EFFECTIVENESS OF CERTAIN INSTRUCTIONAL STRATEGIES BASED ON GRAPHIC ORGANIZERS ON ACHIEVEMENT, RETENTION AND PROBLEM SOLVING ABILITY IN GEOGRAPHY AMONG SECONDARY SCHOOL STUDENTS

Thesis
Submitted for the Degree of
DOCTOR OF PHILOSOPHY IN EDUCATION

by

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Declaration

I **RESHMA P T**, do hereby declare that this thesis entitled as **EFFECTIVENESS OF CERTAIN INSTRUCTIONAL STRATEGIES BASED ON GRAPHIC ORGANIZERS ON ACHIEVEMENT, RETENTION AND PROBLEM SOLVING ABILITY IN GEOGRAPHY AMONG SECONDARY SCHOOL STUDENTS** is an authentic record of research work done by me under the supervision of **Dr. K. Ramakrishnan**, Rtd. Associate Professor, Govt. College of Teacher Education Kozhikode, Research Centre in Education, University of Calicut, and that no part of the thesis has been presented before for the award of any Degree, Diploma and Associateship in any University.

25/08/2023

RESHMA P T

Place: GCTE Kozhikode

Date: 25/08/2023

Certificate

This is to certify that the thesis entitled **EFFECTIVENESS OF CERTAIN INSTRUCTIONAL STRATEGIES BASED ON GRAPHIC ORGANIZERS ON ACHIEVEMENT, RETENTION AND PROBLEM SOLVING ABILITY IN GEOGRAPHY AMONG SECONDARY SCHOOL STUDENTS** is an authentic record of research work carried out by **RESHMA P T** for the degree of Doctor of Philosophy in Education, Govt. College of Teacher Education, Research Centre in Education, University of Calicut, under my supervision and guidance and that no part thereof has been presented before for the award of Degree, Diploma and Associateship in any University.

25/8/2023

Place: GCTE Kozhikode

Date: 25/08/2023

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RESHMA P.T

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Abstract

Geography, as a subject, holds a unique position in secondary education, offering students a lens through which they can understand and engage with the complexities of the world. The effectiveness of instructional strategies in geography classrooms has been a subject of ongoing exploration, with an ever-growing emphasis on innovative approaches to enhance student learning outcomes. The integration of graphic organizers provides students with dynamic representations that facilitate the organization and comprehension of complex information. This study intended to find out the effectiveness of certain instructional strategies based on graphic organizers such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram on achievement, retention, and problem solving ability in geography among secondary school students. ***Quasi-experimental method*** and ***pretest - posttest non-equivalent group design*** was used for the study. Sample consisted of 110 standard IX students from Govt. Vocational Higher Secondary School Madappally, Kozhikode District. Achievement test (pretest) in Geography (Ramakrishnan & Reshma, 2018), Achievement test (Posttest) in Geography (Ramakrishnan & Reshma, 2018), Problem solving ability test (pretest) in Geography (Ramakrishnan & Reshma, 2018), and Problem solving ability test (posttest) in Geography (Ramakrishnan & Reshma, 2018) were prepared and administered for collecting data. Delayed posttest (achievement posttest) was used to assess retention in Geography. Statistical techniques used for the study were descriptive statistics, Mean difference analysis and Analysis of Covariance.

The result of the study revealed that there exists a significant difference between the Posttest scores on Achievement, Retention and Problem Solving Ability in Geography of the Experimental and Control Groups for the total sample and sub sample based on boys, and girls. The mean values of experimental group are found to be higher than that of the control group. It is inferred that the experimental group excelled in achievement, retention and problem solving ability in geography compared to the control group. The study demonstrated that the Instructional strategy based on Graphic organizers enhanced Achievement, Retention and Problem solving ability in Geography among Secondary School students compared to Conventional Method of Teaching. The study implied that instead of the Conventional Method of Teaching, the instructional strategy based on selected Graphic Organizers, such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram should be promoted as preferential pedagogical tools to deliver the geography curriculum among Secondary school students.

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Abstract

ഒരു പഠനവിഷയം എന്ന നിലയിൽ ഭൂമിശാസ്ത്രപഠനം സെക്കൻഡറി ക്ലാസിലെ വിദ്യാർത്ഥികൾക്ക് പ്രപഞ്ചത്തിന്റെ സങ്കീർണതകൾ വിശകലനം ചെയ്യുന്നതിനും ഉൾക്കൊള്ളുന്നതിനും സഹായകമാകുന്നു. അതുകൊണ്ടു തന്നെ വിദ്യാർത്ഥികളുടെ ഭൂമിശാസ്ത്ര പഠനം മെച്ചപ്പെടുത്തുന്നതിന് ഉതകുന്ന ആധുനികപഠന ബോധനതന്ത്രങ്ങൾ ആവിഷ്കരിക്കുന്നതിനുള്ള അന്വേഷണങ്ങൾ തീവ്രമായി നടന്നു കൊണ്ടിരിക്കുന്നു.

സെക്കൻഡറി ക്ലാസുകളിലെ വിദ്യാർത്ഥികൾക്ക് ഭൂമിശാസ്ത്ര ആശയങ്ങൾ സ്വാംശീകരിക്കുന്നതിനും, സ്വാംശീകരിച്ച ആശയങ്ങൾ ദീർഘകാലം നിലനിർത്തുന്നതിനും, പ്രശ്നപരിഹരണ ശേഷി കൈവരിക്കുന്നതിനും പഠന തന്ത്രം എന്ന നിലയിൽ കൺസെപ്റ്റ് മാപ്പ്, ഫ്ലോചാർട്ട്, മെയിൻ ഐഡിയ വെബ്, വെൻ ഡയഗ്രം, ഫിഷ് ബോൺ ഡയഗ്രം എന്നീ ഗ്രാഫിക് ഓർഗനൈസറുകൾ എത്രമാത്രം ഫലപ്രദമാണ് എന്ന പരിശോധനയാണ് ഈ പഠനത്തിന്റെ ലക്ഷ്യം. ക്വാസി-എക്സ്പെരിമെന്റൽ പ്രീടെസ്റ്റ് -പോസ്റ്റ്ടെസ്റ്റ് നോൺ-ഇക്വലന്റ് ഗ്രൂപ്പ് മാതൃകയിലാണ് പ്രസ്തുതപഠനം രൂപകല്പന ചെയ്തിട്ടുള്ളത്.

കോഴിക്കോട് ജില്ലയിലെ മടപ്പള്ളി ഗവൺമെൻറ് വൊക്കേഷണൽ ഹയർ സെക്കൻഡറി സ്കൂളിലെ ഒമ്പതാം ക്ലാസ്സിലെ 110 വിദ്യാർത്ഥികളെ എക്സ്പിരിമെന്റൽ ഗ്രൂപ്പ് (പരീക്ഷണ ഗ്രൂപ്പ്), കൺട്രോൾ ഗ്രൂപ്പ് (നിയന്ത്രിത ഗ്രൂപ്പ്) എന്നിങ്ങനെ രണ്ട് ഗ്രൂപ്പുകളാക്കിയാണ് പഠനത്തിന് വിധേയമാക്കിയിട്ടുള്ളത്. വിവരശേഖരണത്തിനായി അച്ചീവ്മെന്റ് ടെസ്റ്റ് (പ്രീ ടെസ്റ്റ്) ഇൻ ജോഗ്രഫി (രാമകൃഷ്ണൻ & രേഷ്മ, 2018),അച്ചീവ്മെൻറ് ടെസ്റ്റ് (പോസ്റ്റ് ടെസ്റ്റ്) ഇൻ ജോഗ്രഫി (രാമകൃഷ്ണൻ & രേഷ്മ, 2018), പ്രോബ്ലം സോൾവിങ് എബിലിറ്റി ടെസ്റ്റ് (പ്രീ ടെസ്റ്റ്) ഇൻ ജോഗ്രഫി (രാമകൃഷ്ണൻ & രേഷ്മ, 2018), പ്രോബ്ലം സോൾവിങ് എബിലിറ്റി ടെസ്റ്റ് (പോസ്റ്റ് ടെസ്റ്റ്) ഇൻ ജോഗ്രഫി (രാമകൃഷ്ണൻ & രേഷ്മ, 2018), എന്നിവ തയ്യാറാക്കി ഉപയോഗിച്ചു. ഭൂമിശാസ്ത്ര വിഷയത്തിലെ തിരഞ്ഞെടുത്ത പാഠഭാഗങ്ങൾ വിനിമയം ചെയ്യുന്നതിനായി ഗ്രാഫിക് ഓർഗനൈസറുകൾ തന്ത്രങ്ങളായി ഉപയോഗിച്ചുകൊണ്ടുള്ള പഠനാനുഭവങ്ങൾ എക്സ്പെരിമെന്റൽ ഗ്രൂപ്പിനും, പരമ്പരാഗതരീതി ഉപയോഗിച്ചുകൊണ്ടുള്ള പഠനാനുഭവങ്ങൾ കൺട്രോൾ ഗ്രൂപ്പിനും വേണ്ടി പ്രത്യേകം തയ്യാറാക്കി. 'ടി' ടെസ്റ്റ്, അനാലിസിസ് ഓഫ് കോ വേരിയൻസ് എന്നീ സ്റ്റാറ്റിസ്റ്റിക്കൽ തന്ത്രങ്ങൾ ഉപയോഗിച്ചുകൊണ്ടാണ് വിവര വിശകലനം നടത്തിയിട്ടുള്ളത്. ഭൂമിശാസ്ത്ര ആശയങ്ങൾ സ്വാംശീകരിക്കൽ, സ്വാംശീകരിച്ച ആശയങ്ങൾ നിലനിർത്തൽ, ഭൂമിശാസ്ത്ര പ്രശ്നങ്ങൾ പരിഹരിക്കുന്നതിനുള്ള ശേഷി എന്നീ കാര്യങ്ങളിൽ എക്സ്പെരിമെന്റൽ ഗ്രൂപ്പും കൺട്രോൾ ഗ്രൂപ്പും നേടിയ പോസ്റ്റ് ടെസ്റ്റ് സ്കോറുകൾ തമ്മിൽ താരതമ്യ പഠനത്തിന് വിധേയമാക്കിയപ്പോൾ എക്സ്പിരിമെന്റൽ ഗ്രൂപ്പിന്റെ സ്കോറുകൾ, കൺട്രോൾ ഗ്രൂപ്പിന്റെ സ്കോറുകളെക്കാൾ സാരമായി ഉയർന്നതാണെന്ന് കണ്ടെത്തുകയുണ്ടായി. ആൺകുട്ടികളെയും പെൺകുട്ടികളെയും പ്രത്യേകം പരിഗണിച്ചുകൊണ്ട് താരതമ്യപഠനം നടത്തിയപ്പോഴും ഇതേ പ്രവണതയാണ് കാണാൻ കഴിഞ്ഞത്. സെക്കൻഡറി ക്ലാസുകളിൽ ഭൂമിശാസ്ത്ര ആശയങ്ങൾ വിനിമയം ചെയ്യുന്നതിന് പരമ്പരാഗത ബോധനരീതിക്ക് പകരം ഗ്രാഫിക് ഓർഗനൈസറുകളായ കൺസെപ്റ്റ് മാപ്പ്, ഫ്ലോചാർട്ട്, മെയിൻ ഐഡിയ വെബ്, വെൻ ഡയഗ്രം, ഫിഷ് ബോൺ ഡയഗ്രം എന്നിവ ഉപയോഗിക്കുകയാണെങ്കിൽ ആശയ സ്വാംശീകരണം, സ്വാംശീകരിച്ച ആശയങ്ങൾ നിലനിർത്തൽ ഭൂമിശാസ്ത്ര പ്രശ്നപരിഹരണ ശേഷിനേടൽ എന്നീ കാര്യങ്ങളിൽ മെച്ചപ്പെട്ട ഫലമുണ്ടാക്കാമെന്ന് പ്രസ്തുത പഠനഫലം വ്യക്തമാക്കുന്നു.

Chapter 1

INTRODUCTION

- Need and Significance of the Study
- Statement of the Problem
- Definition of Key Terms
- Variables of the Study
- Objectives
- Hypotheses
- Methodology
- Scope of the Study
- Delimitation
- Organization of Report

Learning is the dynamic process through which individuals acquire knowledge, develop habits, and adopt attitudes (Crow & Crow, 1973). It involves the acquisition of new information, the modification of existing knowledge, the refinement of behaviors, the cultivation of skills, the adoption of values, and the shaping of preferences by integrating various types of information. This capacity for learning is not limited to humans but is also observed in animals, plants, and some machines.

The change in the learner can occur at multiple levels, including knowledge, attitude, and behavior, leading to improved performance and laying the foundation for future learning endeavors. Learning can take place consciously, where individuals actively engage in the process, or subconsciously, without conscious awareness.

One effective method of learning is active learning, where students are actively and experimentally involved in the learning process. It revolves around a student-centered approach, encouraging students to take responsibility for their learning by gauging their understanding of subjects. This self-monitoring helps them identify areas that require more attention, fostering a deeper comprehension of the subject matter. Active learning empowers learners to adapt to new situations and overcome obstacles more effectively.

The most effective learning occurs when there is maximum mental activity and engagement. Watkins et al. (2002) emphasize that effective learning occurs when learners are actively involved in the process, strategically approaching their studies, collaborating with others to create knowledge, and developing goals and plans for their own learning journey. In this context, the learner takes an active role in the learning process, which fosters a deeper understanding and retention of the subject matter.

While the subject matter remains important, the key to a successful teaching-learning process lies in employing interesting and engaging methods. An effective teaching technique leaves a lasting impression on the learners, making the content more memorable and relevant to their lives.

Different teachers adopt various teaching methods, and it is essential for educators to be versatile in their approaches. A good teacher should be open to practicing a wide range of teaching strategies to make learning more effective and enjoyable for students. By employing diverse teaching strategies, teachers can overcome various challenges and cater to different learning styles, ensuring that students grasp the concepts more easily.

Effective learning occurs when learners are actively engaged and strategic in their approach. The teaching methods used by educators play a crucial role in shaping the learning experience and making it interesting and impactful. By incorporating a variety of teaching strategies, teachers can create a conducive learning environment and enhance the overall learning outcomes for their students.

An instructional strategy serves as a powerful tool in the teaching process, designed to engage students' curiosity, promote active participation, stimulate critical thinking, maintain focus, encourage classroom interaction, and ultimately enhance their learning of course content. Morris and Tucker (1985) define instructional strategies as generalized plans for lessons, encompassing the structure of the lesson, desired learning behaviors aligned with instructional goals, and an outline of the plan necessary to implement the strategy effectively.

The primary goal of an instructional strategy is to facilitate and optimize the learning process. It achieves this by motivating learners, actively involving them in the learning experience, and helping them maintain concentration and attention. Furthermore, instructional strategies emphasize the development of students'

abilities to learn how to learn effectively, empowering them with essential lifelong learning skills.

Throughout the evolution of formal classroom-based instruction, the organization of the learning environment has remained a fundamental aspect of teaching. Instructional strategies play a central role in shaping the learning environment and reflect educators' professional beliefs about learning and the learner.

Different instructional strategies adopt distinct philosophies about the learning process. Some strategies view students as empty vessels to be filled with knowledge under the guidance of the teacher, while others consider students active participants in their learning journey, encouraging inquiry-based learning and problem-solving approaches.

Instructional strategies are essential tools that promote effective teaching and learning. They actively engage students, encourage critical thinking, and create dynamic learning environments that cater to diverse learning styles. By employing various instructional strategies, educators can accommodate individual differences and create meaningful learning experiences for all students.

The development of life skills is of paramount importance for effectively navigating the demands and challenges of everyday life. According to the National Curriculum Framework (NCF) of 2005, critical life skills include critical thinking skills, interpersonal communication skills, negotiation or refusal skills, decision-making or problem-solving skills, and coping and self-management skills.

Problem-solving, in particular, plays a significant role in developing conceptual understanding and the ability to transfer and apply this understanding to new situations. It encourages students to think logically and discover relationships and patterns within different disciplines. Thinking is the foundational skill required

in problem-solving, as it enables students to make sense of their experiences and approach challenges with a structured mindset.

Effective problem-solving involves several key steps. First, students must identify and define the problem at hand. Then, they proceed to explore and shape possible solutions, followed by testing these solutions through experimentation. The outcome is then evaluated, and the steps are revised as needed to arrive at the best possible solution.

Good (1945) describes problem-solving as a systematic process, starting with identifying the difficulty or situation, gathering relevant information about the problem, formulating hypotheses regarding possible solutions under controlled conditions, collecting, evaluating, and verifying results, reviewing the implications of the findings, and finally accepting or rejecting the initial hypothesis.

Problem-solving is a crucial life skill that fosters logical thinking, creativity, and the ability to tackle real-life challenges effectively. By encouraging students to engage in the problem-solving process, educators help them develop essential skills that are vital for their personal and academic growth, enabling them to succeed in various aspects of life.

The implementation of problem-solving strategies in Geography is crucial as it equips Geographers with the ability to address complex issues prevalent in today's society. By fostering problem-solving skills in Geography, students can develop analytical thinking, critical reasoning, and judgment, which are invaluable in understanding and addressing geographical challenges.

In Geography education, problem-solving can be integrated to enhance students' capabilities to analyze various geographical phenomena, interpret spatial patterns, and propose effective solutions. Emphasizing problem-solving skills encourages students to think critically about geographical issues, enabling them to contribute positively to conservation and environmental concerns.

Geography encompasses the study of both human-built and natural landscapes, where landscapes include both objective, tangible elements and subjective, perceived aspects (Wassmandorf, 1995). It is more than just a subject taught in schools; rather, Geography plays a vital role in individuals' lives and society as a whole.

Recognized as an essential discipline globally, Geography should be integrated more effectively into education to prepare students for higher education, meet their career aspirations, and achieve personal fulfillment. By focusing on problem-solving in Geography, educators can empower students to understand complex spatial relationships, evaluate environmental challenges, and propose sustainable solutions.

Promoting problem-solving skills in Geography education enhances students' abilities to analyze and address geographical issues. This approach not only fosters critical thinking and analytical reasoning but also instills a sense of responsibility and appreciation for environmental conservation. Geography plays a pivotal role in preparing students for their future endeavors, contributing to their personal growth, and making positive contributions to society and the world at large.

Geography is a subject that provides a vast array of information and insights necessary for a comprehensive understanding of the world we live in. It explores the intricate relationship between people and their environment, studying their interactions at various levels, including local, regional, national, and global scales. Throughout its history, Geography has centered on maps and spatial patterns, while in recent times, Geographic Information System (GIS) has emerged as a significant tool in the field.

Geography plays a crucial role in analyzing and addressing contemporary challenges faced by the world. Geographers delve into critical issues such as the

global economy, food security, the impact of new communication technologies, disaster management, and various other pressing concerns that affect human societies and the environment.

Through the lens of Geography, learners gain valuable insights into the ways the environment functions and how human societies navigate and interact with these complex issues. This understanding equips individuals with the knowledge and skills to contribute meaningfully to the world's sustainable development and address global challenges.

Geography education fosters spatial awareness, analytical thinking, and problem-solving abilities, preparing students to become informed global citizens. It encourages them to engage with real-world problems, recognize interconnectedness, and consider the implications of human actions on the environment.

Geography serves as a bridge between people and their surroundings, offering a wealth of knowledge about the world. Its focus on maps, spatial patterns, and the incorporation of Geographic Information System empowers geographers to analyze complex issues and contribute to finding solutions to contemporary global challenges. By instilling a deeper understanding of the environment and human interactions, Geography education prepares individuals to be informed, responsible, and active participants in shaping a sustainable future.

The Geographical Association of the United Kingdom, in 1999, outlined the following aims of Geography Education:

- To foster learners' comprehension and understanding of their local surroundings, as well as other people and places globally. This includes exploring the interrelationships and connections between different locations, recognizing the significance of location, understanding human and physical environments, and examining people-environment relationships and the causes and consequences of change.

- To cultivate essential skills necessary for geographical enquiry, map work, and field work, enabling students to investigate and analyze geographical phenomena effectively.
- To spark an interest in and raise awareness of the world around us, encouraging students to develop a deeper appreciation for geographical issues and global challenges.
- To instill a sense of responsibility and an informed concern for the world, motivating students to take action both at the local and global levels to address societal and environmental issues.
- To familiarize students with key terms, concepts, and fundamental principles of Geography, providing a solid foundation of knowledge.
- To recognize and understand the processes and spatial patterns governing the arrangement of natural and human features and phenomena on the Earth's surface.
- To comprehend and analyze the interconnectedness between natural and human environments and their impact on each other.
- To apply geographical knowledge and inquiry methods to address new situations or problems at local, regional, national, and global levels.
- To develop practical geographical skills, including data collection, processing, analysis, and report preparation, incorporating the use of computers, maps, and graphics.
- To utilize geographical knowledge in understanding community-related issues such as environmental challenges, socio-economic concerns, and gender-related aspects, fostering active and responsible citizenship.

Geography Education aims to equip students with a holistic understanding of their surroundings, develop critical thinking and practical skills, and foster a sense of

global citizenship and responsibility. By imparting geographical knowledge and encouraging active engagement with real-world issues, Geography education prepares students to make informed decisions and contribute positively to their communities and the broader world.

Geographic skills play a fundamental role in helping students think critically and analyze the world from a geographical perspective. These skills are essential for comprehending both physical and human patterns and processes in the world, enabling students to participate effectively in geographic inquiry and logically understand Earth's phenomena. Therefore, it is crucial to systematically incorporate geographic skills throughout students' education. For the secondary stage, the following five geographic skills are particularly important:

Asking Geographic Questions

Students should be able to plan and organize a Geography research project, formulating relevant and meaningful geographic questions to guide their investigations.

Acquiring Geographic Information

Students should know how to locate and gather geographic information systematically from various primary and secondary sources. Additionally, they should be able to assess the reliability and usefulness of the information collected.

Organizing Geographic Information

Students should understand how to select appropriate forms of presentation, such as maps, graphs, diagrams, tables, and charts, to organize and represent geographic information effectively.

Analyzing Geographic Information

Students should be equipped to employ quantitative methods to make inferences and draw conclusions from the data they have collected. They should also

be proficient in using processes like analysis, synthesis, evaluation, and explanation to interpret geographic information from diverse sources.

Responding to Geographic Information

Students should be capable of formulating valid generalizations from their findings and effectively address geographic questions. They should be adept at applying geographic models, theories, and generalizations to analyze, interpret, and present geographic information.

By developing these geographic skills, students can approach geographical inquiries with precision and critical thinking. These skills empower them to better understand the world around them and make informed decisions based on geographical insights. Therefore, integrating geographic skills into the curriculum is essential for fostering geographically literate and capable individuals.

Need and Significance of the Study

Geography equips students with the skills to read maps and interpret geographical information at various scales, ranging from local to global. They learn to analyze data from maps, tables, graphs, and texts, enabling them to identify patterns and solve problems effectively. While many perceive Geography as simply knowing the locations of places, it encompasses much more than that.

Geography involves the comprehensive study of places on Earth and their interconnectedness. It often begins with an exploration of one's own community and gradually expands as students gain broader experiences. This connection between home, school, and the wider world provides students with a conceptual framework to understand their place in the global context.

Geographers delve into how people interact with their environment and with each other in different locations, and they use regional classifications to make insightful observations about the complexities of our world. As Geography is

inherently connected to people's ways of living, it offers a wealth of material related to international understanding, multicultural awareness, and environmental education.

Through Geography, students gain insights into the diverse ways of life across the globe and develop a deeper appreciation for cultural diversity. They learn to appreciate the intricate relationships between human societies and the natural environment, fostering a sense of environmental responsibility.

Furthermore, Geography fosters critical thinking skills, encouraging students to analyze spatial patterns, understand geographical processes, and make informed decisions about various global issues. It serves as a bridge between the local and global, providing a broader perspective on the challenges and opportunities faced by communities worldwide.

Geography goes beyond the mere knowledge of places and maps. It involves studying the connections between locations, people, and the environment. Geography empowers students with essential skills to interpret and solve problems in a spatial context, while also nurturing international understanding, multicultural awareness, and environmental consciousness. By exploring Geography, students gain a deeper understanding of the world and their place in it, fostering a global perspective and a sense of responsibility towards the planet and its inhabitants.

Geography employs a range of tools to help us understand places and their interconnectedness. While maps are a primary tool associated with geographers, they also utilize various forms of statistical information, photographs, images, and diverse data collected through different methods. Geographers rely on their own observations as well as information found in sources such as descriptive Geography texts, histories, diaries, and journals to gain valuable insights.

Geography education enhances students' logical, functional, and aesthetic skills. Problem-solving activities enable students to apply their skills to both familiar

and unfamiliar situations, empowering them to use established theories and develop their own before applying them. By fostering problem-solving strategies, students learn to identify problems, devise effective plans, execute those plans, analyze outcomes, and evaluate the accuracy of their solutions. The problem-solving approach encourages reasoning, thoughtful argumentation, and effective decision-making.

In line with a child-centered approach, teaching and learning methods in Geography should focus on facilitating interactive environments that help learners acquire knowledge and skills. The learning process should encourage a spirit of inquiry and creativity among students. Geography education should employ methods that foster creativity and achievement in the subject, enriching problem-solving abilities. The Geography teacher, as a significant mediator of the curriculum, plays a vital role in simplifying concepts and creating a participatory learning process. Such a method of learning keeps students engaged and connected to real-world social realities.

Geography utilizes diverse tools to understand places and their interconnections. Problem-solving activities enhance students' skills and enable them to apply theoretical knowledge to practical situations. Emphasizing a child-centered approach in Geography education encourages interactive learning environments that foster inquiry and creativity. By employing effective teaching methods, Geography educators can enrich students' problem-solving abilities and create an engaging and relevant learning experience.

The assumption among students that social sciences, including Geography, are dull disciplines poses a challenge for educators to generate interest in these subjects. To address this issue, teachers must employ effective strategies to instill enthusiasm for learning Geography. While current teaching methods offer various

activities for learners, they may have limitations in fully engaging students and fostering interest.

One of the primary goals of education is to cultivate students' problem-solving skills, enabling them to devise practical and innovative solutions to unfamiliar challenges. Education equips students to effectively handle real-life situations. Problem-solving is a crucial aspect of higher-level learning, facilitating the transfer and application of knowledge and understanding to novel circumstances. In Geography, problem-solving strategies can nurture analytical thinking, critical reasoning, and judgment among students.

The integration of Graphic Organizers in Geography education can be beneficial in organizing writing projects, facilitating problem-solving processes, aiding in decision-making, supporting study habits, and encouraging brainstorming. Teachers can effectively utilize Graphic Organizers to model various learning situations, such as reviewing previously learned information or establishing connections between different sources. These well-designed tools serve as scaffolds for content, providing students with a structured framework to complete tasks effectively.

To pique students' interest in Geography, teachers and curriculum developers should consider designing new and innovative strategies that go beyond traditional methods. Incorporating interactive and experiential learning activities can help students connect with the subject on a deeper level and develop a sense of curiosity and excitement about exploring geographical concepts.

When integrated with instructional strategies, Graphic Organizers prove to be highly effective tools, providing students with a much-needed framework for approaching specific tasks. These tools are particularly valuable for teaching or instruction as they demonstrate the order and completeness of a student's thought

process. By utilizing Graphic Organizers, ideas can be differentiated and communicated more effectively, making them valuable visual aids for representing and organizing a student's knowledge and ideas (Morin, 2016).

Graphic Organizers are specifically designed to facilitate the understanding of key concepts by allowing students to visually identify key points and ideas. Their usage across all subject areas helps students master subject matter more quickly and efficiently. These visual displays of information are especially beneficial for learners who struggle with organizing information (Fisher & Schumaker, 1995). They assist students in vividly visualizing how ideas are structured within a text or surrounding a concept, providing a much-needed structure for abstract concepts.

As described by Bromley et al. (1995), Graphic Organizers encompass both visual and verbal information, making them valuable for students with diverse learning styles and abilities. These versatile instructional tools can be effectively employed in various instructional settings. They support students in recognizing and comprehending the connections between the content they are studying and the specific vocabulary and language structures required to communicate about that content. Furthermore, Graphic Organizers engage students in more active learning, enhancing their motivation. By breaking away from the conventional teacher-student interaction pattern, they support cooperative learning activities.

Graphic Organizers are powerful tools when incorporated into instructional strategies. Their ability to provide a clear framework for organizing information and visually represent ideas helps students grasp concepts more effectively. They cater to a wide range of learning styles and abilities, making them beneficial for diverse student populations. Utilizing Graphic Organizers in the classroom fosters active learning and cooperation among students, ultimately enhancing their understanding and motivation to learn.

According to Hanley (2018), Graphic Organizers hold significant importance as teaching tools that guide students in developing sound thinking skills. The use of Graphic Organizers not only makes students' thinking more visible but also enhances classroom learning and fosters student growth and development.

Graphic Organizers are highly effective pedagogical tools for organizing content and ideas, facilitating students' comprehension of recently learned information. These visual tools present material in a visually and spatially engaging manner. As stated by Clark (2007), Graphic Organizers help students record and categorize information, enabling them to understand challenging concepts and identify connections between ideas. When utilized effectively, these visual aids can positively impact student achievement, leading to improved problem-solving and critical thinking skills among students.

Graphic Organizers encompass a diverse range of systems that allow students to visualize information in innovative ways. Examples include descriptive or thematic maps, network trees, Spider Maps, problem and solution maps, sequential maps, fishbone diagrams, comparative and contrast maps, continuum scales, Venn Diagrams, mind maps, timelines, Main idea webs, KWL charts, T charts, Y charts, and more.

Graphic Organizers play a vital role in education, providing numerous benefits to both teachers and students. Some of the key importance of Graphic Organizers in education includes:

- Significantly organizing essential content: Graphic Organizers help teachers present information in a structured and organized manner, making it easier for students to grasp key concepts and relationships between facts and ideas.
- Providing clarity to ideas and recording relationships: By visually representing information, Graphic Organizers help students understand

complex concepts better and make connections between different pieces of information, fostering a deeper comprehension of the subject matter.

- Improving effective student learning: When students engage with Graphic Organizers, they can better organize and internalize concepts, ideas, and facts, leading to more efficient and effective learning outcomes.
- Facilitating divergent thinking: Graphic Organizers encourage students to think creatively and explore multiple possibilities, helping them generate ideas and solutions from various perspectives.
- Assisting in developing mental images: Graphic Organizers enable students to create mental images that accompany the information, enhancing their understanding and retention of the content.
- Enhancing comprehension and retention: Visual aids, such as Graphic Organizers, aid in the comprehension and retention of information, as students can see the relationships between different elements clearly.
- Potentially upgrading student's classroom performance: By providing a visual framework for organizing information, Graphic Organizers can positively impact students' classroom performance and their ability to apply knowledge effectively.
- Increasing achievement test scores: Research suggests that the use of Graphic Organizers can lead to improved student performance on achievement tests, as they provide a structured and systematic approach to studying and learning.

Indeed, a picture is worth a thousand words, and visual learning is a powerful strategy for teaching students of all ages. For adolescents, who may learn differently, visual aids such as Graphic Organizers are particularly valuable in helping them understand complex subjects. Studies have shown that Graphic Organizers are

effective in aiding student learning and retention of information. They help students connect new concepts with existing knowledge, enabling them to apply what they have learned beyond the immediate learning context.

When students feel they understand the material, they are more likely to engage with the text and retain the information for an extended period. Graphic Organizers provide a sense of structure and organization, allowing students to interact with the content more effectively, leading to improved comprehension and retention.

The Graphic Organizer strategy is a valuable tool in Geography education, serving multiple purposes to enhance the learning experience. It plays a crucial role in simplifying complex concepts, supporting problem-solving and decision-making processes, and facilitating brainstorming sessions for generating ideas. One of the significant benefits of using Graphic Organizers is their ability to cater to the diverse needs of all learners. They provide a visual representation of major content information, making it easier for students to comprehend and organize difficult concepts in Geography (Fisher & Schumaker, 1995).

By employing Graphic Organizers, students can better visualize the organization of ideas within a text or surrounding a particular concept. This visual representation assists them in understanding and connecting abstract ideas more effectively. It offers a clear and structured framework, allowing students to grasp the relationships and connections between different elements, fostering a deeper understanding of the subject matter. In Geography, where students often encounter complex spatial relationships and interconnections between various geographical phenomena, Graphic Organizers prove to be invaluable tools. They help students break down intricate information into more manageable components, enabling them to analyze and interpret geographical data more systematically.

Moreover, Graphic Organizers play a vital role in facilitating problem-solving and decision-making processes in Geography. They assist students in identifying patterns, making connections, and developing logical approaches to tackle geographical challenges. Whether it's analyzing population trends, exploring migration patterns, or studying the impact of climate change, Graphic Organizers provide a structured method for students to navigate through complex geographical concepts and data.

Additionally, the use of Graphic Organizers fosters a more engaging and interactive learning environment in Geography classrooms. Through collaborative activities and group discussions, students can work together to create and modify Graphic Organizers, encouraging active participation and enhancing critical thinking skills.

Graphic Organizers serve as powerful tools in Geography education, helping students comprehend and organize complex concepts, aiding in problem-solving and decision-making processes, and promoting active and collaborative learning. By providing a visual representation of geographical information and relationships, Graphic Organizers support students in their exploration of the world and enable them to develop a deeper understanding of geographic phenomena.

The investigator’s own experience as a Geography teacher made to realize that among the various branches of social science, students found it more difficult to learn Geography. The investigator also noticed that students lacked awareness about the relevance and importance of Geography as a subject of study and its potential for higher education and future careers. The major reason attributed to this lack of understanding is the student’s lack of interest in learning Geography. As a Geography teacher, the investigator felt the need to adopt innovative teaching strategies to effectively teach the Geography curriculum. This led the investigator to conduct research in this area of the subject.

The extensive review conducted by the researcher it's found that though several studies have shown the positive effect of Graphic Organizers as an instructional method, a few studies have not supported these findings. In light of this, the investigator decided to study the efficacy of certain instructional strategies based on Graphic Organizers on achievement, retention and problem solving ability in Geography among secondary school students. The investigator also intends to determine which Graphic Organizers are most useful in conveying concepts and ideas in Geography and in developing geographical skills among the students. The findings of this study may be valuable for students, teachers and curriculum planners in making the teaching learning process more interesting, productive and meaningful.

Statement of the Problem

In the present study, the researcher aimed to investigate achievement in the content area, retention of learned concepts in Geography, and the ability to resolve geographical issues in the learning situation by utilizing selected graphic organizers such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram among secondary school students.

Hence, the present study is entitled as **"Effectiveness of Certain Instructional Strategies based on Graphic Organizers on Achievement, Retention and Problem Solving Ability in Geography among Secondary School Students".**

Definition of Key Terms

Effectiveness

The result or product of some efficient cause or agency, a consequence, and an outcome (Good, 1973). In the present study, effectiveness refers to the change that a particular teaching strategy makes in the performance of the pupils.

Instructional Strategy

Morris and Tucker (1985) defined instructional strategies as generalized plan for a lesson which includes structure, desired learning behaviour in terms of goals of instruction and an outline of planned tactics necessary to implement the strategy. In the present study, the investigator used certain Graphic Organizers as instructional strategy to transact selected geographical concepts.

Graphic Organizers

Graphic Organizers are visual displays of key content information designed to be useful for learners who have difficulty organizing information (Fisher & Schumaker, 1995). In the present study, the investigator selected certain Graphic Organizers, namely Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram.

Achievement in Geography

Achievement is defined as the overall accomplishment that students achieve in a particular course measured by their scores (Garrett, 1981). In the present study, Achievement in Geography represents the proficiency of performance in a given skill or body of knowledge in Geography, as measured using standardized test.

Retention in Geography

Good (1973) described retention as the result of an excitation, experience of response, occurring as a persisting aftereffect that serves as the basis for future modification of response or experience. In the present study, Retention is considered the ability to recall and apply previously learned material later in context when needed.

Problem Solving Ability in Geography

Problem Solving Ability is any goal-directed sequence of cognitive operations (Anderson, 1980). Problem solving ability in Geography is the cognitive capability of a learner to perform physical or mental operations in Geography based on his or her knowledge to achieve the goal of solving a problem.

Secondary School Students

The term refers to students studying in standards VIII, IX and X of recognized schools in Kerala.

Variables of the Study

The variables selected for the study are categorized as Independent, Dependent and Control Variables and are presented below.

Independent Variables

Instructional strategies based on;

i. Conventional Method of teaching
ii. Graphic Organizers (Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram)

Dependent Variables

The dependent variables of the study are:

i. Achievement in Geography
ii. Retention in Geography
iii. Problem Solving Ability in Geography

Control Variables

i. Pretest scores in Geography

Objectives of the Study

The present study was designed with the following objectives.

1. To find out whether there exists any significant difference in Achievement in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.
2. To find out whether there exists any significant difference in Achievement in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.
3. To find out whether there exists any significant difference in Retention in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.
4. To find out whether there exists any significant difference in Retention in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.
5. To find out whether there exists any significant difference in Problem Solving Ability in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.
6. To find out whether there exists any significant difference in Problem Solving Ability in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.

Hypotheses of the Study

The hypotheses of the study are as follows;

1. There exists significant difference in Achievement in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.
2. There exists significant difference in Achievement in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.
3. There exists significant difference in Retention in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.
4. There exists significant difference in Retention in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.
5. There exists significant difference in Problem Solving Ability in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.
6. There exists significant difference in Problem Solving Ability in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.

Methodology

The investigator adopted a ***quasi-experimental method*** for the present study. The study aimed to investigate the effectiveness of certain Graphic Organizers as an instructional strategy on Achievement, Retention and Problem Solving Ability in

Geography among secondary school students. Lesson transcripts based on the selected Graphic Organizers were prepared for the experimental group, while lesson transcripts based on the Conventional method of teaching were prepared for the control group to deliver the selected topics in Geography.

Design

The investigator adopted a ***pretest - posttest non-equivalent group design*** for the present study. Two divisions of standard IX students were selected as the experimental and control groups. The experimental group was taught through selected Graphic Organizers (Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram), where as the control group was taught through the Conventional Method of Teaching. Both groups were presented with the same content unit, 'Sun: the Ultimate Source' from Social Science course book (SCERT, Kerala) of standard IX. Pretests and posttests were administered for both groups before and after the experimentation.

Sample Selected for the Study

The study was conducted on a representative sample of 110 standard IX students from Govt. Vocational Higher Secondary School Madappally, Kozhikode District. Two classes were selected, with one class was treated as experimental group and the other as the control group. Each class consisted of 55 students.

Table 1

Sample Selected for the Study

Group	Method of Teaching	Total Students
Experimental Group	Graphic Organizer	55
Control group	Conventional method	55

Tools used for the Study

For the present investigation, the dependent and independent variables were measured using tools developed by the investigator. The lesson transcripts, prepared

by the researcher were used for deliver the selected topic to the experimental and control groups.

i. Achievement test (Pre and Post) in Geography (Ramakrishnan & Reshma, 2018)
ii. Problem solving ability test (Pre and Post) in Geography (Ramakrishnan & Reshma, 2018)
iii. Lesson transcripts based on certain Graphic Organizers (Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram)
iv. Lesson transcripts based on Conventional Method of Teaching

Statistical Techniques

The following statistical techniques were used for the analysis of data in the present study.

- **Descriptive Analysis**
  1) Arithmetic Mean
  2) Median
  3) Standard Deviation
  4) Skewness
  5) kurtosis
- **Inferential Analysis**
  1) Mean difference analysis
  2) Analysis of Covariance

Scope of the Study

By integrating text and visual imagery, Graphic Organizers can actively engage different types of students in the learning process. The main purpose of the study was to examine the effectiveness of certain instructional strategies based on Graphic Organizers such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram, on Achievement, Retention and Problem

Solving Ability in Geography among Secondary School students for the total sample and sub sample based on Boys, and Girls. The findings of this study may be useful for students, teachers, and curriculum planners to make the teaching-learning process more interesting, productive and meaningful.

Delimitations of the Study

Even though all possible precautions have been taken to obtain valid and reliable results, certain limitations have crept in to the present study. They include:

1) For practical reasons, the study was confined to one secondary school in the Kozhikode district.
2) Since it is an experimental study, conducting the research with large number of sample may be difficult. Hence the researcher reduced the sample size to 110 standard IX students.
3) Since the secondary school students comprise the VIII, IX and X standards of Government, aided and unaided schools, the researcher chose to select only IX standard students from a single government school for practical reasons.
4) For the practical reasons, only boys and girls were selected as the sub sample for the study.
5) The content selected for preparing lesson transcripts was limited to the topic 'Sun: the ultimate source' for the treatment.
6) The investigator selected only six Graphic Organizers (Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram) as instructional strategies due to practical reasons.
7) The selection of the dependent variable has been limited to achievement, retention and problem solving ability in Geography among secondary school students.

8) Due to practical reasons, a component-wise analysis of the dependent variables was not attempted.

9) There may be many factors affecting achievement, retention and problem solving ability in Geography, but the present study focused only on the effect of instructional strategies based on certain Graphic Organizers and conventional method of teaching.

Despite acknowledging the aforementioned limitations, the study is expected to provide significant suggestions for enhancing education.

Organization of the Report

The study is reported in six chapters.

Chapter 1 An Introduction to the problem, need and significance of the study, statement of the problem, definition of key terms, variables of the study, objectives and hypotheses, a brief methodology, scope and limitations, and organization of the report.

Chapter 2 A Theoretical Overview of dependent and independent variables along with a detailed Review of Related Studies.

Chapter 3 Methodology in detail with description of the design, variables, sample, tools, procedure adopted for experiment, scoring and consolidation of data and the statistical techniques used for the study.

Chapter 4 Details of Analysis and Interpretation of the collected data.

Chapter 5 A summary of the study along with Major Findings, Tenability of Hypotheses, and Suggestions for improving educational practice and Suggestions for further research in the area concerned.

Chapter 6 Recommendations and Educational implications of the study.

An extensive Bibliography and Appendices follow this.

Chapter 2

REVIEW OF RELATED LITERATURE

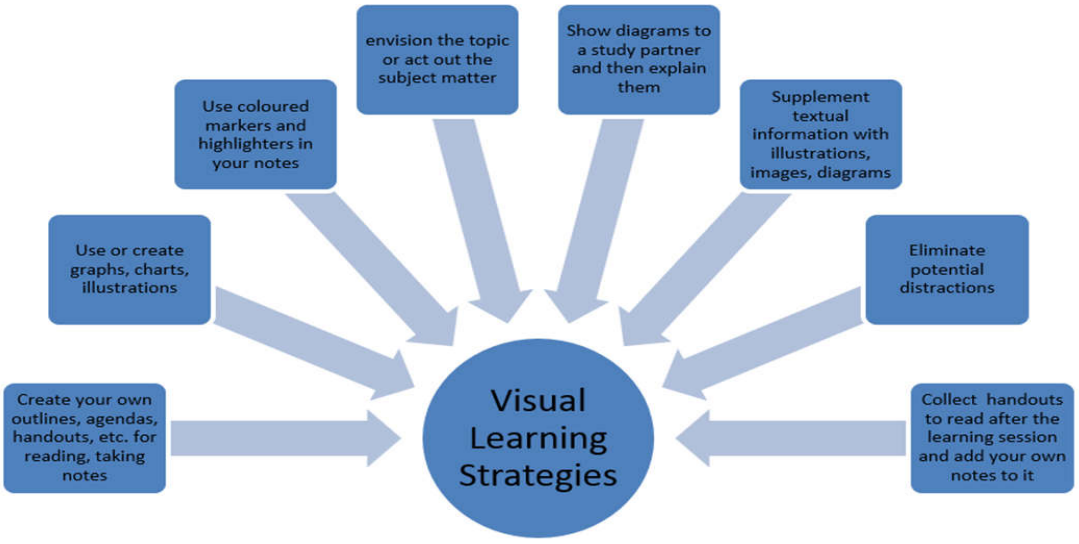
- Graphic organizers– Theoretical overview
- Achievement– Theoretical overview
- Retention– Theoretical overview
- Problem solving ability– Theoretical overview
- Graphic organizers– Related studies

Theoretical Overview of Graphic Organizer

Visual learning is a learning style in which the learner comprehends and retains information more effectively when ideas, words, and concepts are associated with images. The majority of students in a regular classroom prefer to see information visually to enhance their learning experience. Some common visual learning strategies include creating Graphic Organizers, diagramming, mind mapping, outlining, and more.

Figure 1

Visual Learning



Advantages of Visual Learning

- Visual learning helps students clarify their thoughts - students see how ideas are correlated and realize how information can be grouped and organized. With visual learning, new concepts are more rigorously and easily understood when they are linked to prior knowledge.
- Helps students to organize and analyze information - students can use diagrams and plots to display large amounts of information in ways that are easy to comprehend and help reveal relationships and patterns.

- Helps students to integrate new knowledge - students remember information very well when it is represented and learned through visuals and verbal communication.
- Helps students to think critically - linked verbal and visual information helps students make connections, understand relationships, and recollect related details.

Visual Learning in Education

Visual learning strategies, such as graphic organizers, are widely used in classrooms and benefit students of all ages in managing learning objectives and achieving academic success. These strategies assist students in evaluating and interpreting information from various sources, integrating new knowledge with existing understanding, improving writing skills, and thinking critically. Paired with the brain's natural ability to process images, visual learning tools enhance students' comprehension and retention of information.

According to Ellis and Howard (2005), graphic organizers are visual devices that represent information in various ways, often using lines, circles, and boxes to create images that depict four common types of information organization: hierarchical, cause/effect, compare/contrast, and cyclic or linear sequences. These visual cues enable effective communication and understanding of information by demonstrating how essential details about a topic are organized.

Graphic organizers provide students with opportunities to transform information, ideas, and concepts into visual representations. By using graphic organizers, students can accumulate ideas, identify relationships, and retain information more effectively. The versatility of visual representations allows their application in various instructional contexts, depending on the objectives of the lesson.

A graphic organizer serves as a visual representation of knowledge, structuring information and arranging essential aspects of an idea or topic into a

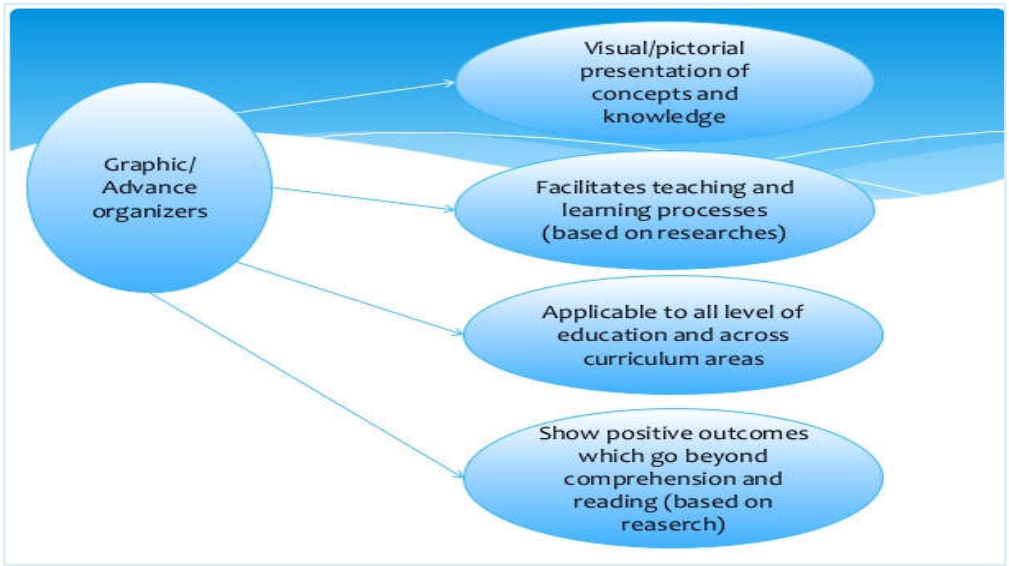
pattern using labels (Bromley, 1995). This process facilitates classification, organization, and summarization of information. Graphic organizers are highly effective visual learning strategies, utilized across the curriculum to enhance learning and comprehension of subject matter content. They guide learners' thinking as they complete and build upon a visual map or diagram.

Educators can utilize graphic organizers as instructional devices to demonstrate students' understanding of a topic or section of text and identify areas for improvement. Before instruction begins, teachers may present and organize educational objectives into a graphical, visual format, known as Graphic Organizer Instruction (Darch & Eaves, 1986). This approach sets the stage for student learning by providing a structured and organized framework for understanding.

In summary, graphic organizers are valuable tools in visual learning, aiding students in comprehending complex information and fostering critical thinking skills. These visual displays exhibit relationships between facts, concepts, or ideas and can include various visual learning strategies like concept mapping, webbing, mind mapping, among others.

Figure 2

Definition of Graphic Organizer



Graphic Organizers serve as effective retrieval cues for information, aiding students in recalling and accessing knowledge (Dunston, 1992). They are visuospatial arrangements of information containing connected words or statements in a meaningful way (Horton et al., 1990). According to Bone (2000), when students use Graphic Organizers, they engage in thoughtful learning, leading to more meaningful connections and improved recall. Graphic Organizers make information more evident, distinct, and articulate for learners. Utilizing Graphic Organizers as an active learning strategy allows teachers to present information in a different format, beyond traditional text.

Allen (1999) states that constructing Graphic Organizers helps students discover meaning through engaging pathways, going beyond the conventional approach. Students are enabled to understand concepts, describe them in their own words, and apply them to their lives. Monroe (1998) emphasizes that Graphic Organizers enable teachers to assess students' level of understanding, facilitating instructional interventions. While students construct their learning process using Graphic Organizers, teachers can provide appropriate support and guidance.

Research indicates that Graphic Organizers can improve the academic performance of low-achieving and general education students (Lovitt & Horton, 1994). Therefore, the widespread use of this instructional method in classrooms could empower lower-functioning students to effectively challenge themselves alongside their general education peers. Egan (1999) describes Graphic Organizers as visual representations of knowledge, structuring information and arranging key concepts in a pattern. When students work cooperatively with Graphic Organizers, they learn to create, share, discuss, and respect one another's ideas. This collaborative environment allows them to construct new meanings and appreciate different thinking and learning styles among their peers.

In conclusion, Graphic Organizers serve as valuable tools for learners, aiding in information retrieval, understanding, and critical thinking. Their use fosters active

and thoughtful learning, enabling students to make meaningful connections and apply knowledge in real-life contexts. By employing Graphic Organizers in the classroom, teachers can create a supportive and engaging learning environment, enhancing students' academic performance and fostering cooperation and mutual respect among learners.

Theoretical Background of Graphic Organizers

The history behind the graphic organizer can be traced back to David Ausubel's (1960) cognitive theory of meaningful reception. Ausubel proposed that learning occurs when new information is connected to existing important ideas within the learner's cognitive structure. Graphic Organizers serve as a means to facilitate this process by providing students with a framework to relate their existing knowledge to the new information they are learning. Ausubel's advance organizer, one of the most widely used methods of transmitting substantial amounts of information across various subject areas, emphasizes presenting the "big picture" with the most general ideas of a subject first, followed by progressively detailed and specific information.

The advance organizer, used as a type of graphic organizer, acts as a roadmap to organize the structure of information that the student will learn. Introduced before the actual learning process, the advance graphic organizer relies on the student integrating new material with their previously acquired knowledge. Unlike a mere overview that only summarizes key ideas, the advance organizer is presented in conjunction with other relevant information, bridging the gap between new material and the pre-existing knowledge the student already possesses. In essence, Ausubel's advance organizer is a visual representation of information that is provided to the student before they delve into reading the textbook or engaging with the learning content.

Ausubel's cognitive theory of learning emphasizes the significance of an individual's existing knowledge or cognitive structure in the process of acquiring new

information in a content area. He believed that meaningful learning occurs when new information is connected to already learned knowledge. Ausubel proposed that new meanings are acquired more effectively when they are clearly and concisely organized and integrated with existing information. Therefore, learning and retention can be facilitated by reinforcing and strengthening the learner's cognitive structure.

According to Ausubel (1968), the use of an advance organizer can support students' existing cognitive structure during classroom learning tasks. An advance organizer is an introductory prose passage that highlights the most important content and structure of the learning material. Ausubel stated that advance organizers provide a framework for integrating new material into the learner's existing cognitive structure and help distinguish it from similar or conflicting ideas already present.

Graphic Organizers find their origins in cognitive theories of learning that aim to explain how students learn through thought processes. These theories assume that mental processes operate in an organized and predictable manner. By incorporating Graphic Organizers during the learning process, these cognitive processes can be enhanced, leading to improved memory, retention, and retrieval of information. Several theories underpin the use of Graphic Organizers:

Subsumption Theory

David Ausubel: Emphasizes organizing information in a hierarchical top-down manner for effective learning and retention.

Information Processing Theory

George Miller (1962): Suggests that students learn better by chunking information, and Graphic Organizers support this process.

Dual Coding Theory

Allan Paivio (1986): Proposes that memory has two systems for processing information - verbal and visual. Graphic Organizers aid the visual process of memory and learning.

Schema Theory

Anderson (1997): States that memory is composed of a network of schemas. Graphic Organizers allow learners to integrate new information into their existing schema.

Cognitive Load Theory

Sweller (1998): Graphic Organizers can minimize cognitive load and free working memory for continued learning.

By applying these theories through the use of Graphic Organizers, educators can enhance students' learning experiences and promote effective knowledge acquisition and retention.

Types of Graphic Organizers

Graphic Organizers are tools used for presenting, illustrating, and modeling information in visual or graphic form to facilitate meaningful learning. They are a set of learning strategies that involve transforming words expressed in linear form into visual structures. By expressing written materials or complex concepts graphically, students can develop alternative structures for understanding the course concepts. The use of Graphic Organizers enhances the learning process by providing students with visual representations that aid in comprehension and knowledge retention.

Figure 3

Types of Graphic Organizer

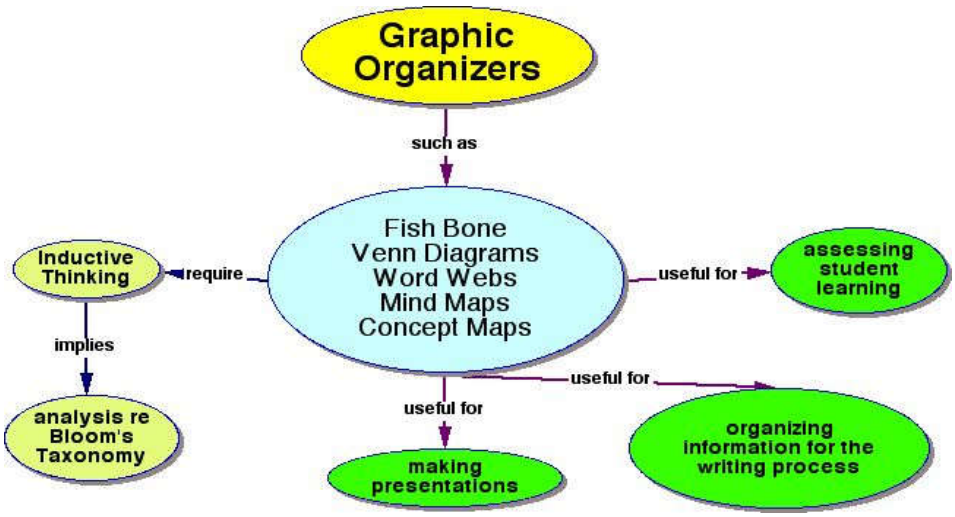


Table 2

Graphic Organizers based on Structural Pattern of Information

Graphic Organizer Pattern	Structural Pattern or Text
Hierarchical	Categories and subcategories, matrix, plot, tree, pyramid
Conceptual	Description, mind map, concept map, concept chart
Sequential	Time line, chronology, process/product, cycle graph, line graph
Evaluative	Agreement scales, satisfaction scales, evaluation chart
Relational	Fish bone, pie chart, cause/effect, characteristic chart
Cyclical	Cycle graph, life cycle, repetitive events

Types of Graphic Organizers, as described by Martella Miller & Mac Queen (1998), include:

- Hierarchical – presents main concepts and supporting details of a topic in a hierarchical structure.
- Comparative – illustrates similarities and dissimilarities among key concepts.
- Sequential – arranges steps or events in a chronological or sequential order.
- Diagrams – represent actual objects and systems in the real world.

According to Bromely et al. (1995), Graphic Organizers consist of:

- Hierarchical– describes a pattern that entails the main concepts and levels of sub-concepts under it.
- Conceptual– presents a central idea with supporting facts, characteristics, and/or examples.
- Sequential – arranges events in a sequence order.
- Cyclical– represents a series of events within a process in a circular formation, with no beginning or end, just a continuous sequence of events.

Frequently used Graphic Organizers, as described by Egan (1999), include:

- Venn diagrams – list facts or ideas about a topic from two different perspectives or eras in two different columns, with the similarities listed in a third, central column.
- Semantic maps – link an important word to related words, rank them from most to least important, and organize them in a diagram.
- Genealogical trees–a hierarchical diagram of words constructed by the teacher.
- Frames – a two-dimensional Graphic Organizer that displays important information related to the targeted key topic in an organized manner.
- Word web – useful in situations where new words naturally group together in two categories around a central concept.

These Graphic Organizers, such as charts, graphs, maps, flow charts, or other structures, help visualize the materials in texts and support students' understanding and retention of information.

Based on the theories behind Graphic Organizers, there are many types that can be applied in the classroom:

- Hierarchical organizers – present the main concepts and supporting details in a ranking order.
- Comparative organizers – present similarities among key concepts.
- Sequential organizers – exemplify a series of steps or place events in chronological order.
- Diagrams – present actual objects and systems in the real world of science and social studies.
- Cyclical organizers-represent a series of events that have no beginning or end.
- Conceptual organizers – comprise a main concept with supporting facts, evidence, or characteristics.

These various types of Graphic Organizers can be used as effective visual learning tools to help students better organize, understand, and retain information across different subjects and topics in the classroom.

Table 3

Graphic Organizers based on Nature of Information

Types		Description
Graphic Organizers that Categorize Information	Concept Maps	Used to develop concepts by linking information together using labeled cells
	Know Wonder learn	Used to help students identify what they already know about a topic, what they want to learn, and then what they have learned once the study is complete.
	Mind Mapping	Used to organize and classify information, make decisions and solve problems using a non-linear format
Graphic Organizers that show relationships	Cause and effect	Used to show the problem solving process. Identifies a problem and various solution tried.
	Fishbone	Used to explore aspects of a complex idea. A visual way to see how details are related
Graphic Organizers that show Order, Sequence, or Development	Chain	Used to show a chain of events, timeline, or cycle
	Cycle	Used to how items are related to each other in a continuous pattern, with no beginning or end
	Flowchart	Used to visually display the sequence of a set of items. A variety of symbols can be incorporated to show such things as stopping points, decision points, and the direction of flow.
	Ladder	Used to order a series of events or items
	Picture Web	Used to create a visual representation of a series of concepts or events
	Story Board	Used to map out scenes of a story
	Story Map	Used to help students identify the elements of a story
Graphic Organizers that compare and contrast	Compare & contrast	Used to compare the attributes of two or more items.
	T-chart	Used to list two aspects of a topic
	Venn Diagram	Used to identify the similarities and differences between two or more items

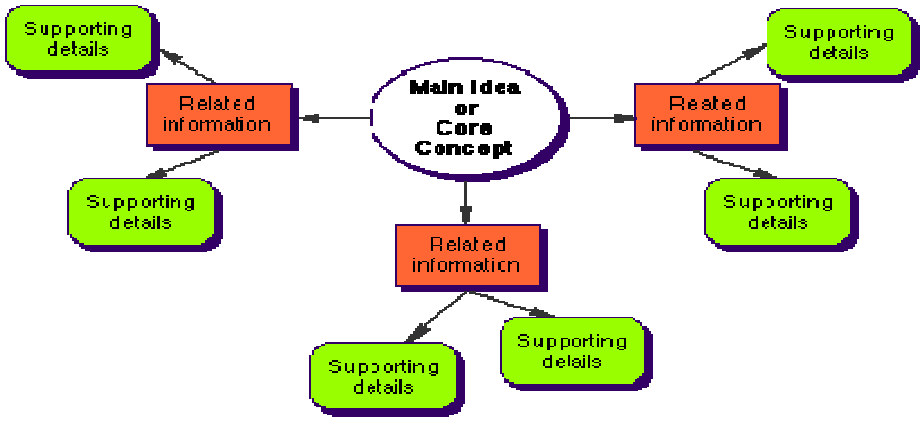
Each graphic organizer can serve multiple objectives, and their applications may overlap across different categories based on their usage. For the present study, the investigator selected specific graphic organizers as instructional strategies. The chosen graphic organizers are as follows:

Concept Map

Introduced by Novak and Gowin (1984), concept maps are used to graphically represent related concepts within a specific knowledge domain. They illustrate the flow within a topic area and specify the relationships between key concepts. Concept maps are presented in a hierarchical format, with sub-topics branching out from a primary concept or idea and further breaking down into more specific concepts. These maps enable students to visually identify connections and foster a deeper understanding of the knowledge structure. They allow learners to explore ideas and their relationships with other concepts. Concept maps can be fixed or interactive, with learners directed from one concept to related materials. These maps reduce cognitive load by focusing on essential relationships and supporting exploration for deeper learning. Concept maps are suitable for both cognitive and constructivist approaches to learning. They can be created by domain experts to aid comprehension of course structure and concept relationships, or learners can participate in the process to enhance individual understanding, either independently or through collaboration and knowledge sharing.

Figure 4

Concept Map

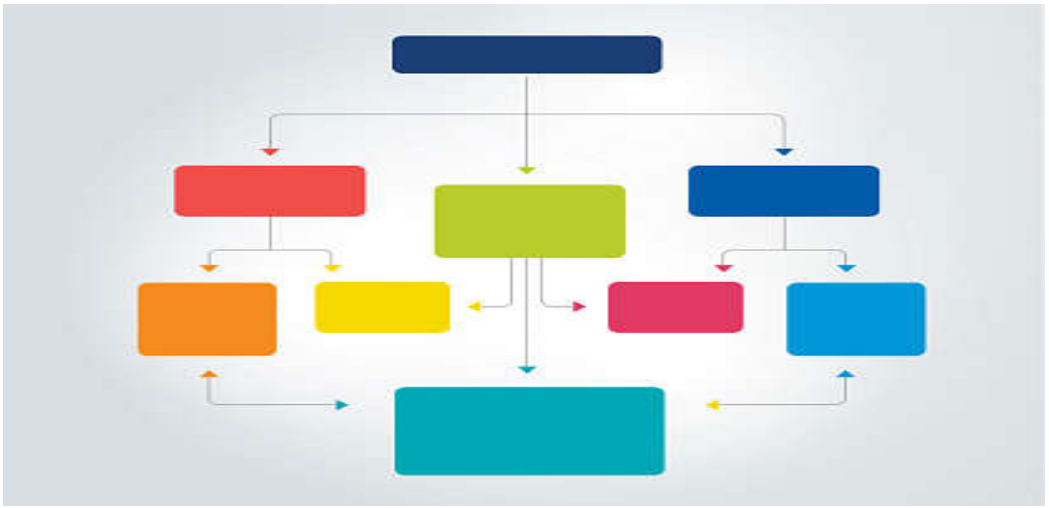


Flowchart

Flowchart diagrams are a type of graphic organizer that visually displays a sequence of instructions used to complete an algorithm or other complex process. Flowcharts typically have a starting point, multiple possible outcomes at certain nodes, rules at specific nodes, and potentially multiple endings. Different symbols in flowcharts carry different meanings. Arrows represent the direction of flow, circles and ovals indicate starting, stopping, or control points, diamonds denote decision points, rectangles and squares represent steps where processing occurs, and parallelograms are used to represent input or output points.

Figure 5

Flowchart



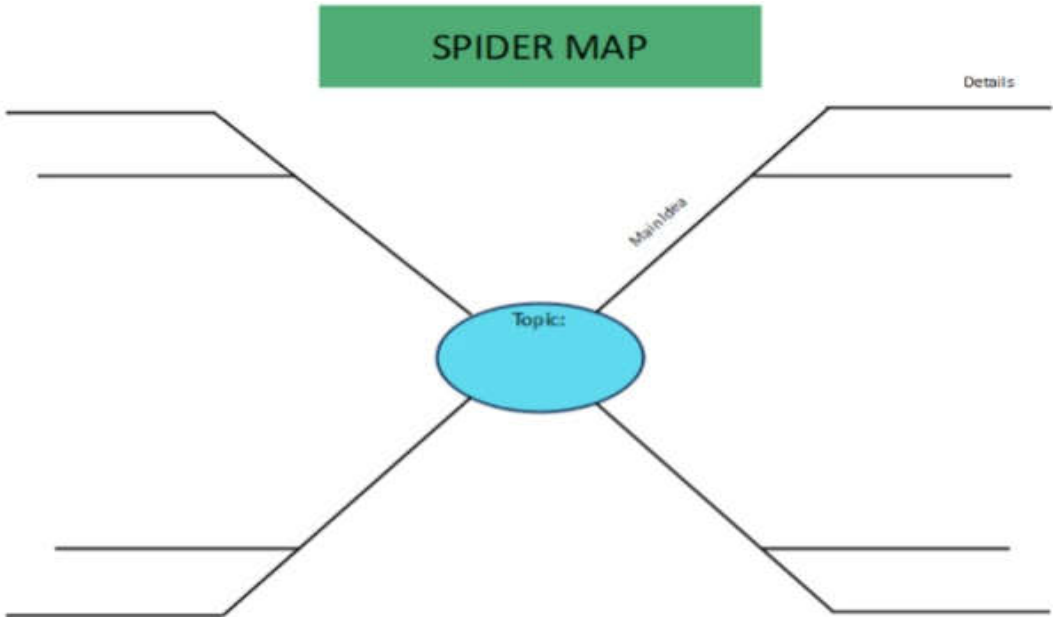
Spider Map

Spider maps, a technique developed by Hanf (1971), serve as an alternative to traditional note-taking from text. They are a type of graphic organizer used to explore and highlight various aspects of a single theme or topic. The term "Spider Map" derives from its resemblance to a spider's web. Creating a Spider Map helps students focus on the topic, requires them to review their existing knowledge in order to organize it, and enables them to monitor their growing comprehension of the topic. It also helps identify areas where further exploration is needed.

In a Spider Map, the main concept or topic is placed in the center (or body) of the diagram. Each detail or sub-topic related to the main idea has its own leg (or branch) extending from the center. Spider Mapping is useful for brainstorming ideas, features, and thoughts related to a specific theme or topic. Its name comes from the way it looks when drawn out, resembling a spider's web.

Figure 6

Spider Map



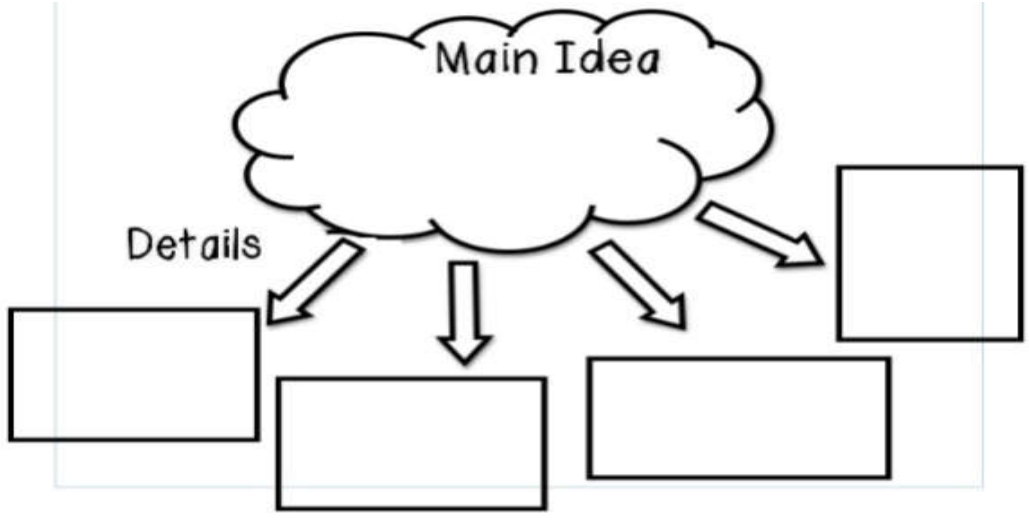
Main Idea Web

The main idea web is a graphic organizer that starts with a central idea and branches out into related ideas and details (or sub-ideas). It is primarily used for brainstorming and generating ideas for planning or writing purposes. This type of graphic organizer helps visualize the structure of a paragraph in text by highlighting the main concept and any supporting details.

The main idea graphic organizer is a valuable tool for students as it provides a framework for them to record the main ideas and details found in each paragraph topic. When students need to structure an essay, it can be challenging at times. However, by using a main idea graphic organizer, students can create an outline that will help them better comprehend the subject matter and organize their thoughts effectively.

Figure 7

Main Idea Web



Venn Diagram

The Venn diagram was actually introduced by John Venn, an English logician, in 1880, and he originally called the illustration Eulerian circles. A Venn

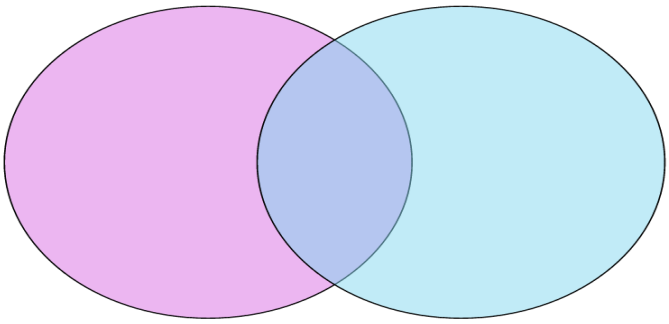
diagram is a visual representation used to exhibit comparison and contrast between two or more ideas. It is a powerful tool to analyze the similarities and differences between different sets or groups.

In a Venn diagram, each set is represented by a large circular shape, and these circles are positioned so that they overlap with the set(s) they are related to. The overlapping regions contain the elements that are common between the sets, while the non-overlapping areas represent the elements that are different.

Venn diagrams have practical applications across various subjects in the curriculum. In Geography, for instance, Venn diagrams can be used to explore and compare weather systems, planets or ecosystems, geographical regions, cultures, and more. They provide a clear and concise visual representation of the relationships between different elements, making them a valuable tool in various fields of study.

Figure 8

Venn Diagram



Fishbone Diagram

Ishikawa diagrams, also known as fishbone diagrams, herringbone diagrams, cause-and-effect diagrams, or Fishikawa, are causal diagrams invented by Kaoru Ishikawa in 1968. These diagrams are used to show the reasons behind a specific event or problem. A fishbone diagram is a visualization tool that helps classify and identify the potential causes of a problem, with the goal of identifying its root causes.

Fishbone diagrams are a type of graphic organizer that can be used to evaluate an event, object, or issue by using a web diagram. The diagram helps identify numerous possible causes for an effect or problem and can be effectively utilized to facilitate a brainstorming session. By organizing ideas into useful categories, the fishbone diagram aids in understanding the various factors contributing to the main issue. This visual representation makes it easier to analyze and address complex problems, leading to more effective problem-solving and decision-making processes.

Figure 9

Fishbone Diagram

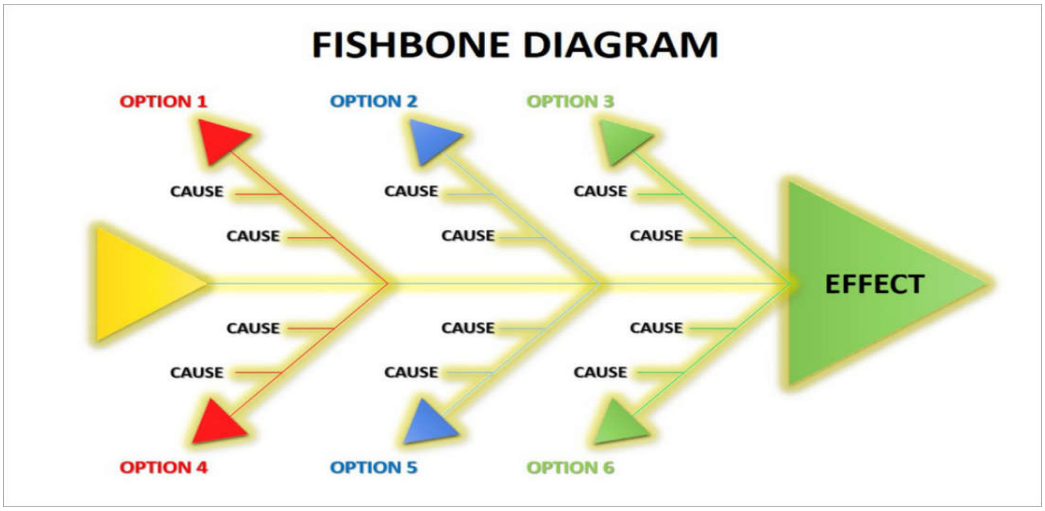
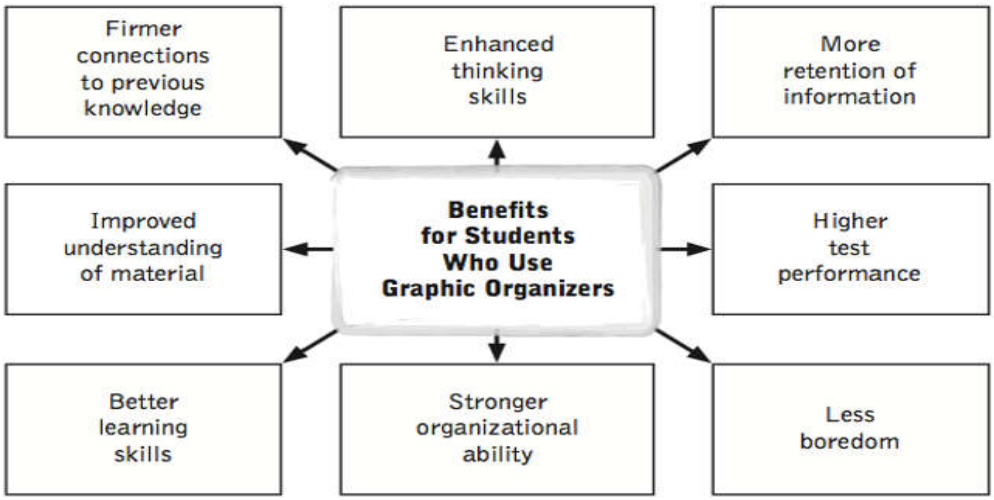


Figure 10

Benefits of Graphic Organizers for Students

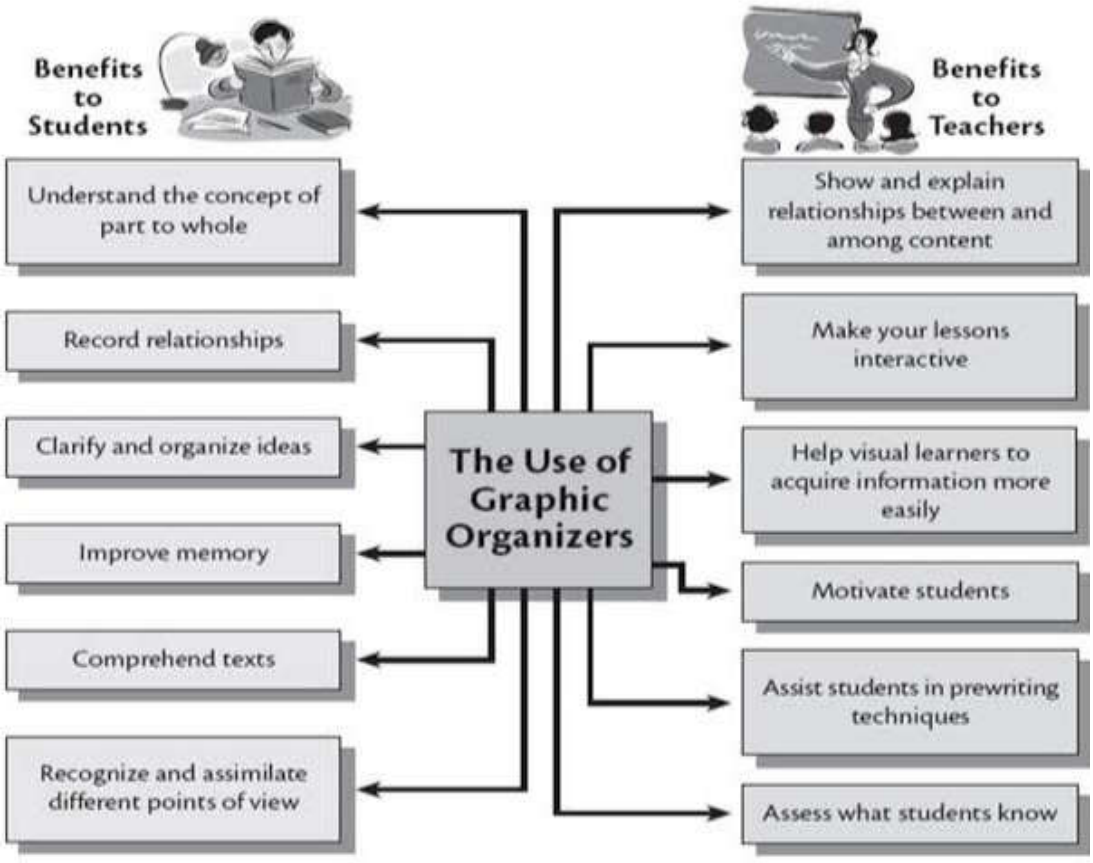


Advantages of Graphic Organizers

- It enables learners to work actively to construct their understanding.
- It promotes visual thinking as it represents what the learner understands.
- It makes thought and organization of thoughts visible and leads to deeper apprehension.
- It aids in processing and restructuring thoughts and information.
- It facilitates the elicitation and explanation of ideas.
- It encourages recall and retention through synthesis and analysis.
- It expedites conceptual change and metacognition skills.
- It strengthens critical thinking or higher-order thinking skills.
- It develops problem-solving skills.
- Graphic organizers are a way to encourage students to think about information in innovative ways.
- They are magnificent tools for activities that ask students to review concepts and demonstrate their understanding. They can easily make alterations and take different views, supporting students in clarifying their thinking.
- Abundant information can be shared on a single picture to provide a broad outlook on a topic.
- It's easy to edit, revise, and swiftly add to a visual map.
- Graphic organizers can be utilized as a helpful planning tool, from information identification to product development.

Figure 11

Use of Graphic Organizers for Students and Teachers



Achievement – Theoretical Overview

Achievement refers to the level of success or accomplishment attained by students in their academic pursuits. It reflects how well students have mastered the required knowledge, skills, and competencies outlined in the educational curriculum. In the present education system, achievement is measured by various means, such as grade reports, teacher observations, standardized assessments, classroom assessments, graduation rates, academic competitions, and portfolio submissions or long-term projects.

A high academic achievement is necessary for students as it will determine their further educational opportunities and future life. Singh (2002) defined

achievement as the accomplishment of specified objectives, past performance, and what an individual or organization has accomplished in the past, in contrast with ability, which refers to what an individual or organization can do now in the present or future. Achievement is the act of accomplishing or finishing tasks and can be defined as the act of acquiring knowledge, skills, ideas, or understanding beyond what already exists. It is the addition of ideas or skills, the recording of ideas, or the acquisition of concepts – a set of possible actions.

Achievement is influenced by various factors, including a student's effort, motivation, engagement, support from teachers and parents, and the quality of the educational environment. High achievement is a desirable goal in education as it indicates that students have successfully acquired the knowledge and skills necessary to progress and excel in their academic journey.

Achievement can be measured through various means, such as:

1. High academic performance indicates a strong level of achievement in the subject matter. This includes grades received in tests, quizzes, assignments, projects, and examinations.
2. Standardized assessments are designed to measure students' knowledge and skills on a common scale, allowing for comparisons across different schools, districts, or regions. These are known as standardized tests.
3. Teachers regularly assess student’s understanding and progress through various assessments conducted in the classroom. These assessments are known as classroom assessments.
4. The percentage of students who successfully complete their educational program and graduate is a critical indicator of achievement. This is known as graduation rates.

5. Students who excel in academic competitions, research projects, or extracurricular activities related to education demonstrate high levels of achievement. This is often recognized through competitions and awards.
6. Some educational programs assess student achievement through portfolio submissions or long-term projects that showcase their learning and growth over time. These are known as portfolios and projects

Achievement Test

Achievement tests focus on evaluating a student's knowledge and skills in specific academic subjects.

Purpose

Achievement tests are designed to measure a student's level of proficiency or mastery in a specific subject or academic area. These tests assess how well a student has learned the material covered in a particular course or curriculum.

Content

The content of an achievement test is directly related to the content covered in the specific subject or course. For example, an achievement test in Mathematics will assess the student's knowledge and skills in math topics like arithmetic, algebra, geometry, etc.

Format

Achievement tests often consist of multiple-choice questions, short answer questions, and sometimes open-ended questions. The format may vary depending on the subject and grade level being assessed.

Scoring

Achievement test scores are typically reported as a numerical or percentage score, indicating the percentage of correct answers or the number of points earned.

Usage

These tests are used to determine a student's academic progress, identify areas of strengths and weaknesses, and evaluate the effectiveness of the educational program. They provide valuable information to teachers, schools, and educational policymakers to make informed decisions about curriculum development and student support. Additionally, achievement tests can also be used for standardized comparisons between students, schools, districts, or even across different regions or countries.

Retention – Theoretical Overview

Retention refers to the ability of learners to retain and remember the information, knowledge, or skills they have acquired over time. It is an essential aspect of the learning process as the ultimate goal of education is not only to facilitate immediate understanding but also to ensure that learners can recall and apply what they have learned in the future. Retaining information and skills is crucial for several reasons:

- **Long-Term Understanding**

When learners retain knowledge, it becomes part of their long-term memory, allowing them to build upon it and make connections to new concepts.

- **Application of Knowledge**

Retained information can be applied in various contexts, enabling learners to solve problems, analyze situations, and make informed decisions.

- **Continued Learning**

Retention forms the foundation for further learning. New knowledge is often built on previously acquired knowledge, and retention ensures the continuity of the learning process.

- **Assessment Performance**

Retention is a significant factor in academic performance. Students who can retain and recall information effectively tend to perform better in assessments and examinations.

Educators and instructional designers employ various strategies to enhance retention, such as:

Repetition

Reinforcing important information through repetition can help solidify it in learners' memories.

Active Learning

Engaging learners in activities that require them to interact with the material, such as discussions, hands-on exercises, and problem-solving, enhances retention.

Visual Aids

Using visual aids, such as diagrams, charts, and graphic organizers, can make information more memorable.

Chunking

Breaking down complex information into smaller, manageable chunks can facilitate retention.

Spaced Learning

Distributing learning sessions over time (spaced learning) rather than cramming all at once (massed learning) can improve long-term retention.

Retention is a critical factor in determining the effectiveness of educational experiences, as it directly impacts learners' ability to recall, apply, and build upon

acquired knowledge and skills. It is an ongoing process that supports continuous learning and lifelong knowledge retention.

Retention Test

A retention test is an assessment designed to evaluate the extent to which individuals or learners can retain and recall information, knowledge, or skills over a period of time. It is used to measure the long-term retention of material previously learned or studied. Retention tests are common in educational settings and are often administered after a certain time has passed since the initial learning took place.

The main purpose of a retention test is to assess whether the learners have successfully retained the information or skills they were exposed to during their learning experience. By testing retention, educators can gauge the effectiveness of their teaching methods and identify areas that may require reinforcement or further review.

Retention tests can take various formats, such as written exams, quizzes, practical demonstrations, or performance assessments. The content of the test is typically based on the material covered in previous lessons, courses, or training sessions. The questions may be designed to assess not only factual knowledge but also the understanding and application of concepts.

It is important to note that the time interval between the initial learning and the retention test can vary depending on the context and the material being tested. For instance, a retention test might be administered a few days, weeks, or months after the initial learning experience. Retention tests play a crucial role in evaluating the effectiveness of the learning process and providing valuable feedback to both learners and educators. They also help reinforce and solidify the

learned material in the long-term memory of the learners. Overall, retention tests are valuable tools for assessing the durability and effectiveness of learning outcomes over time.

Problem Solving Ability - Theoretical Overview

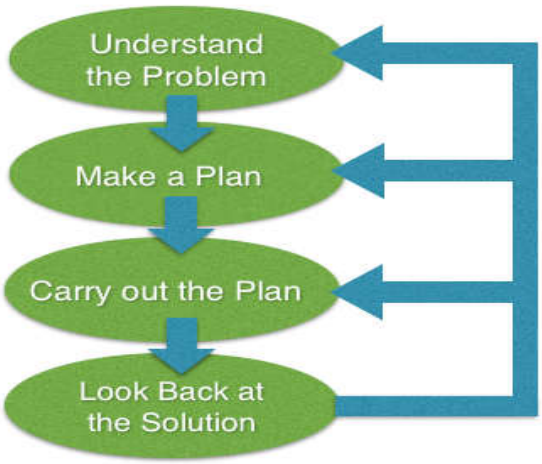
In the process of solving a problem, the individual may engage in a number of activities, all more or less related to finding a solution. Problem-solving is a complex mental process involving visualization, imagination, manipulation, abstraction, and the association of ideas. It requires unique and original responses; the best problem solvers are non-conforming and creative people. Lester (1982) defines problem-solving as a process of coordinating previous experience, knowledge, and intuition in an effort to determine an outcome or solution for which a procedure for determining the outcome is not known.

According to Gagne's hierarchy of learning, there are eight kinds of learning, presented in the form of a pyramid by placing the most complex one (problem solving) at the top and the simplest one at the base, with the rest in the intermediate zones. In Gagne's view, problem solving involves combining previously learned rules into a new, never-before-used higher-order rule. Thus, problem solving leads to a permanent change in a student's capabilities.

Problem-solving skills are essential in various aspects of life, not just in academic settings. They are crucial in the workplace, personal decision-making, and everyday life. The ability to approach challenges with creativity and critical thinking is highly valued, and problem-solving skills play a vital role in achieving success and overcoming obstacles. Educators and learning designers often incorporate problem-solving activities and tasks into the curriculum to foster the development of these essential skills in learners.

Figure 12

Polya's Problem Solving Model



Polya (1962) defined problem-solving as finding a way out of difficulty, a way around an obstacle, or attaining an aim that was not immediately attainable. He considered solving problems as a specific gift of mankind and regarded it as the most characteristically human activity.

According to Anderson (1980), problem-solving generally possesses the following features:

- The individual is goal-directed, trying to reach a desired state or solution.
- Reaching the goal or solution requires various mental processes, not just one.
- The mental processes involved do not occur automatically and without thought.

Problem-solving is a mental process and is a part of a larger problem-solving process that includes problem finding and problem shaping. It is a higher-order cognitive process that requires the modulation and control of more routine or fundamental skills. It provides a framework or pattern within which creative thinking and reasoning take place and involves the ability to think and reason at given levels of complexity.

Bransford and Stein (1984) use the acronym IDEAL to identify the five steps that are basically associated with the task of problem-solving:

I - Identifying the problem: Before solving a problem, there is a need to recognize that there is, in fact, a problem.

D - Defining and representing the problem: This involves representing the problem information in the most efficient way and correctly interpreting the components of the problem.

E - Exploring possible strategies: Once the problem solver has identified the problem, defined the goal, and developed some understanding of the information he has to work with, it's time to move forward toward a possible solution by deciding on a strategy.

A - Acting on the strategies: The problem solver works through the solution strategy and tries to anticipate any dead ends or obstacles that might prevent him from reaching the goal.

L - Looking back and evaluating the effects of activities: The problem solver evaluates whether he has indeed solved the problem and identifies and corrects any errors before moving on and trying something new.

Problem Solving Ability Test

Problem solving ability tests are assessments designed to evaluate a student's capacity to tackle complex problems and think critically in various contexts.

Purpose

These tests are designed to assess a student's capacity to solve complex problems, think critically, and apply their knowledge to real-life situations. They focus on evaluating a student's ability to reason, analyze information, and find solutions to unfamiliar or novel problems.

Content

The content of problem solving ability tests is not limited to a specific subject but involves scenarios or situations that require analytical thinking and problem-solving skills. The problems presented may be interdisciplinary or relate to real-world challenges.

Format

Problem solving ability tests often involve scenario-based questions, puzzles, or open-ended questions that require students to think critically and use creative problem-solving strategies.

Scoring

Scoring for problem-solving ability tests may be more qualitative, assessing the effectiveness of the student's problem-solving approach rather than simply counting correct answers.

These tests aim to assess a student's higher-order thinking skills, problem-solving strategies, and ability to apply knowledge in novel situations. They are valuable in predicting a student's potential for success in complex and challenging tasks.

Graphic Organizers – Related Studies

Cahyani et al. (2021) investigated the improvement of student's mathematical problem solving skills through the relating-experiencing-applying-cooperating-transferring learning strategy and graphic organizer. This study aimed to implement the REACT learning strategy with graphic organizer to enhance student's mathematical problem-solving skills and understand their responses. The sample selected consisted of 38 students of VIII grade. Problem solving tests were used to collect Student's problem-solving skills, and questionnaires were used

to collect student's responses. The data was analyzed using descriptive method. The results showed that the REACT learning strategy and graphic organizer were effective in improving student's mathematical problem-solving skills.

Boykin et al. (2020) conducted a study on the effects of a computer-based graphic organizer with embedded self-regulated learning strategies on the argumentative writing performance of 4^{th} and 6^{th} grade students. Results showed that the CBGO with embedded SRL strategies benefited all students, irrespective of their abilities and needs. In addition, the experimental group generalized the improvements in written arguments in the area of social studies to writing in science compared to the control group.

Rani (2020) conducted a study on the effect of graphic organizers on science achievement of eighth grade students and their attitude towards science. The design selected was a non randomized pretest-posttest control group experimental research design. The study was undertaken on two intact sections of the eighth class, and these sections were randomly designated as the control group (32 pupils) and experimental group (33 pupils). A t-test was used to establish equivalence, compare pretest and posttest scores of the control group as well as the experimental group, and to compare the retention in science among students of the control group and experimental group. The results revealed that the instructional material based on graphic organizers was more effective than the traditional method of teaching in relation to science achievement, retention in science, and pupils' attitude towards science.

Samba et al. (2020) investigated the effects of graphic organizer and experiential learning with feedback on the mean achievement and students' critical thinking. Results revealed that both the graphic organizer and experiential learning with feedback strategies enhanced students' achievement and critical thinking. The results also showed that the graphic organizer was slightly superior to the

experiential learning strategy. The study recommended that both strategies are useful for teaching Basic Science and Technology.

Sindhu (2020) undertook a study on the effectiveness of graphic organizers and project based learning for enhancing awareness on environmental issues and formal thinking ability among higher secondary school students. The method used was a pre-test post-test non equivalent three group design, where the first group was treated as experimental group I (exposed to graphic organizers), the second group was treated as experimental group II (exposed to project based learning) and the third group was treated as the control group (exposed to discussion method). The total sample (105) was equally divided into three groups, with 35 each in experimental group I, experimental group II and control group. The results of the study revealed that the two strategies selected as the experimental tools proved to be effective in transacting the curriculum in biology meaningfully compared to the discussion method.

Amar (2019) conducted a study on the effect of graphic organizers strategy on reading comprehension of students with different learning styles. The aim of the study was to examine whether students taught through KWL and Mind Mapping differ significantly in reading comprehension. Questionnaires and tests were employed to obtain the results in reading comprehension of pupils. Independent t-tests were employed for the analysis of the data. The results revealed that both visual and auditory learners differ significantly with regard to the reading comprehension. The result also showed that the visual group taught by Mind Mapping had a better score than the visual group taught by KWL. Additionally, the result showed that there was no interaction between graphic organizers and the style of learning.

Deborah et al. (2019) investigated the effectiveness of electronic graphic organizers for learning science vocabulary and concepts in an online platform. The sample randomly selected for the study consisted of 92 fourth grade students. The

students were asked to carry out electronic Frayer models on life science vocabulary by themselves and also engage in an online discussion with a partner. The graphic organizers and other science activities were mixed together. After seven weeks of experimentation, with the help of graphic organizers, students significantly improved their science content knowledge.

Gagic et al. (2019) investigated the implementation of mind maps in teaching physics: educational efficiency and students' involvement. In this study, pretest-posttest non-equivalent control group research design was used. The sample selected was 113 students and they were separated into control and treatment groups. The pupils of the experimental group were taught using mind maps, whereas the control group pupils were taught using traditional teaching strategies. ANOVA, t-test and chi-square research were used to analyze the data. The results revealed that the educational efficiency of instruction using mind maps was better than the efficiency of the traditional teaching strategy. It was also shown that the student's involvement in the treatment group was higher than control group.

Killickaya (2019) carried out a review study on the effect of mobile assisted graphic organizers in learning situations. In addition to glossing, graphic organizers are widely used in teaching vocabulary and reading in both L1 and L2 classrooms. The study noted that students using mobile assisted concept-mapping vocabulary learning strategy performed better and retained what they have learned longer than students using text-only strategies. The use of graphic organizers and their effects on learner performance in several contexts were reviewed. Most of the studies revealed the positive effects of graphic organizers on reading and writing, in addition to remembering course content.

Odewumi et al. (2019) explored the efficacy of graphic organizer on primary school students' performance in cognitive writing skills. The aim of the study was to find out the effect of school type and gender on the performance of pupils using

graphic organizers. In this research, a quasi-experimental pretest-posttest control group design was used. Two randomly chosen schools were selected as the sample of the study. The students were further stratified in terms of gender, with boys and girls from the sampled classes. For the analysis of data, t test was used. The study found that the group of students taught by graphic organizers performed better than the group taught by the traditional teaching method. The study showed both boys and girls performed better in achievement when they were instructed through the graphic organizer.

Tandog and Bucayong (2019) conducted a study on graphic organizer: A learning tool in teaching physical science. The main objective of this study was to assess the participants' level of academic achievement using pretest and posttest assessments. A quasi experimental research design was selected, and the study compared a control and experimental group after applying the intervention. It was found that the pretest scores of the control and experimental groups did not differ in the expected proficiency level. However, the academic performance of pupils in the experimental group was significantly higher than that of the control group. The results of the study revealed that student performance would increase if the graphic organizer is used as a teaching tool in the science classroom.

Djudin and Amir (2018) investigated the effect of integrating SQ4R technique with graphic post organizers in the science learning of earth and space. A quasi experimental pre-test-post test non-equivalent group research design was used in the study. The intact classroom was selected, and the sample consisted of 103 seventh grade students. An achievement test and a questionnaire were administered for data collection procedures. The results of the study revealed that the integration of SQ4R reading method including graphical post organizers had a significant effect on academic achievement and metacognitive knowledge of the students.

Elwood (2018) undertook a study on using graphic organizers to improve student outcomes for students with special needs in the field of science. In this study, a total of five students eligible for special educational services participated. All students demonstrated grade-level performance as determined by their set of baseline results. The findings showed that all five participants, who used graphic organizers, experienced a positive effect. By the last week of the study, the students only required minimal assistance, demonstrating that they were on the right path. The study has been highly advantageous for the group of students with particular needs in the field of science.

Kaur and Kamini (2018) conducted a research on the effect of teaching through graphic organizers on academic achievement in science among VII graders. In this study, randomized groups were selected, and a pretest-posttest design was used. The experimental group was treated with graphic organizers, while the control group was treated with conventional teaching methods. Mean, standard deviation and t-test were employed to analyze the data, and inferences were drawn from this analysis. The findings of the investigation revealed that the academic achievement in science of the experimental group of pupils instructed through graphic organizers was significantly greater than that of pupils instructed through traditional method of teaching.

Kwon et al. (2018) investigated the effects of graphic organizers in a collaborative learning context through an experimental study. The results revealed that both generated and received graphic organizers encouraged students to consider alternative views during the discussions and facilitated students' higher levels of cognitive engagement. Thus, there was a significant effect of graphic organizers regarding the ways of interacting with the collaborative learning context.

Aljaser (2017) conducted a study on the effectiveness of electronic mind maps in developing academic achievement and attitude towards learning English among

primary school students. Quasi experimental method was used in this study. The sample selected for the study consisted of thirty female participants from fifth grade, and the sample was divided equally into a control group and an experimental group. The findings revealed that the mean scores of both groups significantly differed. However, the mean score of the treatment group in achievement was higher than the control group. The effect size was higher for the treatment group when utilizing Mind Maps. There exists a significant difference between the mean scores of treatment and control groups in achievement and attitude towards learning English.

Kansızoglu (2017) conducted a study on graphic organizers as effective methods in teaching classroom English. The data collected were interpreted using the random-effects model. The result showed that graphic organizers have a positive impact on academic performance compared to conventional teaching techniques. The analysis of the intervening variable found no significant difference in effect size values based on certain study features, including types of graphic organizers, areas of learning language, field of study, level of education and application time. The results revealed that the use of graphic organizers improved the academic achievements of learners in listening, reading, writing, grammar and concept learning.

Tobar and Moya (2017) conducted a study on Graphic organizers as a reading strategy: Research findings and issues. The primary focus of this study was to review various research findings on graphic organizers. By analyzing several primary sources related to the study, it can be concluded that the utilization of graphic organizers as a teaching technique has great advantages. This study suggested that graphic organizers should be incorporated in to classrooms as a reading technique to encourage students to use them as effective readers, thereby improving their ability to understand the reading.

Uba et al. (2017) conducted a study on, a research based evidence of the effect of graphic organizers on the understanding of prose fiction in ESL Classroom.

The sample selected consisted of 100 pupils from 4 secondary schools, classified into a Graphic-based school and Non-graphic-based school. The Non-graphic-based school was treated as the control group, whereas the Graphic-based school was treated as the experimental group. For data analysis, descriptive statistics and t-tests were employed. The research findings indicated that in prose literature classes, graphic organizer instruction ensured student comprehension and enhanced performance.

Barry (2016) conducted a study to investigate the potential relationship between reading comprehension and teacher-generated graphic organizers in supporting executive function for struggling readers. The study utilized t-tests to compare the reading comprehension levels between control and experimental group. The findings indicated that there was no statistically significant difference between the control group and experimental group in terms of reading comprehension. The correlations between reading comprehension and the use of teacher-generated graphic organizers also did not show any statistical significance. As a result of the non-significant findings, the study recommended that future research may benefit from focusing on increasing the sample size to enhance the statistical power and improve the likelihood of detecting significant relationships. Additionally, the study suggested that future studies could explore which visual components within a graphic organizer are most useful when included in the instructional design. Understanding the most effective visual elements can help optimize the use of graphic organizers as a supportive tool for improving reading comprehension and executive function among struggling readers.

Ilter (2016) conducted research to examine the power of graphic organizers: effects on student's word learning and achievement emotions in social studies. A quasi-experimental nonequivalent pretest-posttest research design was used in this study. The students of the treatment group were exposed to the use of a concept

definition map, a word questioning technique, and a circle thinking map, while the pupils of the control group were exposed to the use of the questioning method. The results showed that the students of graphic organizers group performed better than the control group in improving the word learning and achievement emotions. The study observed that various types of graphic organizers elicit positive emotions for achievement in social studies.

Korur et al. (2016) conducted a study to explore effects of the integrated online advance organizer teaching materials on student's science achievement and attitude. There were no significant effects of treatment between the methods to inquiry and expository. In this study, the independent form of t test was used, and analysis showed that both groups showed significant improvements in achievement and attitude. The results also showed that the use of the treatment improved performance and attitude levels of students.

Mehta (2016) conducted a study on the effect of graphic organizer with cooperative learning: an efficient tool to strengthen higher order thinking skills and creativity in science. The sample selected consisted of 150 students, randomly assigned to each of the five groups. One group was treated with the lecture method, and the other four experimental groups were treated with Mind Mapping with Cooperative Learning, Concept Mapping with Cooperative Learning, Graphic Organizer with Cooperative Learning and Cooperative Learning. A quasi-experimental pre-test post-test multi group design was used. Analysis of Variance and post-hoc analysis were used in this study. The results revealed that scientific creativity and higher order thinking skills were strengthened using Mind Mapping with Cooperative Learning, Concept Mapping with Cooperative Learning, Graphic Organizer with Cooperative Learning and Cooperative Learning. Among the other three methods, Graphic Organizer with Cooperative Learning had the maximum effect.

Sirait (2016) investigated multiple representations based Physics instruction to enhance student's problem solving. Multiple representations include verbal, sketch or pictorial, motion diagrams, force diagrams, graphs, bar charts, mathematical equation, ray diagrams, field diagrams and circuit diagrams. Both qualitative and quantitative research methods were adopted in this study. The experimental method was employed to find out the effect of multiple representations. The results showed that students who employed more than one representation while solving problems scored higher than students who did not. The study revealed that multiple representations are effective and can be used as an alternative instruction to teach physics.

Totappa et al. (2016) investigated the effect of concept mapping instructional strategy on problem solving ability skills in Biology of secondary school students. The sample selected consisted of 60 grade IX Biology students from two classes of the general science course. One class was assigned as the concept mapping group, and the other as the control group. The obtained data were analyzed descriptively and inferentially. The results revealed that the Concept Mapping Instructional Strategy was more effective than the lecture based instructional strategy in improving problem solving ability skills in Biology.

Stephen (2015) conducted a study on Teaching Social Studies to Upper Elementary Students with Learning Disabilities: Graphic Organizers and Explicit Instruction. In this study, a text-based summarization baseline and a treatment that used graphic organizers and explicit instruction were two conditions used to compare social studies learning. The results suggest that treatment components have been effective and promising for enhancing learning with Social Studies text in students with learning disabilities.

Cynthia (2015) carried out a study on Teacher's Perceptions on the Use of Graphic organizers with Struggling Ninth Grade Students in Language Arts. This

case study explored teacher's perceptions of using graphic organizers to help struggling high school students comprehend expository texts. The results indicated that teachers perceived graphic organizers as an effective reading strategy with expository texts and indicated that student achievements increased by using graphic organizers.

Gorjian et al. (2015) carried out research on using discourse structure-based graphic organizers in developing EFL learners' reading comprehension. This study assessed whether the experimental group would show improvement on the posttest compared to the control group using questioning and answering, true/false, and cloze testing method. The investigator collected data in 10 sessions after employing pretest and posttest reading comprehension assessments. t-tests were employed to interpret the collected data. The results revealed that the students who were subjected to discourse structure-based graphic organizers as a post-reading task performed better than those who participated in the traditional teaching method.

Singh and Moono (2015) investigated the effect of using Concept Maps on student achievement in selected topics in Chemistry at the tertiary level. The sample consisted of thirty-nine 1st year learners who were allocated randomly to three groups i.e. Experimental group I, Experimental group II and Control group. In this study, the pretest-posttest true experimental research design was adopted. The control group was treated with the traditional method of teaching. Experimental group I was treated with concept map method of teaching, and Experimental group II was treated with a combination of the concept map and conventional methods of teaching. The findings showed that Experimental group II performed better after treatment than both the control and Experimental group I.

Mann (2014) conducted a study on the effectiveness of graphic organizers on the comprehension of social studies content by students with disabilities. This research focused primarily on the effectiveness of concept or event maps and

sequential chains. Concept map and sequential chains were used to interpreting the content while reading, during class discussions, and for homework assignments,. The sample selected consisted of eighth-grade students, and the achievement in social studies was measured in four middle school classrooms. The results of the study revealed that the scores showed a significant enhancement in the posttest scores of the students from all four middle school classrooms.

Gordon (2014) conducted a study on a correlational study of graphic organizers and science achievement of English language learners. The sample consisted of 145 ninth grade English Language Learners. Out of the total sample, 54 students were taught through the traditional textbook approach, and 91 students were studied using graphic organizers. Multiple regression analysis was applied for data analysis. The result of the study revealed that the utilization of graphic organizer is a significant strategy for high school English language learner's achievement in science. The findings of the study also noted that the utilization of graphic organizers is advantageous for English language learners science achievement.

Heidarifard (2014) carried out a study on the effect of graphic organizers on L2 learners' reading comprehension. The investigator used experimental method, and the sample selected consisted of 80 secondary school students. The selected students were equally divided into two groups based on their Oxford Placement Test scores. Group A students received graphic organizers, and the students of group B received conventional reading instruction. A posttest was given to the students to examine the extent to which the instruction based on graphic organizers would influence the reading comprehension of L2 learners. The results showed that the training of graphic organizers had a significant impact on the reading understanding of L2 learner's reading comprehension. The results also revealed that significant improvement in the ability of students to read with understanding after a gap of six weeks was a result of reading instruction with the aid of graphic organizers.

Jane (2014) investigated creating memorable learning experiences with Foldables in Advance Placement Human Geography. Foldables are student created Graphic Organizers. The results revealed that graphic organizers were used to help students focus on the most important people, theories or models, and concepts in the Advanced Placement Human Geography. The results also revealed that graphic organizers were a powerful way for students to learn and record information in Human Geography.

Saed and Al-Omari (2014) conducted a research study to investigate the impact of a proposed mind mapping program on improving writing achievement skills among eleventh-grade students in Jordan. The study also aimed to explore the role of this approach in fostering positive attitudes towards writing among the participants. The research sample comprised 91 female eleventh-grade pupils from the first semester at Sands National Academy. The participants were deliberately selected and then randomly divided into treatment and control groups. The results of the study revealed significant differences in the mean scores of the students concerning their writing achievement and attitudes towards writing. The implementation of the mind mapping program had a positive and noteworthy effect on students' writing skills, leading to improvements in their overall writing achievement. Furthermore, the study indicated that the mind mapping approach played a significant role in fostering favorable attitudes towards writing among the students. By using mind maps as a tool to organize and structure their writing, students developed a more positive outlook on the writing process and felt more confident in expressing their ideas effectively.

Shoari and Farrokhi (2014) conducted a study on the effect of graphic organizer strategy on improving Iranian EFL learners' vocabulary learning. The research sample consisted of 50 students and was divided in to control and treatment groups. The students in the treatment group were exposed to new vocabulary terms

in the form of pictures and clusters using graphic organizers, while the students in the control group were subjected to the same things using the traditional teaching method. T-test was used for the analysis and interpretation of the data. The results revealed that students utilizing a concept map consistently achieved maximum learning outcomes compared to those utilizing a text outline.

Adesola and Salako (2013) carried out a study on the effect of Concept Mapping Instructional Strategy on Junior Secondary School Student‘s knowledge of multiculturalism in the Global 21st Century Social Studies Classroom. The sample consisted of 50 junior high school students. T-test was used for analyzing the data. The findings of the study revealed that when exposed to concept mapping instructional strategy, students differed significantly in terms of mean pretest and mean posttest scores. Therefore, concept mapping instructional strategy improved the student’s knowledge of multiculturalism in the global 21st century social studies classroom.

Antoine (2013) conducted a study on the effect of graphic organizers on science education. The sample selected consisted 69 high school biology students. Two human body systems were selected as the primary lessons for the treatment. The students of experimental group were taught through graphic organizers and the students of the control group were taught through guided notes with power point instruction only. After each body system was studied, a pretest and a posttest were administered. The results revealed that the students taught through graphic organizers significantly improved their achievement in science compared to the instruction based on guided notes with power point.

Charlotte and Susan (2013) conducted a study on an instructional strategy to introduce pedagogical content knowledge using Venn Diagrams. The findings of the study revealed that the venn diagram is an easily remembered graphic illustration of

pedagogical content knowledge, and the result also revealed that venn diagrams can be useful in planning lessons.

Cheema and Mirza (2013) conducted a study on the effect of Concept Mapping on student's academic achievement. The sample selected consisted of 167 pupils from two schools. ANOVA two way was used to analyze the data. The results of the study revealed that pupils taught using concept mapping significantly improved their performances compared to pupils instructed through the conventional method of teaching. The results also revealed that male pupils treated by concept mapping performed better than female pupils. Therefore, the study suggested that concept mapping can be used for teaching science subjects in elementary classes.

Ezeudu (2013) conducted a study on the influence of Concept Maps on the achievement and retention of senior secondary school students in organic chemistry. The results revealed that the use of a concept map has a significant influence on the retention and achievement of the pupils in organic chemistry compared with the lecture technique for teaching. The results also revealed that gender has no significant effect on the retention and achievement of the pupils in organic chemistry. The combined effects of gender and method had a positive impact on the achievement and retention in organic chemistry among senior secondary school students.

Jbeili (2013) investigated the impact of digital mind maps on science achievement among sixth-grade students in Saudi Arabia. The sample consisted of 44 female students who were randomly assigned to two experimental groups; the first group was treated with digital mind maps, while the other group used paper mind maps. The results of the study revealed that the utilization of digital mind maps had a significant impact on science achievement. The results also revealed that the use of digital mind maps could help improve science achievement in sixth grade students more than the use of paper mind mps.

Perry (2013) conducted a study on the effects of visual media on achievement and attitude in a secondary biology classroom. The selected sample was separated into two groups: the treatment group, which was shown videos as part of a biological diversity unit, and the control group, which received the same instruction without videos. Assessment tests were utilized to evaluate the performance, and pre-survey and post-survey, as well as interviews, were used to evaluate attitude in biology classrooms. The results of the study revealed that the treatment group showed slightly higher improvements. It was also revealed that pupils felt positively about the utilization of videos in the classroom. Based on the findings, it was inferred that videos can be a constructive and effective tool for teaching when pupils pay more attention or concentrate in the classroom.

Arwa (2012) investigated the effect of the Graphic Organizer Strategy on university student's English vocabulary building. This research revealed that the students in the experimental group outperformed those in the control group in terms of their vocabulary building.

Eissa (2012) undertook a study on the effects of advanced graphic organizers strategy intervention on academic achievement, self-efficacy, and motivation to learn social studies in learning disabled students. In this study, 60 learning disabled students participated, and these students were randomly categorized into two groups: the treatment and control groups. ANCOVA and Repeated Measures were used to analyze the data. The results of this study revealed that the advanced graphic organizers strategy improved the academic achievement, self-efficacy, and motivation to learn social studies in the target pupils.

Higgins (2012) conducted a study on effectiveness of an organizational writing graphic organizer based on a critical thinking model. The study was carried out with the assumption that effective communication skills are a vital component of student academic achievement and success, yet students often struggle with them. The findings revealed that there was no significant difference in persuasive writing

scores between the treatment and comparison groups. However, a qualitative analysis of teacher and student perceptions revealed that participants were favorable towards the use of the critical thinking graphic organizer.

Kamble and Tembe (2012) investigated the effect of concept mapping strategy on the performance of students in problem-solving and attitude in mechanical engineering course. The sample consisted of 84 third year mechanical engineering students, with 42 students in each group. The quasi experimental research method with the pretest-posttest control group research design was used. The findings showed that the concept mapping technique increased the performance of the pupils in problem-solving compared to the conventional method of teaching.

Malik and Zaman (2012) undertook a study on the effect of graphical organizer teaching model on student's learning achievement in science at the elementary level. The method used was experimental research, and the design used was pretest-posttest non-equivalent design of control group. The achievement of the students in the control and treatment groups was analyzed by comparing their posttest performances. It was observed that the students of the treatment group, who were taught through graphic organizers, scored higher marks than the students of the control group. The results revealed that student's learning achievement in science was improved by using the graphic organizer teaching model.

Ozturk (2012) conducted a research on the effects of graphic organizers on reading comprehension achievement of EFL learners. In this research, an experimental research design with a control group was adopted. A sample of 50 EFL learners was selected. The reading comprehension achievement assessment was offered to the selected students before the treatment. The experimental group was taught through passages using graphic organizers, whereas the control group was taught through the traditional method. After a 12-week study, the Reading Comprehension Achievement Assessment was given again to both classes. The

results revealed that graphic organizers instruction in EFL reading courses helps learners in comprehension achievement.

Paul (2012) undertook an experimental study to assess the effectiveness of two innovative strategies: Problem-Based Learning and Graphic Organizers. The research employed a multi-stage experimental approach, incorporating a mixed methodology to investigate the impact of these strategies on the Commerce curriculum. The findings highlighted that both Problem-Based Learning and Graphic Organizer strategies proved to be highly effective in facilitating the delivery of the Commerce curriculum. The innovative approaches were successful in engaging students and enhancing their understanding of the subject matter. Moreover, the research demonstrated that these strategies had a significant positive influence on students' academic achievement and vocational competency at the higher secondary level. By incorporating Problem-Based Learning and Graphic Organizers into the teaching process, students demonstrated improved learning outcomes and gained practical skills relevant to their future careers.

Yussof et al. (2012) conducted a study on enhancing reading comprehension through cognitive and graphic strategies: a constructivism approach. A quasi-experimental research design was used in this study, with a sample of 90 students. Among these, 45 pupils in the experimental group were treated with cognitive and graphic strategies, while the other 45 students in the control group utilized common classroom practices. T-test was used to analyze the data and the mean score and effect size were higher in the treatment group than the pupils in the control group. The result of the study revealed that the cognitive and graphic strategies successfully improved the student’s reading comprehension compared to conventional teaching method.

Karen et al. (2011) investigated the effectiveness of electronic text and pictorial Graphic Organizers to improve comprehension related to functional skill. The result of this study revealed that all the students improved their comprehension after the introduction of Graphic Organizers. Based on the results, the study suggested

that integrating Graphic Organizers in to the curriculum and using technology-enhanced text based activities can be beneficial for improving comprehension skills.

Rani (2011) conducted research on the topic "The Effect of Concept Mapping on Science Achievement among Ninth Graders in Relation to Test Anxiety and Self-Efficacy." The study aimed to investigate the impact of two teaching approaches, namely concept mapping and conventional mapping, on science achievement in ninth-grade students. Additionally, the research explored whether test anxiety and self-efficacy played a significant role in influencing students' science achievements. The findings of the study revealed a significant effect of the teaching approach (concept mapping vs. conventional mapping) on science achievement among ninth-grade students. The use of concept mapping as an instructional tool proved to be effective in enhancing students' understanding and performance in science. However, the research did not find any substantial differences between students with low and high test anxiety or low and high self-efficacy concerning their science achievements. It suggests that regardless of students' levels of test anxiety or self-efficacy beliefs, both groups benefitted similarly from the concept mapping approach in terms of science learning outcomes.

Selcuk et al. (2011) studied the effects of learning strategy instruction on achievement, attitude, and achievement motivation in a physics course. A quasi-experimental pretest-posttest design was adopted in this study. The treatment group was taught using graphical organizers, summarizing, and questioning, while the control group did not receive any strategy learning instruction. The study found that graphic organizers enhanced student’s achievement in physics. The results of the study also revealed that students who were taught through graphic organizers had a more significant and positive attitude towards physics and strengthened their achievement motivation compared to students taught through conventional teaching techniques.

Condidorio (2010) carried out a study on the usefulness of Graphic Organizes in enhancing Science learning. The study found that Graphic Organizers used in Science class helped students gain more thorough understanding of concepts.

The findings of the study revealed that the use of the Graphic organizer strategy in the content area increased student learning and made the students more prepared to practice the skills independently throughout life.

Hoffmann (2010) carried out a study on the impact of the graphic organizer and metacognitive monitoring instruction on expository science text comprehension in fifth grade students. Students in the combination of Metacognitive monitoring strategy instruction and graphic organizer instruction strategy showed enhanced reading comprehension scores on seven expository science passages during the six-week experiment. The results of this study revealed that students in the Graphic Organizer and Metacognitive Monitoring Condition showed improved test scores on a reading comprehension test.

Karakuyu (2010) conducted a study on the effect of concept mapping on attitude and achievement in a physics course. The sample selected consisted of 58 9^{th} grade students. 28 pupils were designated as the treatment group and instructed through the electricity concept map, while the other group was designated as the control group with 30 pupils who received no concept mapping. The findings also showed that the pupils in the treatment group had a more positive attitude towards physics than the pupils in the control group. It was also found that concept map instruction was more successful in enhancing participating students' physics achievement than traditional teaching.

Sandra (2010) conducted a study on using Graphic Organizers as a tool for the development of scientific language. The study used cross-case analysis of two teacher’s teaching practices. The result of the study revealed that the use of graphic organizers as a tool supported the development of content knowledge and language development in science education in different ways.

Spears (2010) carried out a study on the dynamic Graphic Organizers and their influence on making factual, comparative and inferential determinations within comparative content. In this experimental study, Graphic Organizers were used as

important instructional tools. The findings of the study indicated that the dynamic Graphic Organizers were equivalent to traditional static Graphic Organizers. The study suggested that dynamic graphic organizers were beneficial for both instructional designers and educational researchers to design new curricula and instructional tools.

Zaini et al. (2010) conducted research on "The Effect of Graphic Organizer on Students' Learning in School." The study aimed to investigate the impact of using graphic organizers on students' learning outcomes in an educational setting. The findings of the study clearly demonstrated that the incorporation of graphic organizers had a substantial and positive influence on the learning process of pupils in school. The use of graphic organizers proved to be an effective instructional tool, leading to notable improvements in various aspects of students' academic performance. By utilizing graphic organizers, students exhibited improved comprehension and retention of information, which contributed to their overall learning outcomes. Moreover, the research highlighted that the implementation of graphic organizers positively impacted students' learning motivation. The visual and organized nature of these tools seemed to engage students more effectively, fostering a sense of interest and enthusiasm for learning.

Akinbobola (2009) conducted a study on enhancing Nigerian Physics students' attitude through the use of pictorial, written and verbal advance organizers. The sample selected consisted of 180 senior secondary pupils in physics. A questionnaire on students' attitude towards physics was used as the method for collecting data, and the collected data were analyzed using t-test and covariance analysis. The findings revealed that the pictorial organizer performed better in changing the attitude of students towards physics. The findings also revealed that there was no significant difference between male and female students in their attitude towards physics when instructed through verbal, written and pictorial advance organizers.

Alan (2009) conducted a study on students “using Graphic Organizers to improve mathematical problem solving communications”. The findings of this study

revealed that the students who used Graphic Organizers were able to organize their ideas and improve their comprehension and communication skills in mathematical problem solving. The result also revealed that Graphic Organizers were beneficial for both students and teachers.

Oliver (2009) carried out research on the effect on second, fourth and fifth-grade students of various types of graphic organizers. A non-equivalent research design with pretest and posttest was adopted. The control group was taught through conventional literacy instruction, while the experimental group was taught the same content through graphic organizers. The pretest scores of both the groups were equal, and the posttest scores of the students in the experimental group were significantly higher than those receiving conventional literacy instruction. The results revealed that the instruction of the graphic organizers positively influenced the experimental group's test scores.

Torres et al. (2009) investigated the integration of graphic organizers in facilitating learning chemistry. This study adopted both descriptive and quasi-experimental research designs. The quasi experimental method was used to explore the association of cause and effect between the research variables. The descriptive approach was used to characterize the attitude of the student towards chemistry, perception of graphic organizers, and academic performance. The study observed that there was a significant difference in student’s attitude towards chemistry in the experimental group before and after treatment. The result also showed that the performance of the treatment group was significantly higher than the control group.

Conley (2008) conducted a research on the effect of graphic organizers on the academic achievement of high school students in United States History who receive instruction in a blended, computer based learning environment. A sample of 60 pupils was assigned for this investigation, and the selected students were divided evenly into two groups of 30 pupils each. The first group was selected as the experimental group,

while the other group was selected as the control group. For data analysis, a 2-tailed t-test was employed. The results of the study revealed that the group of students who received instruction through an online blended learning environment utilizing graphic organizers in history did not perform significantly higher than the students who received instruction without utilizing graphic organizers.

Asan (2007) conducted a study on Concept mapping in science class: A case study of fifth-grade students. The research group comprised 23 elementary school students. Pretests were administered to both groups, and following the pretest, a traditional oral review of the content was given to the control group, while the experimental group was subjected to the usage of inspiration review, which is a concept mapping tool based on a computer. Posttests were given to students of both classes after the treatment. The result showed that concept mapping had a significant positive influence on the achievement of the pupils in science.

Chen (2007) conducted a study on the effects of Advance Organizers on learning and retention in a fully web based class. The aim of the investigation was to assess the long-term and short- term impacts of two types of advance organizers: a text outline and a visual concept map. Two treatment groups and one control group were randomly designated to 166 participants. One of the two advance organizers was introduced to students from the two treatment groups, while the control group continued to read the textbook with no advance organizer. Two parallel posttests were used to assess students on the subject matter. The study results found that students utilizing concept map had significantly higher learning achievements than pupils who utilized a text outline and the control group.

Clark (2007) conducted a study on the effectiveness of Graphic Organizers to enable the students to record and categorize information. The study showed that when the Graphic Organizers were used effectively, they had a positive impact on student achievement. Through the use of graphic organizers, students were able to understand difficult concepts, generate thoughts, and identify connections between ideas. The

study also proved that the students showed improvement in writing and critical thinking skills as the Graphic Organizers guided them through the inquiry process.

Gallavan and Kottler (2007) conducted a study on eight types of Graphic Organizers for empowering social studies students and teachers. In this study, the investigator selected eight types of graphic organizers with descriptions, vocabulary, and examples applicable to citizenship and government, economics, geography, and history in pre-k-12 settings. The result showed that graphic organizers helped students sort, show relationships, make meaning and manage data quickly and easily before, during, and after reading discussion.

Ives (2007) conducted a study on Graphic Organizers applied to secondary algebra instruction for students with learning disorders. The students were treated with specially designed Graphic organizers. The results of the study showed that students who worked with Graphic organizers had a stronger capacity to make conceptual foundations for solving systems of linear equations than the students who did not work with the Graphic organizer.

Stull and Mayer (2007) carried out a research on learning by doing versus learning by viewing: three experimental comparisons of learner generated versus author provided graphic organizers. In Experiment I, the investigator prepared twenty-seven instructor-directed graphical organizers to create graphic organizers. In Experiment II, the investigator selected 18 graphic organizers and 18 corresponding templates of those graphical organizers. In Experiment III, ten graphical organizers were selected by the instructor, or 10 equivalent templates of the graphical organizers were used. There were no differences in maintenance. The findings of the study revealed that students learn better through learning by doing compared to learning by viewing.

Kools et al. (2006) investigated a study on the effect of Graphic Organizers on subjective and objective comprehension on a health education text. The findings

of the study showed that the Graphic Organizers reflected information on the macro level of the text, and health education texts could benefit to improve comprehension. The result also revealed that Graphic Organizers are very effective for comprehension and valuable for designing the health education brochures.

Spears and Kealy (2005) conducted a study to investigate the effectiveness of graphic organizers on retinal variables in enhancing the performance of learners' higher-order thinking skills, such as inference making. The control group in this study received the text-only treatment. However, the findings of the study indicated that there was no significant difference in inferential making judgment between the retinal variable treatment group and the text-only treatment group. The research provides valuable insights into the impact of using graphic organizers, specifically those incorporating retinal variables, on learners' higher-order thinking abilities. The outcomes highlight the importance of thoroughly examining the suitability and efficacy of specific instructional methods for targeted learning outcomes. While graphic organizers have demonstrated benefits in various educational settings, their application may not always yield significant differences in certain cognitive tasks.

Zercie (2005) conducted a study on the effectiveness of graphic organizers as a supplementary tool to science textbooks in enhancing the retention of scientific facts among fourth-grade students. The primary objectives of the research were threefold: first, to draw conclusions about student ability and retention levels following the implementation of graphic organizers; second, to investigate students' confidence and attitudes towards using these organizers; and third, to assess perceptions of teachers and students regarding the utility of graphic organizers in the classroom. Upon analyzing the collected data, the results demonstrated a significant improvement in student retention of scientific facts among fourth graders when utilizing graphic organizers. The findings suggested that incorporating graphic organizers in science education proved to be a valuable approach, positively impacting students' learning outcomes. Furthermore, the study revealed that the use

of graphic organizers not only enhanced retention but also played a role in boosting students' confidence and attitude towards their studies. By encouraging the incorporation of graphic organizers into the learning process, both pupils and teachers exhibited a more favorable attitude towards this instructional tool.

Gill (2004) undertook research on the effect of graphic organizer instruction on learning outcomes and study habits of high school social studies students. The findings of the study revealed that the mean gains of achievement, retention and study habit of students taught through different instructional strategies differed significantly. Students taught through pre-graphic organizers showed better study habits, achievement, and retention than those taught through post-graphic organizers. Additionally, the results also showed that students taught through pre and post graphic organizers had better achievement, retention and study habits than those instructed using traditional teaching technique.

Kirschbaum (2004) conducted a study on the effect of graphic organizers on the academic achievement of fourth grade students. The two different chapters of social studies were selected and taught to the learners. Four tests were administered to the students, and these assessments were of the same level of difficulty. One test was developed using graphic organizers, and the second test utilized a question-answer style. The investigator measured the four sets of data and found that the pupils achieved higher scores on the tests utilizing graphic organizers. The result of the study revealed that Graphic organizers have a significant influence on academic achievement.

Altin (2002) conducted a comprehensive study titled "The Impact of Computer-Assisted Experimental Method and Concept Mapping Method on Cognitive Processes and Retention Levels." The research aimed to explore the effectiveness of two teaching approaches, namely Computer-Assisted Experimental Technique and Concept Mapping Method, on students' learning outcomes in the context of physics education. The study revealed that the use of Concept Mapping Method during the physics course had a significant and positive effect on students'

overall performance. Students who engaged with the Concept Mapping Method demonstrated better learning outcomes and academic achievements. Furthermore, Concept Mapping Method was found to significantly enhance students' conceptual understanding during the science course. The approach facilitated a deeper comprehension of scientific principles and ideas among the students. Lastly, the research showed that the consistent use of the Concept Mapping Method throughout the physics course had a strong and positive impact on students' retention levels.

Chang et al. (2002) investigated the effect of concept mapping to enhance text comprehension and summarization. In this study, a control group was compared with three approaches: displaying a concept mapping created by an expert, concept mapping with scaffold, and building concept mapping. The findings showed that all approaches of concept maps enhanced the ability to understand the text. The result of the study revealed that the concept mapping method with scaffold led to the best results compared to the other two approaches. The results also showed that concept mapping can also be utilized as student's scaffold.

DiCecco and Gleason (2002) conducted a study titled "Using Graphic Organizers to Attain Relational Knowledge from Expository Text." The research aimed to explore the effectiveness of Graphic Organizers in facilitating the retention and recall of content knowledge and the application of relational knowledge from expository text. The results of the study indicated that the use of Graphic Organizers had a positive impact on the retention and recall of factual information and concepts for both the treatment and control groups. When factual information was measured using multiple-choice questions, no significant differences were observed between the two groups, suggesting that both groups performed similarly in terms of factual knowledge. However, where the groups showed differentiation was in their ability to evaluate relational knowledge. The treatment group, which utilized Graphic Organizers, demonstrated a more robust understanding and application of relational knowledge compared to the control group. This finding highlights the specific

benefit of using Graphic Organizers in fostering a deeper comprehension of how various concepts relate and connect to each other.

Crawford and Carnine (2000) conducted a research study titled "Comparing the Effects of Textbooks in Eighth-Grade US History: The Impact of Conceptual Organization." The study aimed to compare the effectiveness of different instructional approaches, particularly examining whether the use of graphic organizers contributed to improved learning outcomes. The findings of the study revealed that participants who utilized graphic organizers as part of their instructional content demonstrated a higher level of content knowledge compared to students who solely studied the text without such organizational aids. The results indicated that incorporating graphic organizers, which aimed to explain the "big ideas" and conceptual organization of the subject matter, had a significant positive impact on students' understanding of the information presented in the text. The research suggested that when instructional content was structured using graphic organizers, students were able to grasp the underlying organizational concepts better. This deeper understanding of the material facilitated improved learning, as students were able to connect and contextualize the information more effectively.

Guastello et al. (2000) conducted a study on the effects of Concept mapping on science content comprehension among low-achieving inner-city seventh graders. The sample consisted of 124 students. The control group was instructed through the read and discuss method, while the experimental group was instructed using the concept mapping pattern. A criterion-referenced measure was used as the dependent variable, based on the content of a chapter in science. The result of the study revealed that concept mapping enhanced comprehension levels of low-achievers more effectively than the conventional teaching approach.

Katayama and Robinson (2000) conducted a study on getting students partially involved in note-taking using Graphic Organizers. The study was based on the assumption that partially completed Graphic Organizers would be more

beneficial to the students. Therefore, the investigators evaluated and compared the use of partially completed Graphic Organizer to complete Graphic Organizer and outline notes on factual tests and application tests. The result of the study revealed that students who were given partially completed Graphic Organizers outperformed the other students on application tests. The result also revealed that there was no statistically significant difference when students were taking factual tests.

Herl et al. (1999) conducted a study on the reliability and validity of computer based knowledge mapping system to measure content understanding. The main aim of the study was to investigate the effectiveness of two computer-based methods for presenting graphic organizer instruction to middle and high school students. The study revealed that the web searching method was effective in improving student's ability to develop sophisticated maps and enhance the content understanding among middle and high school students.

Lesha (1999) conducted a study on the preparation and testing of concept maps and Vee maps for teaching Zoology at the degree level. The results revealed that the concept mapping method group outperformed the lecture method group in terms of post-test achievement. Moreover, the concept mapping method group demonstrated superior development of various scientific and intellectual skills necessary for higher education and practical life. Furthermore, the study emphasizes the broader benefits of concept mapping in fostering critical thinking, analytical skills, and problem-solving abilities. By engaging students in the creation and utilization of concept maps, educators can cultivate a deeper understanding of complex concepts and encourage the development of essential skills applicable to higher education pursuits and real-life situations.

Raghavan (1999) conducted a study on concept mapping in learning physical science and its relation to scholastic performance, cognitive ability, and attitude towards concept mapping and science interest among standard IX students. The results of the study revealed that the strategy was successful with respect to cognitive ability

and performance. The results also showed that there was no significant relationship found between the interest in science and the attitude towards concept mapping.

Inman et al. (1996) conducted a study to on the effectiveness of computer-based graphic organizer strategies. The findings indicated that while some students became highly proficient and independent in utilizing these strategies, others only developed basic skills and displayed reluctance in their application. The study highlights the variability in students' responses to computer-based graphic organizer strategies. While some students embraced and mastered these techniques, others exhibited a more limited engagement and hesitancy in incorporating them into their learning process. The outcomes of the study emphasize the importance of acknowledging individual differences in learning styles and preferences. Educators should recognize that not all students will respond equally to specific instructional approaches, such as computer-based graphic organizers. It is essential to offer diverse instructional strategies and support to cater to the varied needs and learning profiles of students.

Mazure (1996) conducted a study on the value of graphic organizer on the recall and attitude of fifth grade social studies students. The study involved two classes in social studies. One class was taught using graphic organizer instruction and construction, while the other class was taught through text-based activities. Pre-post and post-post tests were administered on the same content on both groups. The findings revealed that the experimental group showed a significant increase in retention in the post-post testing.

Fen (1995) carried out a study on the effect of format and student completion of concept maps on college students’ learning. The main aim of the study was to investigate the interactive effects of different formats of concept maps (whole maps versus stacked maps) and learner involvement in concept mapping (instructor completed maps versus student completed maps) on learning. The study revealed that students with whole concept maps as a learning aid had a better awareness of

lesson structure compared to the group with stacked concept maps. The results also showed that students who completed concept maps themselves had better recall of specific information than the students with instructor completed concept maps.

Foley (1995) conducted a study on effects of co-operative learning and visual organizers on student's ability solve mole problems in Chemistry. The sample of the study was divided in to four groups: i) visual organizer and co-operative learning, ii) co-operative only, iii) visual organizer only, iv) teacher directed group. The study revealed that students in the combination group of visual organizers and co-operative learning performed better than other groups in solving mole problems in chemistry.

George (1995) conducted a study on the effect of student constructed concept maps on achievement in a first year college instructional laboratory activities. The result of the study revealed that the construction of a pre-lab concept map, followed by structuring in the lab, and finally, a post-lab concept map, helped students understand the concepts involved in the experiments they performed.

Griffin et al. (1995) carried out a study on the effect of graphic organizer instruction on fifth grade students. The research participants read information about social studies with or without using a graphic organizer under four experimental environments. The control group students were treated with traditional based teaching. The results revealed that the group of students who received explicit instruction and graphic organizers performed better than students who received traditional based instruction on the transfer measurement.

James (1995) conducted an explanatory study using concept map as an interview to facilitate externalization of conceptual understandings associated with global atmospheric change by the eighth grade physical science students. The findings of the study revealed that the use of concept maps constructed during interviews was a valid indicator of the student's understanding of global atmospheric change after instruction.

The study conducted by Schweitzer (1995) aimed to investigate the effect of graphic organizers on ninth grade student's achievement in Social studies. The sample consisted of 427 ninth grade students, with 316 being regular tracked students and 111 students were honors and gifted tracked students. For experiment one, the regular tracked students formed the sample, and a 2 x 6 ANOVA was used to determine the relationships between six graphic organizers and elaborations and their effect on student achievement in social studies. For the honors and gifted tracked students, a 2x2x2 ANOVA was used. The results of the study revealed that specific graphic organizers are more effective than the conventional method in terms of achieving success in social studies.

Banaz (1994) conducted a study on the effectiveness of using graphic organizers as a note-taking technique on students' abilities to utilize knowledge in the science classroom. The study's findings revealed that when graphic organizers were employed, students acquired and organized information more efficiently, making it more meaningful in the learning process. The study highlights the significance of incorporating graphic organizers as a valuable tool in educational settings, especially in science classrooms. By employing graphic organizers during note-taking activities, students can enhance their understanding of scientific concepts and effectively organize information. The study's outcomes suggest that educators should consider integrating graphic organizers into their teaching methodologies to promote active learning and comprehension in science subjects.

Scott (1994) conducted a study to investigate the reliability and validity of concept maps as an index of cognitive structures. The study's findings revealed a strong correlation between concept maps and achievement test scores, providing robust support for the validity of concept maps. The study sheds light on the potential of concept maps as a valuable tool for assessing and understanding the cognitive structures of individuals. The strong correlation between concept maps and achievement test scores indicates that concept maps can effectively capture the depth

of knowledge and comprehension of the subjects being studied. The results hold significant implications for educators and researchers alike, as they underscore the credibility and utility of concept maps in both educational and cognitive assessment contexts. By utilizing concept maps as a means to represent individuals' cognitive organization of information, educators can gain valuable insights into students' learning progress and identify areas where further support may be needed.

Smith (1993) conducted a comprehensive study to explore the influence of graphic organizers on achievement and retention in hypermedia-based instruction for both formal and non-formal learners. The findings unveiled a noteworthy effect on the reasoning level, significantly enhancing test performance. The study sheds light on the valuable role of graphic organizers in the context of hypermedia-based instruction. These visual tools proved to be instrumental in fostering a deeper understanding of the subject matter and improving learners' abilities to reason critically. The results suggest that incorporating graphic organizers into hypermedia learning environments can be particularly beneficial for both formal educational settings, such as classrooms, and non-formal learning contexts, including self-paced online courses or workshops.

Korey (1992) conducted a study on the impact of graphic organizers on the comprehension of Mathematics and Science among high school special education students. The study's results were remarkable, showing a clear advantage of using graphic organizers in enhancing students' understanding of Mathematics. Through the implementation of graphic organizers, students demonstrated significant improvements in their performance, particularly in Mathematics. The visual and structured nature of graphic organizers seemed to be especially beneficial for students with special education needs, providing them with a powerful tool to organize information, make connections, and grasp complex mathematical concepts more effectively.

Louise (1991) conducted a study on the effectiveness of concept maps for problem-solving. The results showed that the students of experimental group outperformed the students of control group on the problem-solving test.

Additionally, the study revealed that there was no relationship between scores on the problem-solving test and concept map scores.

Bulgren et al. (1988) conducted a study to examine the effectiveness of a concept teaching routine in enhancing the performance of students with learning disabilities. The study revealed that when teachers used concept diagrams to instruct both students with and without learning disabilities, there were significant improvements in performance on tests of concept acquisition, as well as improvements in their note-taking abilities.

Simmons et al. (1988) conducted a study on the effects of teacher constructed pre and post Graphic Organizer instruction on sixth grade science students' comprehension and recall. The study results revealed that all three groups were equal in the day-to-day evaluation method and an immediate posttest. However, the pre graphic organizer group outperformed the post graphic organizer group on a delayed posttest measure. The findings showed that teacher created graphic organizers tend to be no more successful than conventional teaching in enhancing the comprehension and retention in science for sixth grade learners, whether presented before or after textual reading.

Millers (1984) conducted a study to investigate the effectiveness of visual and verbal organizers. The experimental group was exposed to pictures as organizers, whereas the control group received a prose organizer. The study revealed that the experimental group demonstrated superior immediate recall compared to the control group.

Alvermann (1981) conducted a study on the compensatory effect of graphic organizers on descriptive text. The study found that students in the treatment group recalled descriptive text material significantly better than the students in the control group. The results also supported the theory of assimilation encoding and reported that graphic organizers help students remember descriptive text when they need to reorganize the material.

Thompson (1980) conducted a study to test the effectiveness of the flow chart approach. The study involved two ninth-grade inner-city classes comprising forty-five students and was conducted over a duration of eighteen weeks. One group was taught using the traditional flow chart approach, while the other group followed the conventional textbook approach. The study's results revealed improvement among the underachievers of the ninth grade.

Summary of Related Studies on Graphic Organizers

Effectiveness of Graphic Organizers on Problem Solving Ability Skills

***Investigators*:** Cahyani et al. (2021), Sindhu (2020), Kwon et al. (2018), Mehta (2016), Sirait (2016), Totappa et al.(2016), Higgins (2012), Kamble and Tembe (2012), Alan (2009), Clark(2007), Ives (2007), Spears and Kealy (2005), Crawford and Carnine (2000), Foley(1995), Louise (1991)

***Results*:** Graphic organizers were effective in improving student's problem solving ability skills.

Effectiveness of Graphic Organizers on Academic Achievement

***Investigators*:** Samba et al. (2020), Odewumi et al. (2019), Djudin and Amir (2018), Kaur and Kamini (2018), Kansızoglu (2017), Ilter (2016), Korur et al. (2016), Cynthia (2015), Singh and Moono (2015), Gordon (2014), Antoine (2013), Eissa (2012), Malik and Zaman (2012), Paul (2012), Rani (2011), Selcuk et al. (2011), Condidorio (2010), Karakuyu (2010), Conley (2008), Asan (2007), Kirschbaum (2004), Herl et al. (1999), Lesha (1999), Schweitzer (1995), Fen(1995), George(1995), Griffin et al. (1995), James (1995), Banaz (1994), Scott (1994), Gagicetal.(2019), Elwood (2018), Aljaser (2017), Stephen (2015), Adesola and Salako (2013), Charlotte and Susan (2013), Cheema and Mirza (2013), Jbeili (2013), and Perry (2013)

***Results*:** The graphic organizers enhanced the academic achievement of students.

Effectiveness of Graphic Organizers on Achievement and Retention

***Investigators*:** Rani (2020), Ezeudu (2013), Gill (2004), and Smith (1993)

***Results*:** The instructional material based on graphic organizers were more effective than the traditional method of teaching in relation to achievement, and retention.

Effectiveness of Graphic Organizers on Retention

***Investigators*:** Deborah et al. (2019), Jane (2014), Chen (2007), Zercie (2005), Altin (2002), DiCecco and Gleason (2002), Mazure (1996), Millers (1984), Alvermann (1981), and Thompson (1980)

***Results*:** Graphic Organizers had a positive impact on the retention and recall of factual information and concepts.

Effectiveness of Graphic Organizers on Reading Comprehension and Writing Skills

***Investigators*:** Boykin et al. (2020), Amar (2019), Killickaya (2019), Tobar and Moya (2017), Uba et al. (2017), Barry (2016), Gorjian et al. (2015), Mann(2014), Heidarifard (2014), Saed and Al-Omari (2014), Shoari and Farrokhi (2014), Gallavan and Kottler (2007), Arwa (2012), Ozturk (2012), Yussof et al. (2012), Karen et al. (2011), Hoffmann (2010), Kools et al. (2006), Chang et al. (2002), Guastello et al. (2000), Korey (1992), and Simmons et al. (1988)

***Results*:** Graphic organizers enhanced the reading comprehension and writing skills.

Conclusion

Based on the extensive review conducted by the investigator, it has been concluded that as the instructional strategies, graphic organizers enhanced the academic achievement, retention, problem solving ability skills, and reading comprehension and writing skills of students in various subjects. In this context, the investigator has decided to study the efficacy of certain graphic organizers on achievement, retention and problem solving ability in Geography among secondary school students.

Chapter 3

METHODOLOGY

- Variables
- Objectives
- Hypotheses
- Design of the Study
- Tools used for collection of data
- Design of the Experimental phase of the Study
- Sample
- Data Collection Procedure
- Scoring and Consolidation of Data
- Statistical Techniques

The present study is intended to find out the effectiveness of Instructional Strategies based on selected Graphic Organizers on Achievement, Retention and Problem Solving Ability in Geography among Secondary School Students. The variables, objectives, hypotheses, design, tools used for data collection, sample, data collection procedure and statistical techniques used in this study are detailed in this chapter.

Variables of the Study

The dependent variables, independent variables, and the controlled variables of the presentstudy are detailed below.

Independent Variables

Instructional strategies based on;

i. Conventional Method of teaching
ii. Graphic Organizers (Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram)

Dependent Variables

The dependent variables of the study are:

i. Achievement in Geography
ii. Retention in Geography
iii. Problem Solving Ability in Geography

Control Variables

i. Pretest scores in Geography

Objectives of the Study

Main Objective

To find out the Effectiveness of Instructional Strategies based on selected Graphic Organizers on Achievement, Retention and Problem Solving Ability in Geography among Secondary School Students.

Specific Objectives

The specific objectives of the study are as follows;

1. To find out whether there exists any significant difference in Achievement in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.
2. To find out whether there exists any significant difference in the Achievement in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.
3. To find out whether there exists any significant difference in Retention in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.
4. To find out whether there exists any significant difference in the Retention in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.

5. To find out whether there exists any significant difference in Problem Solving Ability in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.

6. To find out whether there exists any significant difference in the Problem Solving Ability in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.

Hypotheses of the Study

1. There exists significant difference in Achievement in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.

2. There exists significant difference in the Achievement in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.

3. There exists significant difference in Retention in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.

4. There exists significant difference in the Retention in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional

Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.

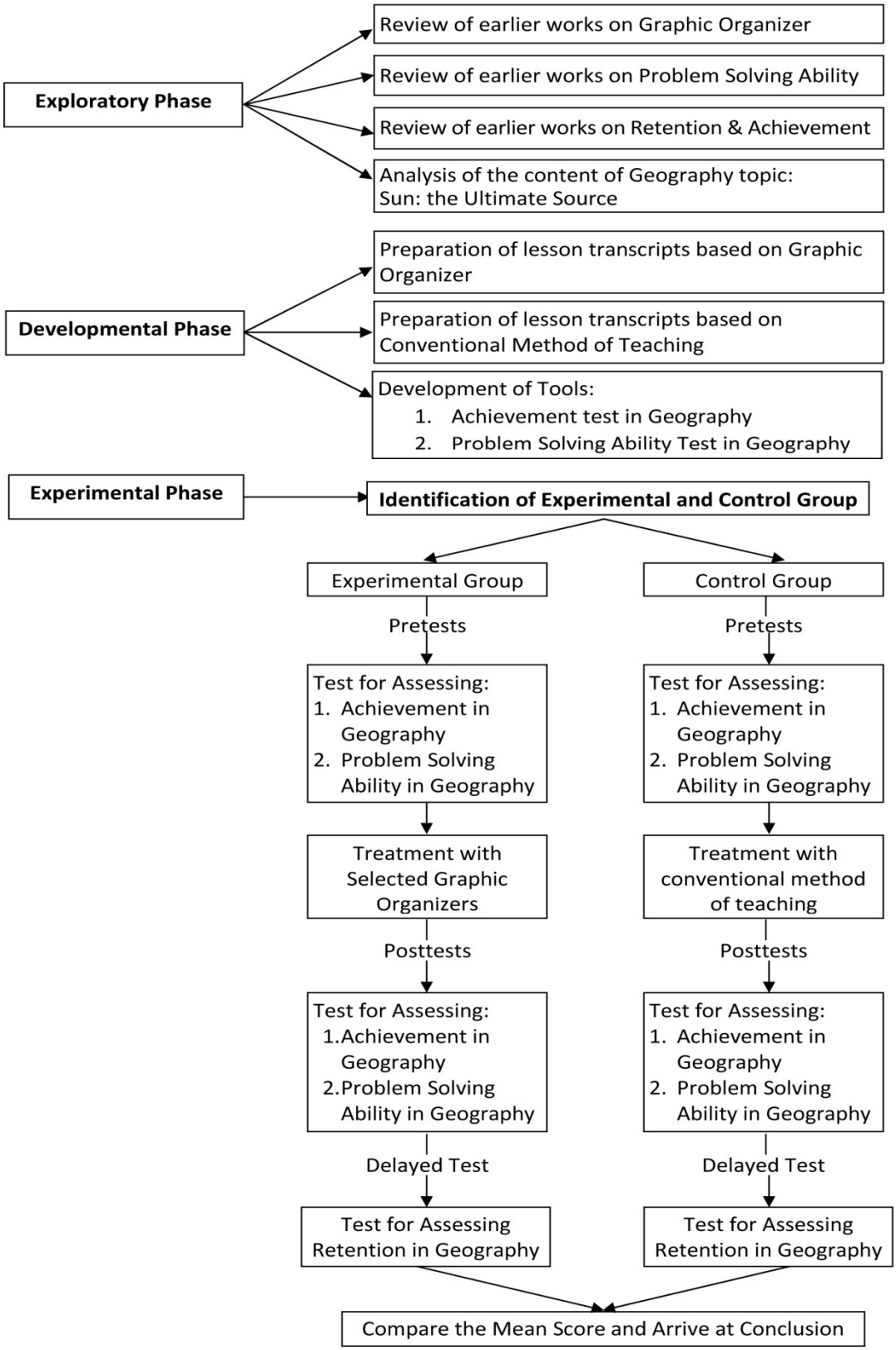
5. There exists significant difference in Problem Solving Ability in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.
6. There exists significant difference in the Problem Solving Ability in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.

Design of the Study

In the present study, ***quasi - experimental pretest - posttest non-equivalent group design*** was employed to test the effectiveness of Instructional Strategies based on selected Graphic Organizers on Achievement, Retention and Problem Solving Ability in Geography among Secondary School Students. The study was done in three phases; exploratory phase, developmental phase and experimental phase. The layout of the design of the study is illustrated in Figure 13.

Figure 13

Design of the Study



Phase I: Exploratory Phase

In the exploratory phase, initially, the investigator done an intensive review of literature on student learning process and related variables. The investigator also reviewed literature on achievement, Retention and Problem Solving Ability of students in Geography and related learning strategies. This helped to recognize the limitations of Conventional Method of Teaching and learning process. A detailed analysis of the different strategies were done and identified Graphic Organizer as one of the suitable method to transact Geography and other school curriculum. Hence the focus of the study was limited to the effectiveness of Graphic Organizers on achievement, Retention and Problem Solving Ability in Geography of Secondary School Students.

In order to identify the different Graphic Organizers, review of theories and earlier works on Graphic Organizer were performed. The investigator selected six Graphic Organizers namely; Concept Map, flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram as independent variable for the study. The unit, 'Sun: The Ultimate Source' presented in the SCERT Social Science textbook prescribed for standard IX in Kerala were identified as the content to transact among students after the expert consultation. Content analysis of the topics was done in this phase.

Table 4

Summary of Content Analysis of the Chapter: Sun: The Ultimate Source

Terms, Major concepts, and definitions in the unit 'Sun: The Ultimate Source'
Key Terms
Insolation, terrestrial radiation, aphelion, perihelion, equinox, solstices, conduction, convection, advection, heat budget, isotherms, inversion of temperature, pressure gradient force, frictional force, gravitational force, absolute and relative humidity, dew point, condensation, precipitation, convectional rainfall, cyclonic rainfall, and orographic rainfall
Major Concepts
1 Solar radiation 2 Variability of insolation

3 Heating and cooling of atmosphere
1 conduction
2 convection
3 advection
4 terrestrial radiation
4 Heat budget
5 Temperature
6 Inversion of temperature
7 Air pressure
8 Wind system
9 Humidity
1 absolute humidity
2 relative humidity
10 Condensation and precipitation
11 Clouds
1 cirrus
2 cumulus
3 stratus
4 nimbus

Definitions

1. The energy received by the earth from sun is known as solar radiation.
2. The amount and intensity of insolation vary at the surface of the earth during a day, in a season and in a year.
3. The earth's surface facing the sun gets heated by insolation, which begins with sunrise lasts till sunset. The heat is then transferred to the atmosphere from the surface of the earth through conduction, convection, advection and terrestrial radiation.
4. Heat budget is the amount of heat received in the form of insolation equals the amount lost by the earth through terrestrial radiation.
5. Temperature is the degree of hotness of the atmosphere. It is measured with the help of thermometer.
6. Normally, the temperature decreases with increase in elevation. Sometimes the situation is reversed, the temperature increases with increase in elevation. It is called inversion of temperature.
7. The weight of column of air contained in a unit area from mean sea level to the top of the atmosphere is called atmospheric pressure.
8. Horizontal distribution of pressure is studied by drawing isobars at constant level. Isobars are imaginary lines joining places having equal air pressure.

9. The air is set in motion due to the differences in atmospheric pressure. The horizontal movement of air from high pressure areas to low pressure areas are called wind.
10. Water vapour present in the air is known as humidity. There are two types of humidity, absolute and relative.
11. The transformation of water vapour in to water is called condensation. After the condensation of water vapour, the release of moisture is known as precipitation.
12. Cloud is a mass of minute water droplets or tiny crystals of ice formed by the condensation of the water vapour in free air at considerable elevations.

Phase II: Developmental Phase

Twenty lesson transcripts based on the selected area of content were prepared to transact among the experimental group by using certain Graphic Organizers such as Concept Map, flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram. (lesson transcripts is presented as Appendix A1). And also prepared twenty lesson transcripts based on the selected area of content to transact among controlled group by using Conventional Method of Teaching (lesson transcripts is presented as Appendix A2).

Four tools were prepared to assess the performance of the student's in Geography, ie, Achievement Test (pre and post), and Problem Solving Ability Test (pre and post). A pilot study was conducted in this phase.

Description of Tools

Two tools were prepared as a part of the study which includes instructional tools and measuring tools. The instructional tools are lesson transcripts based on the selected area of content to transact among experimental group by using certain Graphic Organizers and controlled group by using Conventional Method of Teaching. The measuring tools are Achievement Test (pre and post), and Problem Solving Ability Test (pre and post). Delayed posttest was used to assess retention in Geography. The tests were based on the topic selected for the treatment ie; 'Sun: The Ultimate Source'.

Achievement Test and Problem Solving Ability Test are two distinct types of assessments used in educational settings to evaluate different aspects of a student's abilities and knowledge. Achievement tests focus on evaluating a student's knowledge and skills in specific academic subjects, while problem solving ability tests assess a student's capacity to tackle complex problems and think critically in various contexts. Both types of assessments play important roles in understanding and evaluating student's abilities and progress in different aspects of their education.

Sample used for Standardization of Tools

Secondary School Students of standard IX in Kerala constitute the population of the study. For the standardization of test for assessing Problem Solving Ability, Retention and achievement in Geography, seven secondary schools were chosen from Kannur and Kozhikode districts. One class from each school was randomly selected as sample for standardization of tools. Draft test of the tools were administered in the selected classes. Out of 130 students, 100 students gave back data completely in all respects. Therefore, these 100 students were selected as the sample for standardization of the tools.

Try Out of the Tools

Proper instructions were given before executing each tool. Space for personal details like name of the student, gender, division and name of school were provided in the response sheet. The responses of each item by all students were scored and were subjected to item analysis.

Achievement Test in Geography (Pretest) (Ramakrishnan & Reshma, 2018)

Achievement test in Geography used as pretest was constructed by the investigator with the help of supervising teacher. In the present study pre-test was constructed based on the topics selected in the same area which was previously learned. Proper weightage was assigned to the various Graphic Organizers such as

Concept Map, Flow Chart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram for comparing the Achievement in Geography while preparing the Achievement Test. The major stages in the construction of achievement test in Geography are described as follows.

Planning the Test

The investigator studied thoroughly the curriculum, syllabus and the text book of Geography for the academic year 2017-2018. For guidance the investigator consulted with subject experts and experienced teachers in Geography. The investigator also referred available source book and text books in Geography for framing the items of the pretest.

Preparation of the Test

Items for the achievement test (pretest) in Geography were prepared on the basis of the major objectives of taxonomy of cognitive domain. While planning the test, the investigator considered the following aspects.

Table 5

Weightage to Unit and Learning Outcome

Sl No.	UNIT	Learning Outcome	Score	%
1	Solar Radiation, Heat Balance and Temperature	1.1, 1.1, 1.2, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.7	10	33.3
2	Atmospheric Circulation and WeatherSystem	2.1, 2.1, 2.1, 2.2, 2.3, 2.4, 2.4, 2.5, 2.6, 2.6	10	33.3
3	Water in the Atmosphere	3.1, 3.1, 3.2, 3.3, 3.3, 3.4, 3.4, 3.4, 3.5, 3.5	10	33.3
	Total		30	100

Table 6

Weightage to Thinking Skill

Sl No.	Thinking Skill	Score	%
1	Concept Attainment	18	60
2	Concept Generation	12	40
	Total	30	100

Table 7

Blue Print

Sl No.	Unit	Learning Outcome	Score	Total
1	Solar Radiation, Heat Balance and Temperature	1.1	2 (2)	10
		1.2	2(2)	
		1.3	1(1)	
		1.4	1(1)	
		1.5	1(1)	
		1.6	1(1)	
		1.7	2(2)	
2	Atmospheric Circulation and Weather System	2.1	3(3)	10
		2.2	1(1)	
		2.3	1(1)	
		2.4	2(2)	
		2.5	1(1)	
		2.6	2(2)	
3	Water in the Atmosphere	3.1	2(2)	10
		3.2	1(1)	
		3.3	2(2)	
		3.4	3(3)	
		3.5	2(2)	
	Total			30

Marks are given outside the bracket and number of question are given inside the bracket

Scoring Key

The scoring key was prepared by the investigator and decided to give one score for each correct answer and zero score for each wrong answer.

Try out

The objective type questions of the draft test was tried out on a sample of 100 students of standard IX. The time schedule for the administration of test was fixed in advance. A sample copy of draft test is presented as Appendix B1.

Item Analysis

After the administration of the draft test, the investigator conducted item analysis for the selection of the items for the final test. After the tryout of the test the investigator re arranged the answer sheets in the descending order of scores. Then the highest 27 and the lowest 27 were (27%) taken and were considered as upper and lower group respectively. In order to select the items for the final test, the discriminating power and difficulty index of each item were found out.

Difficulty Index. Item Facility (IF) value (also called difficulty index) was taken as the percentage of the group who answered the item correctly. Difficulty index of an item is represented by the percentage of student who responds correctly to each item. The following formula suggested by Ebel was used to calculate the difficulty index.

$$IF\ (Di) = U + L/2N$$

Where,

U = Number of correct responses in the upper group

L = Number of correct responses in the lower group

N = Number of students in the upper or lower group

Discriminating Power. Discriminating Power of an item of test of achievement refers to the quality of anitem at which it discriminate between students with high and low achievement inGeography. It was calculated using the formula,

Where,

$$ID = U - L/2N$$

U = Number of correct responses in the upper group

L = Number of correct responses in the lower group

N = Number of students in the upper or lower group

Difficulty index and discriminating power of 30 items of draft test of Achievement (Pretest)in Geography are given in Table 8.

Table 8

Data and Results of Item Analysis of Achievement Test (Pretest) in Geography

Item No.	U	L	ID	IF	Selected or Not	Item No.	U	L	ID	IF	Selected or Not
1	11	7	0.12	0.272	Rejected	16	24	9	0.454	0.5	Accepted
2	19	5	0.424	0.363	Accepted	17	15	4	0.33	0.287	Rejected
3	26	11	0.454	0.56	Accepted	18	28	6	0.666	0.515	Accepted
4	23	8	0.454	0.469	Accepted	19	24	10	0.424	0.424	Accepted
5	20	9	0.515	0.348	Accepted	20	22	7	0.454	0.439	Accepted
6	29	11	0.545	0.606	Accepted	21	30	10	0.606	0.606	Accepted
7	14	9	0.15	0.348	Rejected	22	21	7	0.424	0.424	Accepted
8	20	6	0.424	0.393	Accepted	23	23	7	0.484	0.454	Accepted
9	26	9	0.515	0.53	Accepted	24	24	5	0.575	0.439	Accepted
10	21	7	0.424	0.409	Accepted	25	20	3	0.515	0.348	Accepted
11	20	9	0.33	0.439	Rejected	26	27	9	0.545	0.545	Accepted
12	25	11	0.424	0.545	Accepted	27	12	8	0.121	0.303	Rejected
13	29	12	0.515	0.62	Accepted	28	24	8	0.484	0.484	Accepted
14	28	9	0.575	0.56	Accepted	29	29	11	0.545	0.606	Accepted
15	24	5	0.575	0.439	Accepted	30	30	13	0.515	0.65	Accepted

Selection of the Items for Final Test. The items for the final test were selected on the basis of difficulty index and discriminating power of each item. For the preparation of final test, the investigator decided to select items having discriminating power more than 0.4 and IF value between 0.3 to 0.7 initially. Thus on the basis of item analysis, 25 items with IF value in the range 0.3 – 0.7 and ID statistic of 0.4 and more were accepted as good items. Five items with discriminating items lesser than 0.4 were rejected.

Validity of the Test

The investigator subjected the test items for expert's evaluation. The test content covered all the topics under the selected topic, 'Sun: the Ultimate Source' of standard IX of Kerala state syllabus. Hence, the investigator claims high content validity of the test.

For establishing face validity, items of the test were subjected to expert's evaluation. The experts confirmed that the items were able to measure achievement in Geography of standard IX students. Hence the test has face validity.

Reliability of the Test

Reliability of the test was established using test-retest method on 55 standard IX students of secondary school. To establish reliability by test-retest method, the same test was administered to same students after a time period of three weeks. Obtained coefficient of correlation of first and second tests were 0.82. The value showed that the tool was reliable.

A copy of final Pretest of Achievement in Geography along with response sheet and scoring key are presented as Appendix B2 to B4.

Achievement Test in Geography (Posttest) (Ramakrishnan & Reshma, 2018)

Achievement test in Geography used as posttest was constructed by the investigator with the help of supervising teacher. In the present study the posttest were prepared based on same objectives as used in pretest and the items in the pretest were modified. The blueprint of the pretest and posttest were same. The posttest also used as delayed test to assess student's Retention in Geography. Proper weightage was assigned to the various Graphic Organizers such as Concept Map, Flow Chart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram for comparing the Achievement in Geography while preparing the Achievement Test. A copy of draft test is presented as Appendix C1.

Difficulty index and discriminating power of 30 items of draft test of Achievement in Geography are given in Table 9.

Table 9

Data and Results of Item Analysis of Achievement Test (Posttest) in Geography

Item No.	U	L	ID	IF	Selected or not	Item No.	U	L	ID	IF	Selected or not
1	11	7	0.12	0.272	Rejected	16	24	9	0.454	0.5	Accepted
2	19	5	0.424	0.363	Accepted	17	26	9	0.515	0.53	Accepted
3	26	11	0.454	0.56	Accepted	18	28	6	0.666	0.515	Accepted
4	14	9	0.15	0.348	Rejected	19	24	10	0.424	0.424	Accepted
5	20	9	0.515	0.348	Accepted	20	30	13	0.515	0.65	Accepted
6	23	8	0.454	0.469	Accepted	21	30	10	0.606	0.606	Accepted
7	29	11	0.545	0.606	Accepted	22	21	7	0.424	0.424	Accepted
8	20	6	0.424	0.393	Accepted	23	23	7	0.484	0.454	Accepted
9	15	4	0.33	0.287	Rejected	24	24	5	0.575	0.439	Accepted
10	21	7	0.424	0.409	Accepted	25	20	3	0.515	0.348	Accepted
11	29	12	0.515	0.62	Accepted	26	27	9	0.545	0.545	Accepted
12	25	11	0.424	0.545	Accepted	27	20	9	0.33	0.439	Rejected
13	22	7	0.454	0.439	Accepted	28	24	8	0.484	0.484	Accepted
14	28	9	0.575	0.56	Accepted	29	29	11	0.545	0.606	Accepted
15	24	5	0.575	0.439	Accepted	30	12	8	0.121	0.303	Rejected

Selection of the Items for Final Test. The items for the final test were selected on the basis of difficulty index and discriminating power of each item. For the preparation of final test, the investigator decided to select items having discriminating power more than 0.4 and IF value between 0.3 to 0.7 initially. Thus on the basis of item analysis, 25 items with IF value in the range 0.3–0.7 and ID statistic of 0.4 and more were accepted as good items. Five items with discriminating items lesser than 0.4 were rejected.

Validity of the Test

The investigator subjected the test items for expert's evaluation. The test content covered all the topics under the selected topic 'Sun: the Ultimate Source' of standard IX of Kerala state syllabus. Hence, the investigator claims high content validity of the test.

For establishing face validity, items of the test were subjected to expert's evaluation. The experts confirmed that the items were able to measure achievement in Geography of standard IX students. Hence the test has face validity.

Reliability of the Test

Reliability of the test was established using test-retest method on 55 standard IX students of Secondary schools. To establish reliability by test-retest method, the same test was administered to same students after a time period of three weeks. Obtained coefficient of correlation of first and second tests were 0.86. The value showed that the tool was reliable.

A copy of final Posttest of Achievement in Geography along with response sheet and scoring key are given as Appendix C2 to C4.

Test for Assessing Problem Solving Ability in Geography (Pretest) (Ramakrishnan & Reshma, 2018)

Test of Problem Solving Ability in Geography is an instrument used to measure the ability to solve Geography problems in specified areas of learning. The tool was prepared by the investigator with the help of supervising teacher was based on the topics selected in the same area which was previously learned. This test was used as pretest in the present study.

The procedure adopted for the different stages of preparation and standardization of Problem Solving Ability test in Geography is described in the following sections.

Planning and Preparation of the Test

The investigator thoroughly studied the curriculum, syllabus, text book and teacher's hand book of Geography for standard IX. The investigator also consulted experienced Geography teachers for their guidelines. As the test is intended to measure Problem Solving Ability in Geography, the investigator prepared the questions using the text book and source books on the basis of the components of Problem Solving Ability. The number of questions was limited to 35 for this test. The objective type items are included in this test.

Scoring Key

The scoring key was prepared by the investigator and decided to give one score for each correct answer and zero score for each wrong answer.

Try Out

The objective type questions of the draft test was tried out on a sample of 100 students of standard IX. The time schedule for the administration of test was fixed in advance.

Item Writing

During the preparation of the initial test draft, careful attention was paid to item construction rules, ensuring clarity, precision, and item relevance. The test items were classified into different levels of difficulty, including easy, medium, and difficult. Each difficulty level received the appropriate amount of emphasis. The preliminary stage involved a thorough content analysis and comprehensive review, facilitating the accurate distribution of weightage among various types of items.

Table 10

Problem Type-wise Distribution of Items in Draft of Problem Solving Ability Test in Geography

Sl No	Problem Type	Item No.	Total
1	Insolation and Terrestrial Radiation	1,3	2
2	Aphelion and Perihelion	4,5	2
3	Heating and cooling of Atmosphere	6,7	2
4	Heat Budget of the Earth	2,35	2
5	Factors controlling Temperature Distribution	8,9,31	3
6	Measuring temperature	32,33,34	3
7	Isotherms and Inversion of Temperature	10,11	2
8	Atmospheric Pressure	12,13	2
9	Winds	14,15,16	3
10	Humidity – Relative and Absolute	17	1
11	Evaporation and Condensation	18,19,20	3
12	Types of Clouds	21,22,23	3
13	Precipitation	24,25	2
14	Types of Rainfall and World distribution	26,27,28,29,30	5
	Total		35

A copy of the draft test of Problem Solving Ability in Geography with 35 items is presented as Appendix D1.

Item Analysis

After the administration of the draft test, the investigator conducted item analysis for the selection of the objective items for the final test. After the tryout of the test the investigator re arranged the answer sheets in the descending order of scores. Then the highest 27 and the lowest 27 were (27%) taken and were considered as upper and lower group respectively. In order to select the items for the final test, the discriminating power and difficulty index of each item were found out.

Difficulty Index. Item Facility (IF) value (also called difficulty index) was taken as the percentage of the group who answered the item correctly. Difficulty index of an item is represented by the percentage of student who responds correctly to each item. The following formula suggested by Ebel was used to calculate the difficulty index.

$$IF\ (Di) = U + L/2N$$

Where'

U – Number of correct responses in the upper group

L – Number of correct responses in the lower group

N – Number of students in the upper or lower group

Discriminating Power. Discriminating power of an item of test of Problem Solving Ability refers to the quality of an item at which it discriminate between students with high and low Problem Solving Ability in Geography. It was calculated using the formula;

$$ID = U\text{-}L/2N$$

Where,

U – Number of correct responses in the upper group

L – Number of correct responses in the lower group

N – Number of students in the upper or lower group

Difficulty index and discriminating power of 35 items of draft test of Problem Solving Ability (Pretest) in Geography are given in Table 11.

Table 11

Data and Results of Item Analysis of Test of Problem Solving Ability (Pretest) in Geography

Item No.	U	L	ID	IF	Selected or not	Item No.	U	L	ID	IF	Selected or not
1	27	9	0.545	0.545	Accepted	19	31	8	0.696	0.59	Accepted
2	31	7	0.727	0.575	Accepted	20	29	9	0.606	0.575	Accepted
3	30	9	0.636	0.59	Accepted	21	9	5	0.121	0.212	Rejected
4	29	10	0.575	0.59	Accepted	22	27	10	0.545	0.56	Accepted
5	28	7	0.636	0.53	Accepted	23	28	10	0.545	0.575	Accepted
6	25	11	0.424	0.545	Accepted	24	29	6	0.696	0.53	Accepted
7	31	7	0.727	0.575	Accepted	25	28	7	0.636	0.53	Accepted
8	13	6	0.515	0.287	Rejected	26	29	10	0.575	0.59	Accepted
9	29	8	0.636	0.56	Accepted	27	25	9	0.484	0.515	Accepted
10	11	3	0.242	0.212	Rejected	28	29	9	0.606	0.575	Accepted
11	27	9	0.545	0.545	Accepted	29	26	10	0.484	0.545	Accepted
12	26	10	0.484	0.545	Accepted	30	28	11	0.515	0.59	Accepted
13	24	11	0.424	0.545	Accepted	31	24	9	0.454	0.5	Accepted
14	9	0	0.272	0136	Rejected	32	26	12	0.424	0.575	Accepted
15	30	9	0.636	0.59	Accepted	33	29	9	0.606	0.575	Accepted
16	28	8	0.606	0.545	Accepted	34	29	7	0.666	0.545	Accepted
17	26	7	0.575	0.50	Accepted	35	23	9	0.424	0.484	Accepted
18	7	2	0.151	0.136	Rejected						

Selection of the Items for Final Test. The items for the final test were selected on the basis of difficulty index and discriminating power of each item. For the preparation of final test, the investigator decided to select items having discriminating power more than 0.4 and IF value between 0.3 to 0.7 initially. Thus on the basis of item analysis, 30 items with IF value in the range 0.3 – 0.7 and ID statistic of 0.4 and more were accepted as good items. Five items with discriminating items lesser than 0.4 were rejected.

Validity of the Test

The investigator subjected the test items for expert's evaluation. The test content covered all the topics under the selected topic, 'Sun: the Ultimate Source' of standard IX of Kerala state syllabus. Hence, the investigator claims high content validity of the test.

For establishing face validity, items of the test were subjected to expert's evaluation. The experts confirmed that the items were able to measure Problem Solving Ability in Geography of standard IX students. Hence the test has face validity.

Reliability of the Test

Reliability of the test was established using test-retest method on 60 standard IX students of secondary school. To establish reliability by test-retest method, the same test was administered to same students after a time period of three weeks. Obtained coefficient of correlation of first and second tests were 0.81. The value showed that the tool was reliable.

A copy of final Pretest of Problem Solving Ability in Geography along with response sheet and scoring key are presented as Appendix D2 to D4.

Test for Assessing Problem Solving Ability in Geography (Posttest) (Ramakrishnan & Reshma, 2018)

Test of Problem Solving Ability in Geography is an instrument used to measure the ability to solve Geography problems in specified areas of learning. The tool was prepared by the investigator with the help of supervising teacher on topic selected for treatment 'Sun: the Ultimate Source' and the test was based on the same components as used in the pretest and the pattern was modified. This test was used as posttest in the present study.

The investigator thoroughly studied the curriculum, syllabus, text book and teacher's hand book of Geography for standard IX. The investigator also consulted experienced Geography teachers for their guidelines. As the test is intended to measure Problem Solving Ability in Geography, the investigator prepared the questions using the text book and source books on the basis of the components of Problem Solving Ability. So the investigator has written the questions which brought the students in to a new situation to use the knowledge obtained by them during the instruction. The number of questions was limited to 35 for this test. The objective type items are included in this test.

A copy of the draft test of Problem Solving Ability in Geography with 35 items is presented as Appendix E1.

Difficulty index and discriminating power of 35 items of draft test of Problem Solving Ability (posttest) in Geography are given in Table 12.

Table 12

Data and Results of Item Analysis of Test of Problem Solving Ability (posttest) in Geography

Item No.	U	L	ID	IF	Selected or Not	Item No.	U	L	ID	IF	Selected or Not
1	30	9	0.636	0.59	Accepted	19	27	9	0.545	0.545	Accepted
2	31	7	0.727	0.575	Accepted	20	29	9	0.606	0.575	Accepted
3	28	7	0.636	0.53	Accepted	21	25	9	0.484	0.515	Accepted
4	29	10	0.575	0.59	Accepted	22	27	10	0.545	0.56	Accepted
5	13	6	0.515	0.287	Rejected	23	7	2	0.151	0.136	Rejected
6	25	11	0.424	0.545	Accepted	24	29	6	0.696	0.53	Accepted
7	31	8	0.696	0.59	Accepted	25	27	9	0.545	0.545	Accepted
8	11	3	0.242	0.212	Rejected	26	29	10	0.575	0.59	Accepted
9	29	8	0.636	0.56	Accepted	27	29	9	0.606	0.575	Accepted
10	31	7	0.727	0.575	Accepted	28	26	7	0.575	0.50	Accepted
11	28	7	0.636	0.53	Accepted	29	26	10	0.484	0.545	Accepted
12	26	10	0.484	0.545	Accepted	30	28	11	0.515	0.59	Accepted
13	24	11	0.424	0.545	Accepted	31	24	9	0.454	0.5	Accepted
14	9	0	0.272	0.136	Rejected	32	26	12	0.424	0.575	Accepted
15	30	9	0.636	0.59	Accepted	33	28	10	0.545	0.575	Accepted
16	28	8	0.606	0.545	Accepted	34	29	7	0.666	0.545	Accepted
17	29	9	0.606	0.575	Accepted	35	23	9	0.424	0.484	Accepted
18	9	5	0.121	0.212	Rejected						

Selection of the Items for Final Test. The items for the final test were selected on the basis of difficulty index and discriminating power of each item. For the preparation of final test, the investigator decided to select items having discriminating power more than 0.4 and IF value between 0.3 to 0.7 initially. Thus on the basis of item analysis, 30 items with IF value in the range 0.3 – 0.7 and ID statistic of 0.4 and more were accepted as good items. Five items with discriminating items lesser than 0.4 were rejected.

Validity of the Test

The investigator subjected the test items for expert's evaluation. The test content covered all the topics under the selected topic 'Sun: the Ultimate Source' of standard IX of Kerala state syllabus. Hence, the investigator claims high content validity of the test.

For establishing face validity, items of the test were subjected to expert's evaluation. The experts confirmed that the items were able to measure Problem Solving Ability in Geography of standard IX students. Hence the test has face validity.

Reliability of the Test

Reliability of the test was established using test-retest method on 60 standard IX students of secondary school. To establish reliability by test-retest method, the same test was administered to same students after a time period of three weeks. Obtained coefficient of correlation of first and second tests were 0.82. The value showed that the tool was reliable.

A copy of final test of Problem Solving Ability in Geography along with the response sheet and scoring key are provided as Appendix E2 to E4.

Phase III: Experimental Phase

This phase includes the experimental intervention using ***quasi-experimental pretest-posttest non-equivalent group design*** in a secondary school. Pretest and posttest were administered, and suitable statistical procedures were employed to analyze the data.

Design of the Experimental Phase of the Study

The present study probes the effectiveness of certain Instructional Strategies based on Graphic Organizers on Achievement, Retention and Problem Solving Ability

in Geography among Secondary School Students. The symbolic representation of the study is given below;

G_1 O_1 X_1 O_2

G_2 O_3 X_2 O_4

O_1 and O_3 – pre tests

O_2 and O_4 – post tests

G_1 – Experimental Group

G_2 – Control Group

O_2-O_1, O_4-O_3 – Gain Scores

X_1 – Application of Experimental Treatment

X_2 – Application of Control Treatment

Sample used in the Experiment

Two intact class divisions of 110 students (55 in experimental group and 55 in control group respectively) of standard IX students of GVHSS Madappally from Kozhikode district, following Kerala syllabus (prescribed by SCERT) was selected as the sample.

Data Collection Procedure

The data required for the actual study was collected during the progressive stages of the treatment itself. The Achievement in Geography and Problem Solving Ability were measured right at the beginning.

Pretest

In the initial stage of the experiment, the scores of the Achievement and Problem Solving Ability in Geography were measured for ensuring the homogeneity of the group and for comparing the scores before and after the treatment.

Experimental Treatment

The experimental group was taught through instructional strategy based on selected Graphic Organizers. The IX standard students of Secondary School were taught the content of the topic 'Sun: the Ultimate Source'. To teach the content in Geography, investigator selected six Graphic Organizers such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram. For this investigator prepared 20 Graphic Organizer based lesson transcripts on the selected topic of Geography with the help of power point presentation. The complete teaching was done during the usual class hours in the face to face mode.

Control Treatment

The control group was taught the same topic 'Sun: the Ultimate Source' by using Conventional Method of Teaching. For this investigator prepared 20 lesson transcripts on the selected topic with the help of power point presentation. The complete teaching was done during the usual class hours in the face to face mode.

Administration of Posttest

The standardized Achievement test and Problem Solving Ability test in Geography were administered in control and experimental groups after the completion of the treatment period.

Administration of Delayed Test

The same posttest i.e., Achievement test in Geography was given to both control and experimental groups after a gap of one month to assess the effectiveness of Instructional Strategies based on selected Graphic Organizers on Retention in Geography.

Scoring and Consolidation of Data

The Problem Solving Ability Test, Achievement Test and Delayed Test were administered. The difference between the Posttest and the Pretest (Gain score) score was taken as measure of the Achievement and Problem Solving Ability in Geography. The difference between the scores of Posttest and Delayed test in Achievement was treated as the measure of Retention in Geography.

The test for assessing Problem Solving Ability, Retention and Achievement in Geography were scored using a suitable scoring key. The maximum score for the Problem Solving Ability test was 30 and the test was to be performed in time duration of 1 hour. The maximum score for the Achievement test was 25 and the test was to be performed in time duration of 1 hour

Table 13 shows the number of students in the experimental and control groups who were taken in to consideration for final data analysis.

Table 13

Actual Number of Students for Final Data Analysis

Group	Boys	Girls	Total
Experimental	30	25	55
Control	26	29	55

Procedure used for Analysis of Data

The hypotheses of the present study were tested by employing appropriate statistical techniques. The major statistical processing like Test of Mean difference and ANCOVA were done using computer facility with software IBM SPSS Statistics 21.

Statistical Techniques used for the Study

In order to test the hypotheses stated in the present study, the following statistical techniques were used for the present study.

To understand the nature of the distribution of the independent and dependent variables, the descriptive statistics such as mean, median, standard deviation, skewness and kurtosis were calculated for each of the study group.

Effectiveness of Instructional Strategies based on the selected Graphic Organizers on Achievement, Retention and Problem Solving Ability in Geography among Secondary School Students was examined using Test of Mean difference and ANCOVA. ANCOVA was utilized to remove statistically the effects of the extraneous cognitive variables (pretest scores) which would have an effect upon the dependent variables, Achievement and Problem solving ability in Geography.

Chapter 4

ANALYSIS AND INTERPRETATION OF DATA

- Effectiveness of Instructional Strategies based on selected Graphic Organizers compared to Conventional Method of Teaching on Achievement in Geography for the Total Sample
- Effectiveness of Instructional Strategies based on selected Graphic Organizers compared to Conventional Method of Teaching on Achievement in Geography for the Sub sample based on Boys, and Girls
- Effectiveness of Instructional Strategies based on selected Graphic Organizers compared to Conventional Method of Teaching on Retention in Geography for the Total Sample
- Effectiveness of Instructional Strategies based on selected Graphic Organizers compared to Conventional Method of Teaching on Retention in Geography for the Sub sample based on Boys, and Girls.
- Effectiveness of Instructional Strategies based on selected Graphic Organizers compared to Conventional Method of Teaching on Problem Solving Ability in Geography for the Total Sample
- Effectiveness of Instructional Strategies based on selected Graphic Organizers compared to Conventional Method of Teaching on Problem Solving Ability in Geography for the Sub sample based on Boys, and Girls

Analysis of the data of the present study is presented in this chapter. This has been classified under the following major heads.

- Effectiveness of Instructional Strategies based on selected Graphic Organizers compared to Conventional Method of Teaching on Achievement in Geography for the Total Sample
- Effectiveness of Instructional Strategies based on selected Graphic Organizers compared to Conventional Method of Teaching on Achievement in Geography for the Sub sample based on Boys, and Girls
- Effectiveness of Instructional Strategies based on selected Graphic Organizers compared to Conventional Method of Teaching on Retention in Geography for the Total Sample
- Effectiveness of Instructional Strategies based on selected Graphic Organizers compared to Conventional Method of Teaching on Retention in Geography for the Sub sample based on Boys, and Girls
- Effectiveness of Instructional Strategies based on selected Graphic Organizers compared to Conventional Method of Teaching on Problem Solving Ability in Geography for the Total Sample
- Effectiveness of Instructional Strategies based on selected Graphic Organizers compared to Conventional Method of Teaching on Problem Solving Ability in Geography for the Sub sample based on Boys, and Girls

Effectiveness of Instructional Strategies based on Selected Graphic Organizers Compared to Conventional Method of Teaching on Achievement in Geography for the Total Sample

The achievement tests (Pretest and Posttest) were prepared by the investigator to assess the achievement in Geography of Secondary School Students. The test was prepared, standardized, and established for validity and reliability

before administering it to the selected sample. The tests were administered to both the experimental and control groups.

The data obtained from administering the achievement test to the total sample of experimental group treated with instructional strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram, and control group treated with conventional methods of teaching were subjected to analysis. The results of the analysis are discussed under the following headings.

Preliminary Analysis

Nature of Distribution of Pretest and Posttest Scores of Achievement in Geography for the Total Sample in the Experimental and Control Groups

Descriptive statistics like Mean, Median, Standard Deviation, Skewness and Kurtosis were found out for the Pretest and Posttest scores for getting a general picture of the groups. The obtained values are given in Table 14.

Table 14

Descriptive Statistics of Pretest and Posttest Scores of Experimental and Control groups on Achievement in Geography for the Total Sample

Groups	Test	Mean	Median	SD	Skewness	Kurtosis
Experimental	Pretest	6.27	6	3.5	0.343	-0.775
	Posttest	15.65	14	5.13	0.273	-1.220
Control	Pretest	6.6	7	3.5	0.190	-1.080
	Posttest	9.93	10	3.8	0.276	-0.551

From Table 14, it is evident that the arithmetic mean and median values of the pretest and posttest scores for both the experimental and control groups are almost the same. The standard deviation values of the scores on achievement in Geography for both groups show that the values are not significantly dispersed from the central value.

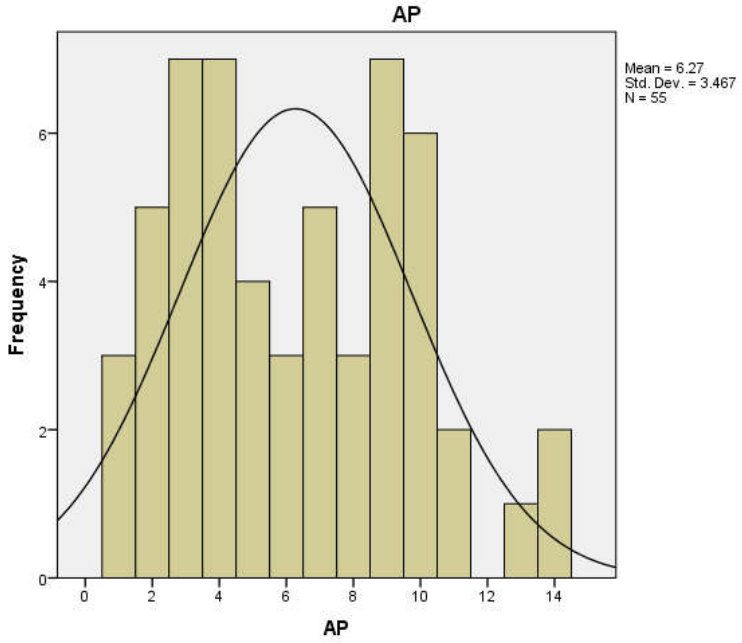
The standard deviation value also indicates that the samples are almost homogeneous concerning the pretest and posttest scores on achievement in Geography.

The pretest and posttest scores of both the experimental and control groups are positively skewed, indicating that the scores are concentrated towards the lower end of the scale. This implies that there are relatively fewer students who achieved high scores compared to those who achieved low scores.

The kurtosis values of the pretest and posttest scores on achievement in Geography for both the experimental and control groups are less than 0.263, indicating that the distributions are leptokurtic.

Figure 14

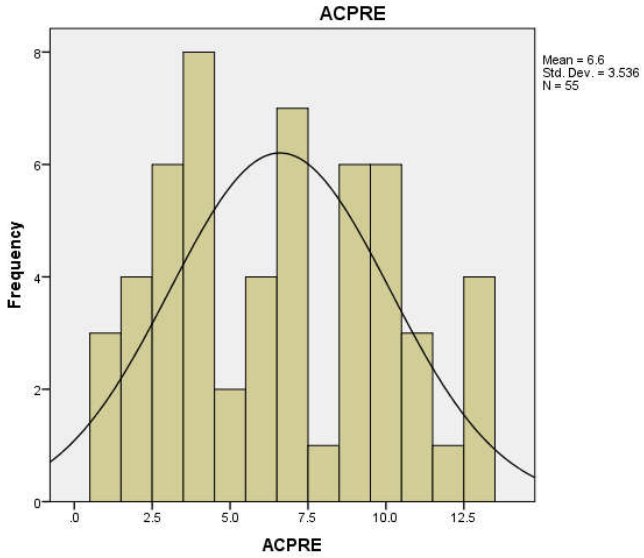
Histogram for the Pretest Scores of Experimental Group on Achievement in Geography for the Total Sample



From the figure 14, it is clear that more scores of Experimental group on Pretest on Achievement in Geography are on the lower end of the scale and the distribution is leptokurtic in nature.

Figure 15

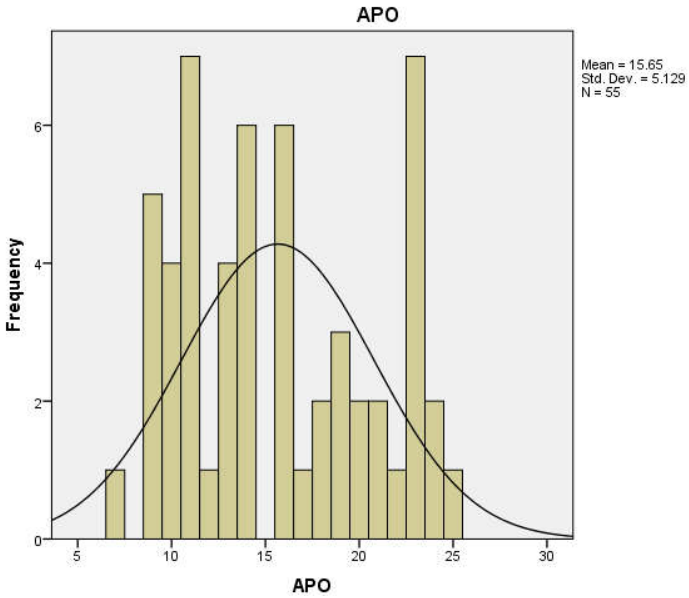
Histogram for the Pretest scores of Control Group on Achievement in Geography for the Total Sample



From the figure 15, it is clear that more scores of Control group on Pretest on Achievement in Geography are on the lower end of the scale and the distribution is leptokurtic in nature.

Figure 16

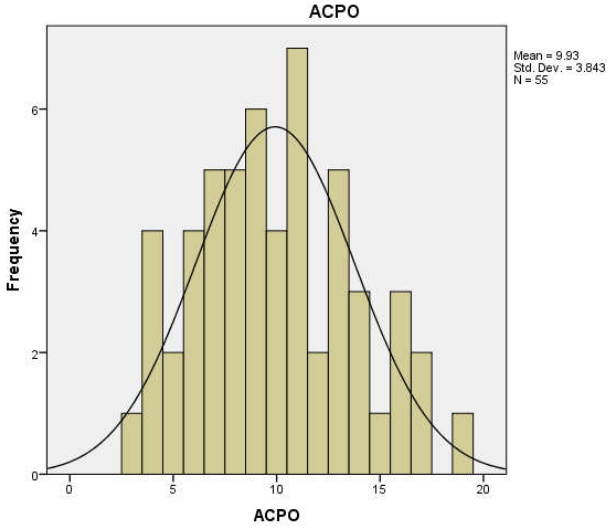
Histogram for the Posttest scores of Experimental Group on Achievement in Geography for the Total Sample



From the figure 16, it is clear that more scores of Experimental group on Posttest on Achievement in Geography are on the lower end of the scale and the distribution is leptokurtic in nature.

Figure 17

Histogram for the Posttest scores of Control Group on Achievement in Geography for the Total Sample



From the figures, it is evident that more scores of the Control group on the Posttest for Achievement in Geography concentrated towards the lower end of the scale, and the distributions are leptokurtic in nature.

Major Analysis

Comparison of Achievement in Geography of Students in the Experimental and Control Groups for the Total Sample before Experiment

The Experimental and Control groups were subjected to a Pretest on Achievement in Geography before conducting the experiment. The Pretest scores on Achievement in Geography were compared by calculating the mean and standard deviation of both groups. The scores of the two groups were subjected to the test of significance of difference between means and the values are presented in Table 15.

Table 15

Comparison of Pretest Scores of Experimental and Control Groups on Achievement in Geography for the Total Sample

Groups	N	Mean	Standard Deviation	t- value
Experimental	55	6.27	3.5	0.49
Control	55	6.6	3.5	

The t-value obtained is not significant at .01 level. This means that there is no significant difference between the Pretest scores of the Experimental and Control Groups on Achievement in Geography before the experiment.

Comparison of Achievement in Geography of Students in the Experimental and Control Groups for the Total Sample after Experiment

After the experiment, the Achievement test was given as a Posttest to both the Experimental and Control Groups. From the scores obtained, the Mean and Standard Deviation were calculated. Then, the significance of the difference between the mean scores was tested. The result obtained is given in Table 16

Table 16

Comparison of Posttest Scores of Experimental and Control Groups on Achievement in Geography for the Total Sample

Groups	N	Mean	Standard Deviation	t- value
Experimental	55	15.65	5.13	6.65**
Control	55	9.93	3.6	

** $p < .01$

In Table 16, it is evident that the obtained t-value is significant at .01 level. This indicates a significant difference between the Posttest scores on Achievement in Geography of the Experimental and Control Groups. It means that the two groups differ significantly after the Experiment. Since the Mean value of the Experimental

Group is found to be higher than that of the Control Group, it is inferred that the Experimental Group excelled in Achievement in Geography compared to the Control Group.

Therefore, it can be concluded that teaching through Instructional Strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram has enhanced the Achievement in Geography of Secondary School Students when compared to the Conventional Method of Teaching.

Comparison of Gain Scores of Achievement in Geography of Students in the Experimental and Control Groups for the Total Sample after Experiment

The Gain scores of Achievement in Geography for the Experimental and Control groups for the Total Sample were calculated by taking the difference between Pretest and Posttest scores. The Mean, Standard deviation and t-value for the Gain scores were calculated and are given in Table 17.

Table 17

Comparison of Gain Scores on Achievement in Geography of Experimental and Control Groups for the Total Sample

Groups	N	Mean	Standard Deviation	t- value
Experimental	55	9.4	3.1	12.18**
Control	55	3.33	2.01	

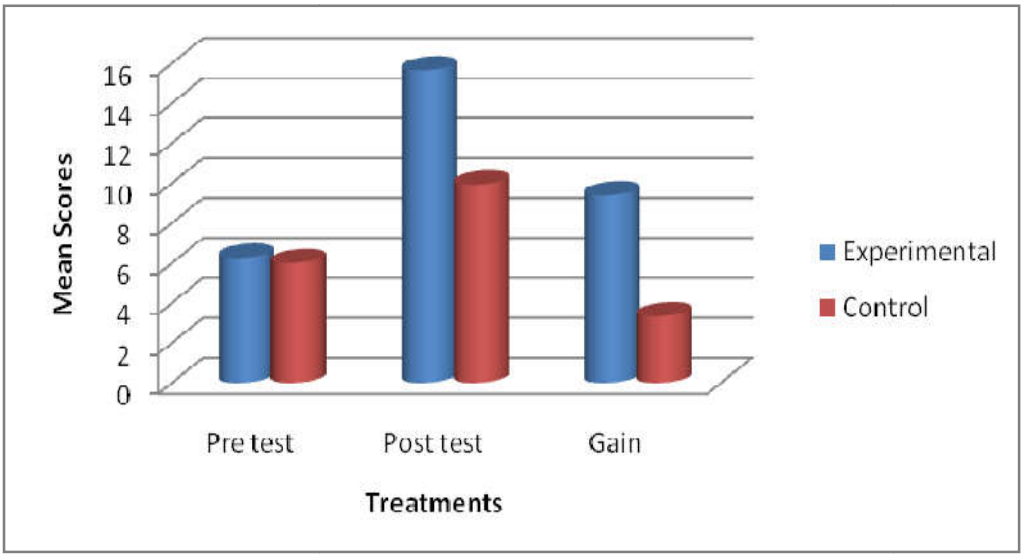
** $p < .01$

From Table 17, it is clear that the t-value obtained is significant at .01 level. This means that the Experimental and Control groups differ significantly in their Gain scores on Achievement in Geography after the Experiment.

The Graphical representation of the Mean scores on Achievement in Geography of the Pretest, Posttest and Gain scores of the Experimental and Control Groups for the Total Sample is given in the Figure 18.

Figure 18

Mean Pretest, Posttest and Gain scores of Experimental and Control Groups on Achievement in Geography for the Total Sample



The graph gives an idea that the Experimental group performs better than the Control Group on Achievement in Geography for the Total Sample on all tests.

Genuineness of Difference on Achievement in Geography of the Experimental and Control Groups

The analysis of the Posttest and Gain scores of students in the Experimental and Control groups shows that there is a significant difference in the Achievement in Geography of students treated with Instructional strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram compared to the Existing Method. However, it is important to note that the sample selected for the study consisted of non-equivalent intact class room groups. Therefore, even though the groups differ significantly in the posttest and gain scores, it cannot be concluded that the higher Posttest scores of students in the Experimental group is due to the implementation of the Experimental treatment. Many intervening variables might have influenced the Experimentation.

In this context, it becomes necessary to analyze the scores using the statistical technique ANCOVA, by which the difference in the initial status can be removed

statistically, allowing the two groups to be compared as though their initial status has been equated. The effects of Pretest and other variables are partialled out, and the resulting adjusted means of Posttest scores are compared. The use of ANCOVA is justified in this study since it uses a pretest posttest non-equivalent group design.

Comparison of Scores on Achievement in Geography of Experimental and Control Groups using Analysis of Covariance

The scores on Achievement in Geography of the Experimental and Control groups were subjected to ANCOVA to find out the effectiveness of Instructional strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram over Existing Method. For this, the Total sum of squares, Mean square variances and F-ratios of pre and posttest scores of the Experimental and Control groups were calculated. The Fx and Fy values obtained were tested for significance. The table values for df (1,108) are 4.00 at.05 level and 7.08 at .01 level. The obtained Fx value is 0.24 which is not significant at .01 level, showing that initially, the groups were not different. The Fy value obtained is 43.91, which is significant at .01 level.

The adjusted sum of squares and the adjusted mean square variances for the posttest were computed, and the F ratio was calculated. The summary of Analysis of Covariance for the posttest scores on Achievement in Geography for the total sample is given in Table 18.

Table 18

Summary of Analysis of Covariance of the Pretest and Posttest scores on Achievement in Geography of the Experimental and Control Groups for the Total Sample

Source of Variation	df	SSx	SSy	SSyx	MSyx	SDyx	Fyx
Among Groups	1	2.945	902.045	1012.628	1012.628	2.577	152.46**
Within Groups	109	1324.109	2218.145	723.954	6.641780		

** p < .01 level

The Table value for df (1,109) at .05 level is 4.00 and 7.08 at .01 level. The obtained Fyx value (Fyx = 152.46) is found to be significant at .01 level. It shows that there is a significant difference between the means of final scores after they have been adjusted for differences in initial scores. The significant F ratio necessitates testing the difference separately by the test of significance of difference between means.

Comparison of Scores on Achievement in Geography of Experimental and Control Groups using Adjusted Means

The Adjusted means of the Posttest scores on Achievement in Geography were calculated. The results are shown in Table 19

Table 19

Data of Adjusted Means of Post test Scores on Achievement in Geography of the Experimental and Control Groups for the Total Sample

Groups	N	Mx	My	Myx (adjusted)	t- value
Experimental	55	6.272	15.654	15.828	12.36**
Control	55	6.6	9.927	9.753	

** p < .01 level

The Adjusted means for Posttest scores were tested for significance. The *t* value obtained is 12.36. The Table value is 1.96 at .05 level and 2.53 at .01 level. Therefore, the obtained value is significant at .01 level. The result shows that the two groups differ significantly. Therefore it can be concluded that Instructional strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram are effective in enhancing Achievement in Geography of Secondary School students when the total sample is considered.

Effectiveness of Instructional Strategies based on Selected Graphic Organizers Compared to Conventional Method of Teaching on Achievement in Geography for the Sub sample based on Boys, and Girls

The Pretest, Posttest and Gain scores of Achievement in Geography were found out for the Sub samples of Boys, and Girls. The results obtained on the comparison of the Sub sample were discussed under the following headings.

Preliminary Analysis

Nature of Distribution of Pretest and Posttest scores of Achievement in Geography for the Sub sample based on Boys, and Girls in the Experimental and Control Groups

The scores obtained on the Pretest and Posttest were condensed into frequency tables. In order to get a general picture of the groups, Descriptive statistics like Mean, Median, Standard Deviation, Skewness and Kurtosis were found out. The results are summarized in Table 20.

Table 20

Descriptive statistics of Pretest and Posttest Scores of Experimental and Control Groups on Achievement in Geography for the Subsample based on Boys, and Girls

Sub sample	Classification	Group	Test	Mean	Median	S.D	Skew-ness	Kurtosis
Gender	Boys	Experimental	Pretest	6.83	7	3.8	0.166	-0.870
			Posttest	15.83	16	4.8	-0.062	-1.161
		Control	Pretest	6.15	6.5	3.4	0.163	-1.063
			Posttest	9.84	10.5	3.7	0.172	0.243
	Girls	Experimental	Pretest	5.6	5	2.9	0.384	-1.097
			Posttest	15.44	14	5.5	0.605	-1.200
		Control	Pretest	7	7	3.6	0.171	-1.174
			Posttest	10	9	4.02	0.352	-0.991

From Table 20, it is clear that the Arithmetic Mean and Median for the Pretest and Posttest scores of Control group and Experimental group for the relevant Sub samples are almost the same. The Standard Deviation of the scores on Achievement in Geography of the groups indicates that the scores are not much dispersed from the central value. The distribution is positively skewed on the Pretest and Posttest scores of the Experimental and Control groups except for Posttest scores of Boys in the Experimental group. This means that the scores are massed at the lower end of the distribution. That is, the number of students who got high scores is comparatively less than the number of students who got low scores.

The distribution is negatively skewed in the Posttest scores of the Experimental Group for the relevant Sub sample Boys. This means that the scores are massed at the upper end of the distribution. That is, the number of students who got high scores is comparatively greater than the number of students who got low scores. The kurtosis value is lower than 0.263 in all cases and hence the distributions are leptokurtic.

Comparison of Scores of Experimental and Control Groups on Achievement in Geography for the Relevant Sub sample before Experiment

The Experimental and Control Groups were subjected to a Pretest before implementing the treatment. The Pretest scores of both the groups were compared by computing the Mean and Standard deviation. The scores of the two groups were then subjected to the test of significance of the difference between Means and the values are presented in Table 21.

Table 21

Comparison of Pretest Scores of Experimental and Control Groups on Achievement in Geography for the Relevant Subsample based on Boys, and Girls

Subsample	Classification	Groups	N	M	SD	t- value
Gender	Boys	Experimental	30	6.83	3.8	0.71
		Control	26	6.15	3.4	
	Girls	Experimental	25	5.6	2.9	1.58
		Control	29	7	3.6	

Table 21 shows that all the t-values obtained are not significant even at.05 level. It implies that there exists no significant difference between the Pretest scores of the Experimental and Control Groups on Achievement in Geography for the Sub sample of Boys, and Girls before the Experiment.

Comparison of Scores of Experimental and Control Groups on Achievement in Geography for the Relevant Subsample after Experiment

After the Experiment, the Achievement test was given as a Posttest. The scores obtained were found out, and the Mean and Standard deviations of the Sub sample were calculated. The Posttest scores of both groups were compared using Mean and Standard Deviation values. Then the test of significance of the difference between the Means of the Experimental and Control groups was found out. The results obtained are given in Table 22.

Table 22

Comparison of Posttest Scores of Experimental and Control Groups on Achievement in Geography for the Relevant Subsample based on Boys, and Girls

Subsample	Classification	Groups	N	M	SD	t- value
Gender	Boys	Experimental	30	15.83	4.8	5.26**
		Control	26	9.84	3.7	
	Girls	Experimental	25	15.44	5.5	4.09**
		Control	29	10	4.02	

** $p < .01$

From the table 22, it is clear that the t-values obtained are significant for the Sub sample of Boys, and Girls at .01 level. This means that there is a significant difference between the Posttest scores of the Experimental and Control groups on Achievement in Geography for the Subsample of Boys, and Girls after the Experiment. The Mean values also show that the Experimental Group of Boys, and Girls excelled in the scores of Achievement in Geography compared to the Control Groups.

Thus, it can be concluded that Instructional Strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram have significantly enhanced the Achievement in Geography of Secondary School Students for the Sub sample of Boys, and Girls when compared with the Conventional Method of Teaching.

Comparison of Gain Scores of Experimental and Control Groups on Achievement in Geography for the Relevant Subsample after Experiment

The Gain scores of Achievement in Geography for the Experimental and Control groups for the Sub sample were calculated by taking the difference between Pretest and Posttest scores. The Mean, Standard deviation and t-values for the Gain scores were determined and are given in Table 23

Table 23

Comparison of Gain Scores of Experimental and Control Groups on Achievement in Geography for the Relevant Subsample based on Boys, and Girls

Subsample	Classification	Groups	N	M	SD	t- value
Gender	Boys	Experimental	30	9	2.9	7.27**
		Control	26	3.69	2.56	
	Girls	Experimental	25	9.84	3.2	9.99**
		Control	29	3	1.31	

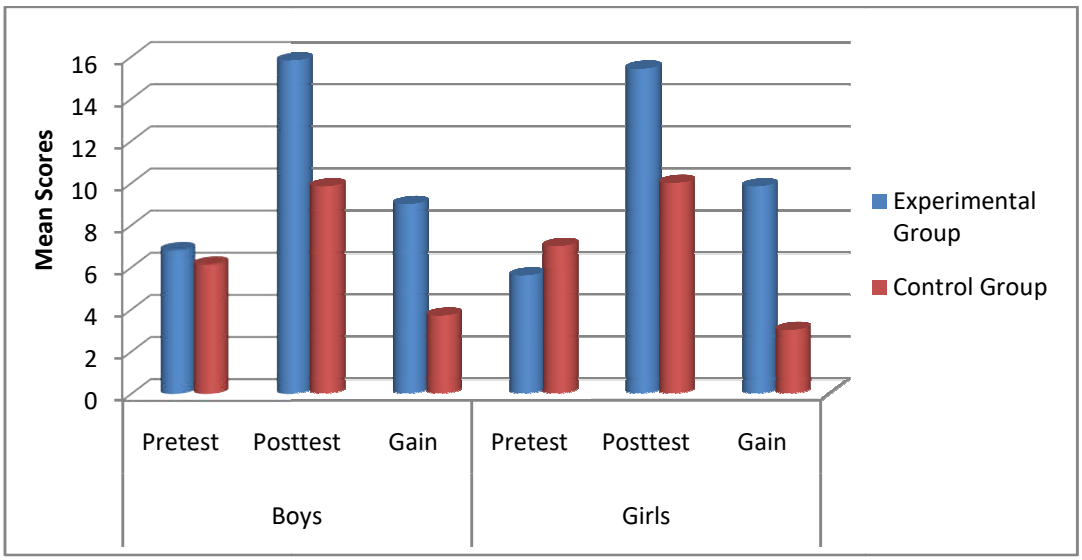
** $p < .01$

From Table 23, it is clear that the t-values obtained are significant at .01 level of significance for the Subsample of Boys, and Girls. It implies that there exists significant difference between the Gain scores of the Experimental and Control Groups for the Sub sample based on Boys, and Girls.

Hence, it can be concluded that Instructional Strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram are effective in enhancing the Achievement in Geography of Secondary School Students for the Sub sample of Boys, and Girls. The results corresponding to Pretest, Posttest and Gain scores are graphically represented as shown in Figure 19.

Figure 19

Mean Pretest, Posttest and Gain Scores on Achievement in Geography for the Subsample based on Boys, and Girls



The graphical representation shows that there is not much difference between the Experimental and Control groups in their Pretest scores on Achievement in Geography. However, it is evident that there is a significant difference between the two groups in their Posttest and Gain scores on Achievement in Geography. Therefore, it was concluded that Instructional Strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram are

effective in enhancing the Achievement in Geography of Secondary School Students considering the Sub sample based on Boys, and Girls.

The analysis of Posttest sores and Gain scores of the Experimental and Control groups revealed that the Posttest and Gain scores of Boys and Girls differ significantly on Achievement in Geography after the treatment. However, the two groups were non equivalent intact class room groups. So it cannot be concluded that the difference in mean Posttest and Gain scores of the Experimental and Control groups is solely due to the treatment. Therefore, it becomes necessary to analyze the data using the statistical technique ANCOVA by which the difference in the initial status can be statistically removed.

Comparison of the Scores on Achievement in Geography of the Experimental and Control Groups for the Subsample based on Boys, and Girls using Analysis of Covariance

The scores on Achievement in Geography of the Experimental and Control groups of Boys and Girls were subjected to ANCOVA to find out the effectiveness of Instructional strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram over Existing Method. For this, the total sum of squares, mean square variances and F-ratios of pre and posttest scores of the Experimental and Control groups were found out. The Fx and Fy values obtained are tested for significance.

The table values for df (1, 54) are 4.08 at .05 level and 7.31 at .01 level. For Boys, the Fx value obtained is 0.49, which is not significant at .05 level, showing that initially the two groups were not significantly different. The Fy value obtained is 25.93, which is significant at .01 level. The table values for df (1, 52) are 4.08 at .05 level and 7.31 at .01 level. For Girls, the Fx value obtained is 2.33, which is not significant at .05 level, indicating that initially the two groups were not significantly

different. The Fy value obtained is 17.57, which is found to be significant at .01 level.

So it can be concluded that there is a significant difference between the groups after treatment. Therefore, the Adjusted sum of squares and the Adjusted mean square variances for the Posttest were computed, and the F ratio was calculated. The summary of Analysis of Covariance for the Posttest scores on Achievement in Geography for the subsample based on boys and girls are given in Table 24.

Table 24

Summary of Analysis of Covariance for the Pretest and Posttest Scores on Achievement in Geography for the Relevant Subsamples

Sub-sample	Classification	Source of Variation	df	SS_x	SS_y	SS_{yx}	MS_{yx}	SD_{yx}	F_{yx}
Gender	Boys	Among Groups	1	6.431	499.288	394.478	394.478	2.735	52.75**
		Within Groups	55	705.551	1039.551	411.296	7.478		
	Girls	Among Groups	1	23.315	397.322	663.193	663.193	2.231	133.19**
		Within Groups	53	588	1176.16	263.89	4.97		

** $p < .01$

The Table values for df (1, 55) are 4.08 at .05 level and 7.31 at .01 level. The Table values for df (1, 53) are 4.08 at .05 level and 7.31 at .01 level. The calculated Fyx value for Boys are significant (Fyx = 52.75) at .01 level. The computed value of Fyx for Girls are also significant (Fyx = 133.19) at .01 level of significance.

These values show that there is a significant difference between the Means of final scores after they have been adjusted for differences in initial scores for the Subsample based on Boys, and Girls. Further analysis was done to find out which treatment is better. The significant F ratio necessitates testing the difference separately by the test of significance of difference between Means.

Comparison of the Scores on Achievement in Geography of the Experimental and Control Groups using Adjusted Means

The Adjusted means of Posttest scores on Achievement in Geography for the Experimental and Control groups were calculated. The results are shown in Table 25.

Table 25

Data of Adjusted Means of Posttest Scores on Achievement in Geography of the Experimental and Control groups for the Subsample based on Boys, and Girls

Subsample	Classification	Groups	N	Mx	My	Myx (adjusted)	t- value
Gender	Boys	Experimental	30	6.833	15.833	15.512	7.29**
		Control	26	6.154	9.85	10.17	
	Girls	Experimental	25	5.6	15.44	16.312	11.79**
		Control	29	7	10	9.13	

** $p < .01$

The Adjusted means of Posttest scores were tested for significance, and the *t* values obtained for Boys, and Girls were found to be significant at .01 level. The results showed that the two groups differ significantly on their Achievement in Geography after the Experiment. Therefore, it was concluded that the Instructional strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram are effective in enhancing the Achievement in Geography compared to the Conventional method of teaching for the Sub sample based on Boys, and Girls.

Hence from Tables 14, 16, 17, 18, 19, 20, 22, 23, 24 and 25, and also from Figures 18 and 19, it is clear that experimental group, taught through Instructional Strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn

Diagram and Fishbone Diagram excelled in Achievement in Geography for the Total Sample and Sub sample of Boys, and Girls over the Conventional Method of Teaching. Therefore, it can be concluded that for the Achievement in Geography the Instructional Strategy based on selected Graphic Organizer is better than the Conventional Method of Teaching for the Total Sample as well as the Sub sample of Boys, and Girls.

Effectiveness of Instructional Strategies based on Selected Graphic Organizers Compared to Conventional Method of Teaching on Retention in Geography for the Total Sample

A Delayed test was conducted for both the experimental and control groups after three weeks of the Posttest. The scores obtained were collected, and appropriate statistical techniques were used to find the effectiveness of Instructional Strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram on Retention in Geography for the Total Sample. Statistical techniques used to find out the effectiveness of Instructional Strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram on Retention in Geography for the Total Sample are discussed under the following headings.

Preliminary Analysis

Nature of Distribution of Delayed test scores for the Total Sample in the Experimental and Control Groups

The descriptive statistics for the delayed test scores of Retention in Geography of Experimental and Control groups were summarized in the table 26 as given below.

Table 26

Descriptive Statistics of Delayed test scores of Experimental and Control Groups on Geography for the Total Sample

Groups	Test	Mean	Median	SD	Skewness	Kurtosis
Experimental	Delayed Test	15.56	15	5.1	0.391	-1.182
Control	Delayed Test	8.14	9	3.6	0.347	-0.704

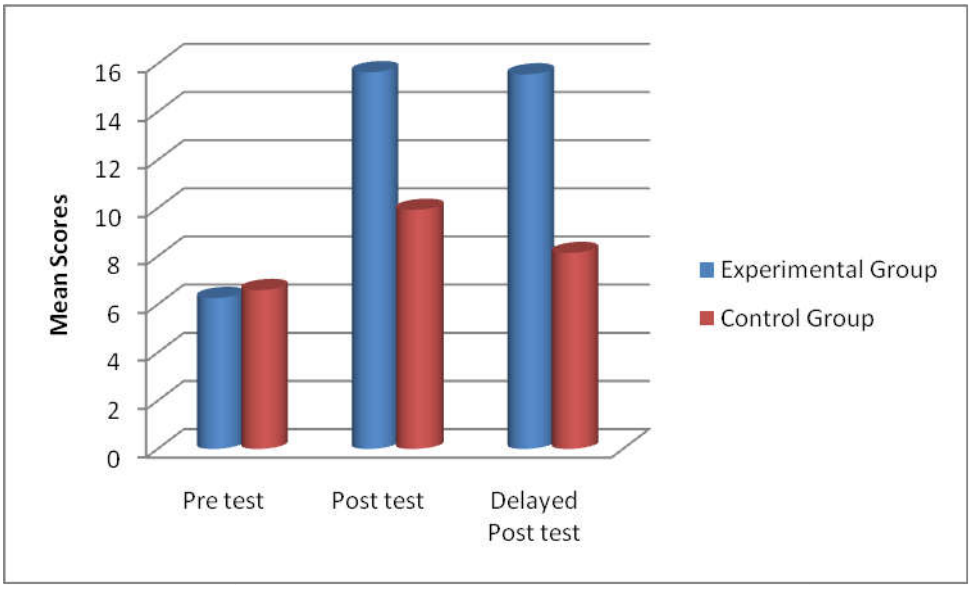
Table 26 shows that the mean and median values of Delayed test scores of the Experimental group are almost same. The Standard Deviation values of the scores on Retention in Geography for the Experimental group also shows that the values are not much dispersed from the central value. The Standard Deviation values also shows that the sample is almost homogeneous with regard to Delayed test scores on Retention in Geography. The Delayed test scores on Retention in Geography of the Experimental group are positively skewed, indicating that scores are massed at the low end of the scale. This means that the number of students who got high scores is comparatively less than the number of students who got low scores. The Kurtosis values of the Delayed test scores on Retention in Geography of the Experimental group are less than 0.263, hence the distributions are leptokurtic.

Table 28 also shows that the mean and median values of Delayed test scores of the Control group are almost the same. The Standard Deviation values of the scores on Retention in Geography for the Control group also show that the values are not much dispersed from the central value. The Standard Deviation values also show that the sample is almost homogeneous with regard to Delayed test scores on Retention in Geography. The Delayed test scores on Retention in Geography of the Control group are positively skewed. This indicating that scores are massed at the low end of the scale. This means that the number of students who got high scores is comparatively less than the number of students who got low scores. The Kurtosis values of the Delayed test scores on Retention in Geography of the Control group are less than 0.263. Hence the distributions are leptokurtic.

The graphical representation of the Mean scores on Achievement and Retention in Geography of the Pretest, Posttest and Delayed test scores of the Experimental and Control Groups for the Total Sample is given in Figure 20.

Figure 20

Mean Scores on Pretest, Posttest and Delayed test of the Experimental and Control Groups on Geography for the Total Sample



The graph gives an idea that the Experimental group perform better than the Control Group on Achievement and Retention in Geography for the Total Sample on Pretest, Posttest and Delayed tests.

Major Analysis

Comparison of Delayed test Scores of Retention in Geography of Students in the Experimental and Control Groups for the Total Sample

The Delayed test scores of Retention in Geography of the Experimental and Control groups for the Total Sample were calculated by taking the difference between Posttest scores and Delayed test scores. The Mean, Standard deviation and t-value for the Delayed test scores were determined and are given in Table 27.

Table 27

Comparison of Delayed Test Scores on Retention in Geography of Experimental and Control Groups for the Total Sample

Groups	N	Mean	Standard Deviation	t- value
Experimental	55	15.56	5.1	8.83**
Control	55	8.14	3.6	

** $p < .01$

From Table 27, it is clear that the t-value obtained is significant at .01 level. This means that the Experimental and Control groups differ significantly in their Delayed scores on Retention in Geography. The Mean values also shows that the Experimental Group was excelled in the Scores of Retention in Geography compared to the Control Group. Thus, it can be concluded that Instructional Strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram has significantly enhanced the Retention in Geography of Secondary School Students for the Total sample when compared with the Conventional Method of Teaching.

Effectiveness of Instructional Strategies based on Selected Graphic Organizers Compared to Conventional Method of Teaching on Retention in Geography for the Sub sample Boys, and Girls

A delayed test was conducted for both the experimental and control groups after three weeks of the Posttest. The scores obtained were collected, and appropriate statistical techniques were used to find the effectiveness of Instructional Strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram on Retention in Geography for the Sub sample based on Boys, and Girls.

Preliminary Analysis

Nature of Distribution of Delayed Test Scores for the Subsample Boys, and Girls in the Experimental and Control Groups

The descriptive statistics for the delayed test scores of Retention in Geography of Experimental and Control groups for the Sub sample of Boys, and Girls were summarized in Table 28 as given below.

Table 28

Descriptive Statistics of Delayed Test Scores of Experimental and Control Groups on Geography for the Subsample Boys, and Girls

Gender	Group	Tests	Mean	Median	SD	Skewness	Kurtosis
Boys	Experimental	Delayed test	15.8	15.5	4.72	0.092	-1.232
	Control	Delayed test	7.76	8	3.25	0.027	-1.289
Girls	Experimental	Delayed test	15.28	13	5.5	0.680	-1.091
	Control	Delayed test	8.48	9	3.8	0.452	-0.682

From Table 28, it is clear that the mean and median values of Delayed test scores of the Experimental group for the Sub sample of Boys are almost the same. The Standard Deviation values of the Scores on Retention in Geography for the Experimental group Sub sample of Boys also show that the values are not much dispersed from the central value. Standard Deviation values also shows that the sample is almost homogeneous with regard to Delayed test scores in Geography. The Delayed test scores in Geography of the Experimental group Sub sample of Boys are positively skewed. This indicating that scores are massed at the low end of the scale. This means that the number of students who got high scores is comparatively less than the number of students who got low scores. The Kurtosis values of the Delayed test scores in Geography of the Experimental group Sub sample of Boys are less than 0.263, hence the distributions are leptokurtic.

Table 28 also shows that the mean and median values of Delayed test scores of the Control group for the Sub sample of Boys are almost same. The Standard Deviation values of the Scores on Retention in Geography for the Control group Sub sample of Boys also show that the values are not much dispersed from the central value. Standard Deviation values also show that the sample is almost homogeneous with regard to Delayed test scores on Retention in Geography. The Delayed test scores on Retention in Geography of the Control group Sub sample of Boys are positively skewed. This indicating that scores are massed at the low end of the scale. This means that the number of students who got high scores is comparatively less than the number of students who got low scores. The Kurtosis values of the Delayed test scores in Geography of the Control group Sub sample of Boys are less than 0.263. Hence the distributions are leptokurtic.

From Table 28, it is also evident that the mean and median values of Delayed test scores of the Experimental group for the Sub sample of Girls are almost the same. The Standard Deviation values of the Scores on Retention in Geography for the Experimental group Sub sample of Girls also show that the values are not much dispersed from the central value. Standard Deviation values also show that the sample is almost homogeneous with regard to Delayed test scores in Geography. The Delayed test scores in Geography of the Experimental group Sub sample of Girls are positively skewed. This indicates that scores are massed at the low end of the scale. This means that the number of students who got high scores is comparatively less than the number of students who got low scores. The Kurtosis values of the Delayed test scores in Geography of the Experimental group Sub sample of Girls are less than 0.263. Hence the distributions are leptokurtic.

Table 28 also shows that the mean and median values of Delayed test scores of the Control group for the Sub sample of Girls are almost the same. The Standard

Deviation values of the Scores on Retention in Geography for the Control group Sub sample of Girls also show that the values are not much dispersed from the central value. Standard Deviation values also shows that the sample is almost homogeneous with regard to Delayed test scores on Retention in Geography. The Delayed test scores on Retention in Geography of the Control group Sub sample of Girls are positively skewed, indicating that scores are massed at the low end of the scale. This means that the number of students who got high scores is comparatively less than the number of students who got low scores. The Kurtosis values of the Delayed test scores in Geography of the Control group Sub sample of Girls are less than 0.263. Hence the distributions are leptokurtic.

The graphical representation of the Mean scores on Retention in Geography of the Pretest, Posttest and Delayed test scores of the Experimental and Control Groups for the Sub sample of Boys, and Girls is given in the Figures 21 and 22.

Figure 21

Mean Pretest, Posttest and Delayed test scores of the Experimental Group and Control Group on Achievement in Geography for the Sub sample Boys

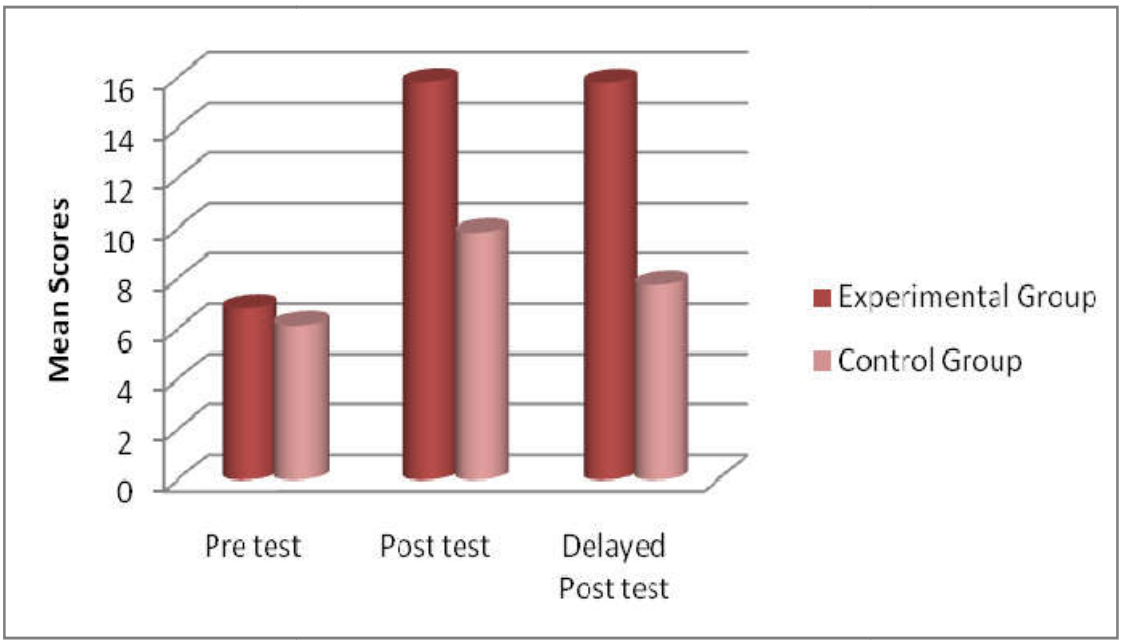
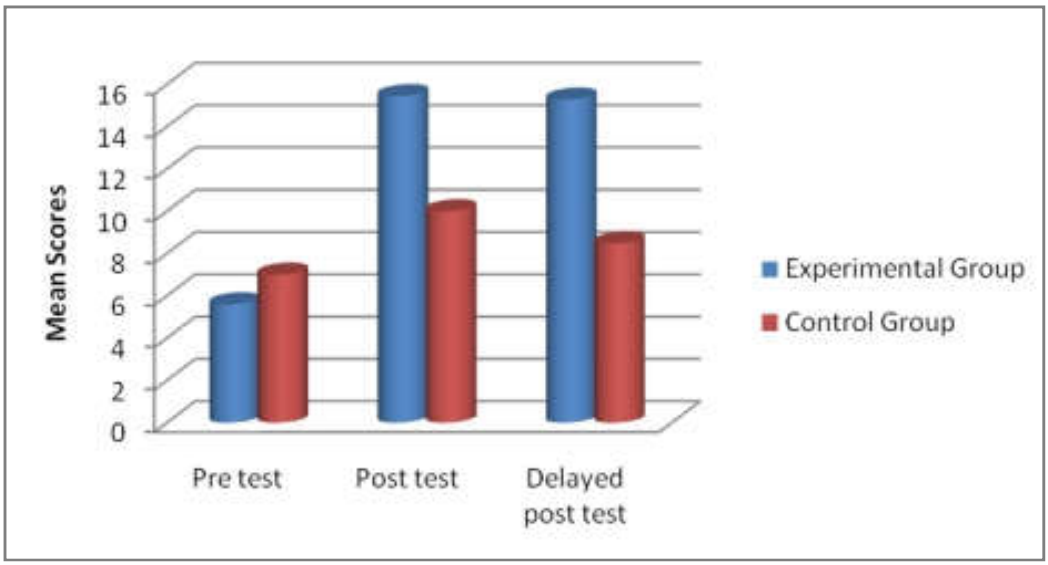


Figure 22

Mean Pretest, Posttest and Delayed Test Scores of the Experimental and Control Group on Achievement in Geography for the Subsample Girls



The graphs gives an idea that the Experimental group perform better than the Control Group on Retention in Geography for the Sub sample based on Boys, and Girls on Pretest, Posttest and Delayed test.

Major Analysis

Comparison of Delayed Test Scores of Retention in Geography of Students in the Experimental and Control Groups for the Subsample based on Boys, and Girls

A Delayed test was conducted for both the experimental and control groups after three weeks of the Posttest. The scores obtained were calculated for the Subsample based on Boys, and Girls, and the Mean and Standard deviations were calculated. The Delayed test scores of both groups were compared using Mean and Standard Deviation values. Then, the test of significance of difference between the Means of Experimental and Control groups was found out. The results obtained are given in Table 29.

Table 29

Comparison of Delayed Test Scores of Experimental and Control Groups on Retention in Geography for the Relevant Subsample based on Boys, and Girls

Subsample	Classification	Groups	N	M	SD	t- value
Gender	Boys	Experimental	30	15.8	4.72	7.51**
		Control	26	7.76	3.25	
	Girls	Experimental	25	15.28	5.5	5.21**
		Control	29	8.48	3.8	

** $p < .01$

From the table 29, it is clear that the t-values obtained for Boys, and Girls are significant at .01 level. This means that, there is significant difference between the Delayed test scores of Experimental and Control groups on Retention in Geography for the Sub sample based on Boys, and Girls. The Mean values also indicate that the Experimental Groups of Boys, and Girls performed better in the scores of Retention in Geography compared to the Control Groups.

Therefore, based on the data from Tables 26, 27, 28, and 29 and also from Figures 20, 21, and 22 it is clear that the Experimental group taught with Instructional Strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram has significant Retention in Geography compared to the control group taught with Conventional Method of Teaching for the Total Sample and Sub sample based on Boys, and Girls. Thus, it can be concluded that Instructional Strategies based on any selected Graphic Organizers can enhance the Retention capacity of Secondary School Students in Geography for the Total sample as well as the Sub sample of Boys and Girls.

Effectiveness of Instructional Strategies based on Selected Graphic Organizers Compared to Conventional Method of Teaching on Problem Solving Ability in Geography for the Total Sample

A Problem Solving Ability tes**t** was prepared by the investigator for assessing the Problem solving ability of students in Geography at secondary level.

The test was prepared, standardized and validated by the investigator before being administered to the sample. The same test was given as pretest and posttest to the Experimental and Control groups. The data obtained from the Problem Solving Ability test for the Total Sample of Experimental groups (treated with Instructional Strategies Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram) and Control Groups (treated with Conventional Method of Teaching) were subjected to analysis. The results of the analysis are discussed under the following headings.

Preliminary Analysis

Nature of Distribution of Pretest and Posttest scores of Problem Solving Ability in Geography for the Total Sample in the Experimental and Control Groups

In Table 30, the Descriptive statistics like Mean, Median, Standard Deviation, Skewness and Kurtosis were computed for the Pretest and Posttest scores of Problem Solving Ability in Geography for the Total Sample in both Experimental and Control Groups.

Table 30

Descriptive Statistics of Pretest and Posttest Scores of Experimental and Control Groups on Problem Solving Ability in Geography for the Total Sample

Groups	Test	Mean	Median	SD	Skewness	Kurtosis
Experimental	Pretest	6.32	7	3.1	0.075	-1.181
	Posttest	18.94	19	5.2	0.299	-0.397
Control	Pretest	6.03	6	3.3	0.223	-0.921
	Posttest	9.42	10	3.6	0.239	-0.127

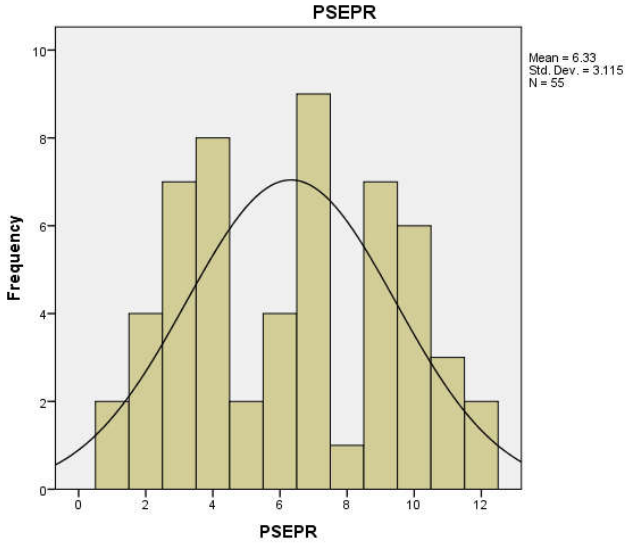
From Table 30, it is clear that the Arithmetic Mean and Median values of Pretest and posttest scores for both Experimental and Control groups are almost the same. The Standard Deviation values of the scores on Problem Solving Ability in

Geography for both groups show that the values are not widely dispersed from the central value. The Standard Deviation values also shows that the samples are relatively homogeneous with regard to Pretest and Posttest scores on Problem Solving Ability in Geography. Both the Pretest and Posttest scores of both Experimental and Control groups exhibits positive skewness. This suggested that the scores are concentrated towards the lower end of the scale, this means that there are fewer students with high scores compared to those with lower scores.

Furthermore, the Kurtosis value of the Pretest and Posttest scores on Problem Solving Ability in Geography for both Experimental and Control groups are less than 0.263, hence the distributions are leptokurtic. This means that the distributions have relatively higher peaks and are more clustered around the mean, showing relatively narrower spread of data compared to a normal distribution.

Figure 23

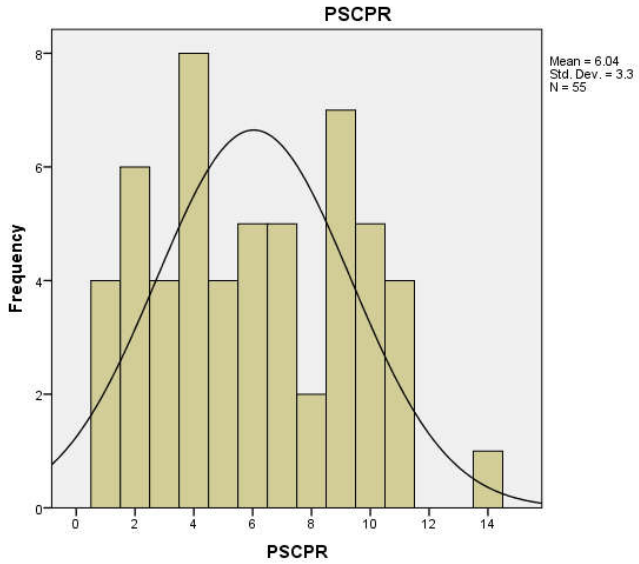
Histogram for the Pretest Scores of Experimental Group on Problem Solving Ability in Geography for the Total Sample



From the figure 23, it is clear that more scores of Experimental group on Pretest on Problem Solving Ability in Geography are on the lower end of the scale and the distribution is leptokurtic in nature.

Figure 24

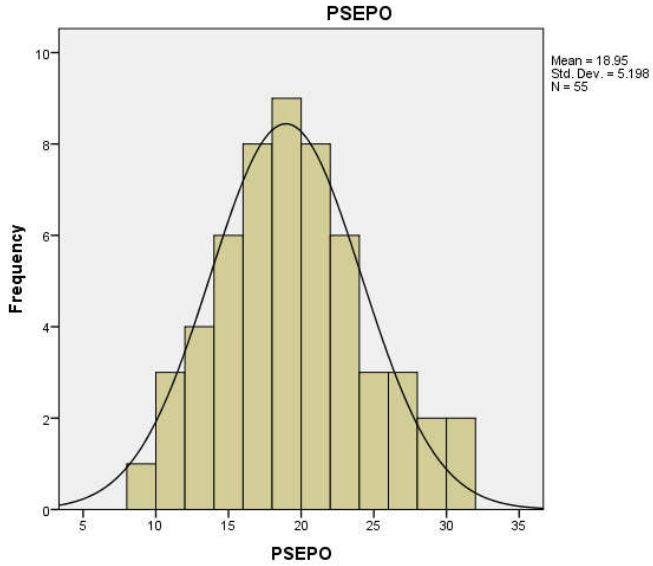
Histogram for the Pretest Scores of Control Group on Problem Solving Ability in Geography for the Total Sample



From the figure 24, it is clear that more scores of Control group on Pretest on Problem Solving Ability in Geography are on the lower end of the scale and the distribution is leptokurtic in nature.

Figure 25

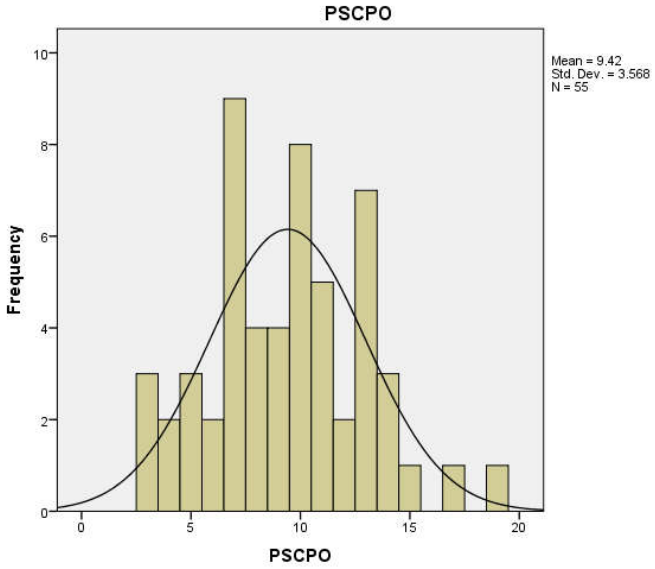
Histogram for the Posttest Scores of Experimental Group on Problem Solving Ability in Geography for the Total Sample



From the figure 25, it is clear that more scores of Experimental group on Posttest on Problem Solving Ability in Geography are on the lower end of the scale and the distribution is leptokurtic in nature.

Figure 26

Histogram for the Posttest Scores of Control Group on Problem Solving Ability in Geography for the Total Sample



From the figure 26, it is clear that more scores of Control group on Posttest on Problem Solving Ability in Geography are on the lower end of the scale and the distribution is leptokurtic in nature.

Major Analysis

Comparison of Problem Solving Ability in Geography of Students in the Experimental and Control Groups for the Total Sample before Experiment

The Experimental and Control groups were subjected to a Pretest on Problem Solving Ability in Geography before conducting the experiment. The Pretest scores on Problem Solving Ability in Geography were compared by calculating the mean and standard deviation of both the groups. The scores of the two groups were then subjected to the test of significance of difference between means and the values are presented in Table 31.

Table 31

Comparison of Pretest Scores of Experimental and Control Groups on Problem Solving Ability in Geography for the Total Sample

Groups	N	Mean	Standard Deviation	t- value
Experimental	55	6.32	3.1	0.065
Control	55	6.03	3.3	

The t-value obtained is not significant even at .05 level. This means that there is no significant difference between the Pretest scores of Experimental and Control Groups on Problem Solving Ability in Geography before the experiment.

Comparison of Problem Solving Ability in Geography of Students in the Experimental and Control Groups for the Total Sample after Experiment

After the experiment, the Problem Solving Ability test was given as Posttest to both the Experimental and Control Groups. From the scores obtained, the Mean and Standard Deviation were calculated. Then the significance of difference between the mean scores was tested. The result obtained is given in Table 32.

Table 32

Comparison of Posttest Scores of Experimental and Control Groups on Problem Solving Ability in Geography for the Total Sample

Groups	N	Mean	Standard Deviation	t- value
Experimental	55	18.94	5.2	11.16**
Control	55	9.42	3.6	

** $p < .01$

From Table 32, it is clear that the t-value obtained is significant at .01 level. This means that there is a significant difference between the Posttest scores on Problem Solving Ability in Geography of the Experimental and Control Groups. It means that the two groups differ significantly after the experiment. Since the Mean

value of the Experimental Group is found to be higher than that of the Control Group, it is inferred that the Experimental Group excelled in Problem Solving Ability in Geography compared to the Control Group.

Therefore it can be concluded that teaching through Instructional Strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram has enhanced Problem Solving Ability in Geography of Secondary School Students when compared to Conventional Method of Teaching.

Comparison of Gain Scores of Problem Solving Ability in Geography of Students in the Experimental and Control Groups for the Total Sample after Experiment

The Gain scores of Problem Solving Ability in Geography of Experimental and Control groups for the Total Sample were calculated by taking the difference between Pretest and Posttest scores. The Mean, Standard deviation and t-value for the Gain scores were determined and are presented in Table 33.

Table 33

Comparison of Gain Scores on Problem Solving Ability in Geography of Experimental and Control Groups for the Total Sample

Groups	N	Mean	Standard Deviation	t- value
Experimental	55	12.62	5.3	12.38**
Control	55	3.38	1.6	

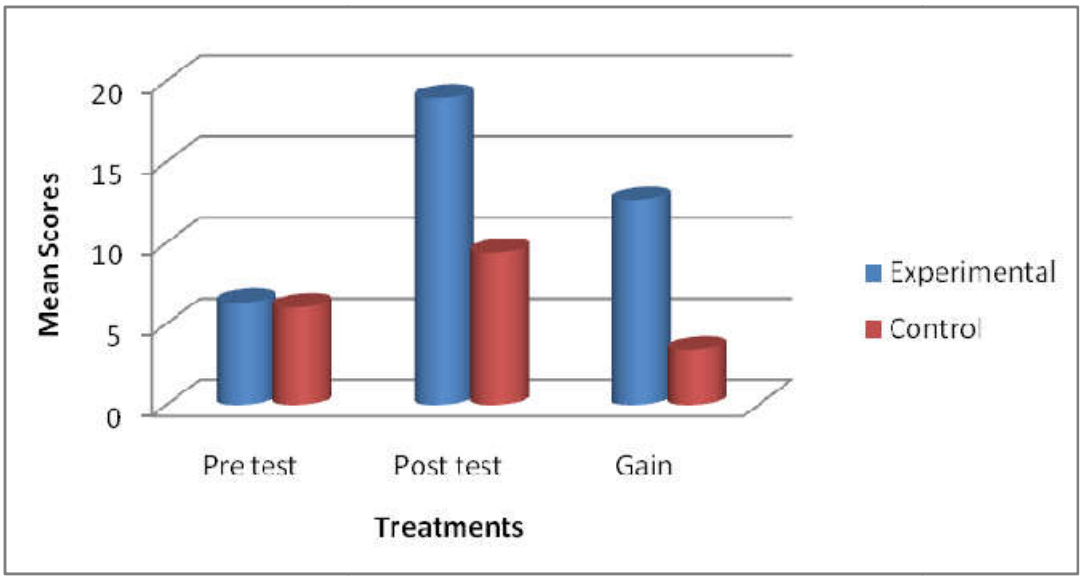
** $p < .01$

From Table 33, it is clear that the t-value obtained is significant at .01 level. This means that the Experimental and Control groups differ significantly in their scores on Problem Solving Ability in Geography after the experiment.

The graphical representation of the Mean scores on Problem Solving Ability in Geography, including the Pretest, Posttest and Gain scores of the Experimental and Control Groups for the Total Sample is given in Figure 27.

Figure 27

Mean Pretest, Posttest and Gain scores of Experimental and Control groups on Problem Solving Ability in Geography for the Total Sample



The graph gives an idea that the Experimental group performed better than the Control Group on Problem Solving Ability in Geography for the Total Sample in all tests.

Genuineness of Difference on Problem solving ability in Geography of the Experimental and Control Groups

The analysis of the Posttest and Gain scores of students in the Experimental and Control groups reveals that although there is a significant difference in the Problem solving ability in Geography between the two groups. The study used non-equivalent intact class room groups. Therefore it cannot be stated that the higher Posttest scores of students in the Experimental group are solely attributed to the implementation of the Experimental treatment. Various intervening variables might have influenced the results.

To address this issue, it is necessary to analyze the scores using the statistical technique ANCOVA, which allows for the statistical removal of initial differences

between groups. This ensures that the two groups can be compared as if their initial status has been equated. The effects of Pretest and other variables are partialled out and the resulting adjusted means of Posttest scores are compared. The use of ANCOVA is justified in this study as it employs a Pretest - Posttest non-equivalent group design.

Comparison of Scores on Problem solving ability in Geography of Experimental and Control Groups using Analysis of Covariance

The scores on Problem solving ability in Geography of the Experimental and Control groups were subjected to ANCOVA to find out the effectiveness of Instructional strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram over Existing Method. For this purpose, the Total sum of squares, Mean square variances and F-ratios of pre and post test scores of the Experimental and Control groups were found out. The Fx and Fy values obtained were then tested for significance. The table values for df (1,108) are 4.00 at.05 level and 7.08 at .01 level. The obtained Fx value is 0.22 which is not significant at .01 level showing that initially the groups were not different. On the other hand, the Fy value obtained is 125.61, which is significant at .01 level.

The adjusted sum of squares and the adjusted mean square variances for the Posttest were computed, and the F ratio was calculated. The summary of the Analysis of Covariance for the Posttest scores on Problem solving ability in Geography for the total sample is given in Table 34.

Table 34

Summary of Analysis of Covariance of the Pretest and Posttest Scores on Problem Solving Ability in Geography of the Experimental and Control Groups for the Total Sample

Source of Variation	df	SS_x	SS_y	SS_{yx}	MS_{yx}	SD_{yx}	F_{yx}
Among Groups	1	2.327	2496.15	2382.681	2382.681	3.795	165.37**
Within Groups	109	1112.04	2146.22	1570.488	14.41		

** p < .01 level

The Table value for df (1,109) at .05 level is 4.00 and 7.08 at .01 level. The obtained Fyx value (Fyx = 165.37) is found to be significant at .01 level. The result shows that there is a significant difference between the means of the final scores after they have been adjusted for differences in initial scores. The significant F ratio necessitates testing the difference separately using the test of significance of the difference between means.

Comparison of Scores on Problem Solving Ability in Geography of Experimental and Control Groups using Adjusted Means

The Adjusted means of the Posttest scores on Problem solving ability in Geography were calculated. The results are shown in the Table 35.

Table 35

Data of Adjusted Means of Posttest Scores on Problem Solving Ability in Geography of the Experimental and Control Groups for the Total Sample

Groups	N	Mx	My	Myx (adjusted)	t- value
Experimental	55	6.327	18.945	18.841	12.87**
Control	55	6.036	9.418	9.523	

** p < .01 level

The Adjusted means for Posttest scores were tested for significance and the *t* value obtained is 12.87. The Table value is 1.96 at .05 level and 2.53 at .01

level. Therefore, the obtained value is significant at .01 level. The result shows that the two groups differ significantly. Consequently, it can be concluded that Instructional strategies Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram is effective in enhancing Problem solving ability in Geography compared to the Conventional method of teaching for the total sample.

Effectiveness of Instructional Strategies based on Selected Graphic Organizers Compared to Conventional Method of Teaching on Problem Solving Ability in Geography for the Subsample based on Boys, and Girls

The Pretest, Posttest and Gain scores on Problem Solving Ability in Geography were obtained for the Sub samples of Boys, and Girls. The comparison of the Sub sample results was discussed under the following headings.

Preliminary Analysis

Nature of Distribution of Pretest and Posttest scores of Problem Solving Ability in Geography for the Subsample based on Boys, and Girls in the Experimental and Control Groups

The scores obtained on the Pretest and Posttest were condensed into frequency tables. To gain a general understanding of the groups, Descriptive statistics like Mean, Median, Standard Deviation, Skewness and Kurtosis were calculated. The results are summarized in Table 36.

Table 36

Descriptive Statistics of Pretest and Posttest Scores of Experimental and Control Groups on Problem Solving Ability in Geography for the Subsample based on Boys, and Girls

Subsample	Classification	Group	Test	Mean	Median	S.D	Skewness	Kurtosis
Boys, and Girls	Boys	Experimental	Pretest	6.17	6	3.1	0.217	-1.217
			Posttest	20	19.5	5.2	0.149	-0.595
		Control	Pretest	6.7	6.5	3.5	0.169	-0.984
			Posttest	10.5	10	3.62	0.330	-0.111
	Girls	Experimental	Pretest	6.52	7	3.2	-0.090	-1.167
			Posttest	17.68	17	5.02	0.524	0.377
		Control	Pretest	5.45	5	3.1	0.146	-1.161
			Posttest	8.45	8	3.3	0.008	-0.636

From the Table 36, it is clear that Arithmetic Mean and Median for the Pretest and Posttest scores of both the Control group and Experimental group for the relevant Sub samples are almost the same. The Standard Deviation of the scores on Problem Solving Ability in Geography for the groups indicates that the scores are not widely dispersed from the central value. The Standard deviation values also suggest that the samples are almost homogeneous concerning the Pretest and Posttest scores on Problem Solving Ability in Geography for the relevant Sub samples.

The distribution is positively skewed for the Pretest scores of the Experimental and Control groups in all cases, except for the Pretest scores of Experimental Girls. This implies that the scores are concentrated at the lower end of the distribution, indicating that there are fewer students with high scores compared to those with low scores. However, for the Pretest scores of Experimental Girls, the distribution is negatively skewed. This means that the scores are massed at the upper end of the distribution meaning there are more students with high scores than with low scores.

The kurtosis value is lower than 0.263 in most cases except for the Posttest scores of Experimental Girls and indicating that the distributions are leptokurtic. However, the kurtosis values are found to be higher than 0.263 in the case of Posttest scores of Experimental Girls indicating that the distribution is Platykurtic.

Major Analysis

Comparison of Scores of Experimental and Control Groups on Problem Solving Ability in Geography for the Relevant Subsample before Experiment

Before implementing the treatment, the Experimental and Control Groups underwent a Pretest. The Pretest scores of both the groups were compared by computing the Mean and Standard deviation. The scores of the two groups were then subjected to test of significance to determine the difference between the Means and the values are presented in Table 37.

Table 37

Comparison of Pretest scores of Experimental and Control Groups on Problem Solving Ability in Geography for the Relevant Subsample based on Boys, and Girls

Subsample	Classification	Groups	N	M	SD	t- value
Gender	Boys	Experimental	30	6.17	3.1	0.07
		Control	26	6.7	3.5	
	Girls	Experimental	25	6.52	3.2	1.24
		Control	29	5.45	3.1	

Table 37 shows that all the obtained t-values are not significant even at .05 level. This implies that there is no significant difference between the Pretest scores of the Experimental and Control Groups on Problem Solving Ability in Geography for the Sub samples of Boys, and Girls before the Experiment.

Comparison of Scores of Experimental and Control Groups on Problem Solving Ability in Geography for the Relevant Subsample after Experiment

After the experimentation, the Problem Solving Ability test in Geography was conducted as Posttest. The scores obtained were found out and the Mean and Standard deviations of various Sub samples were determined. The Posttest scores of both groups were compared using the Mean and Standard Deviation values. Then, the test of significance of the difference between the Means of the Experimental and Control groups was conducted, and the results obtained are presented in Table 38.

Table 38

Comparison of Posttest Scores of Experimental and Control Groups on Problem Solving Ability in Geography for the Relevant Subsample based on Boys, and Girls

Subsample	Classification	Groups	N	M	SD	t- value
Gender	Boys	Experimental	30	20	5.2	8.01**
		Control	26	10.5	3.62	
	Girls	Experimental	25	17.68	5.02	7.85**
		Control	29	8.45	3.3	

** $p < .01$

From Table 38, it is clear that the t-values obtained are significant for the Sub samples of Boys, and Girls at .01 level. This means a significant difference between the Posttest scores of the Experimental and Control groups on Problem Solving Ability in Geography for the Sub sample of Boys, and Girls after the Experiment. The Mean values also show that the Experimental Group of Boys and Girls outperformed the control group in the Scores of Problem Solving Ability in Geography.

Thus, it can be concluded that Instructional Strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram have significantly enhanced the Problem Solving Ability in Geography of Secondary

School Students for the Sub sample of Boys, and Girls when compared with the Conventional Method of Teaching.

Comparison of Gain scores of Experimental and Control groups on Problem Solving Ability in Geography for the relevant Sub sample after Experiment

The Gain scores of Problem Solving Ability in Geography for the Experimental and Control Groups in the Sub samples were calculated by taking the difference between the Pretest and Posttest scores of the Problem Solving Ability Test. The Mean, Standard deviation and t- values were calculated for the Gain scores of the Sub samples. The values obtained are presented in Table 39.

Table 39

Comparison of Gain Scores of Experimental and Control Groups on Problem Solving Ability in Geography for the Relevant Subsample based on Boys, and Girls

Subsample	Classification	Groups	N	M	SD	t- value
Gender	Boys	Experimental	30	13.83	5.5	9.57**
		Control	26	3.81	1.5	
	Girls	Experimental	25	11.16	4.7	8.28**
		Control	29	3	1.6	

** $p < .01$

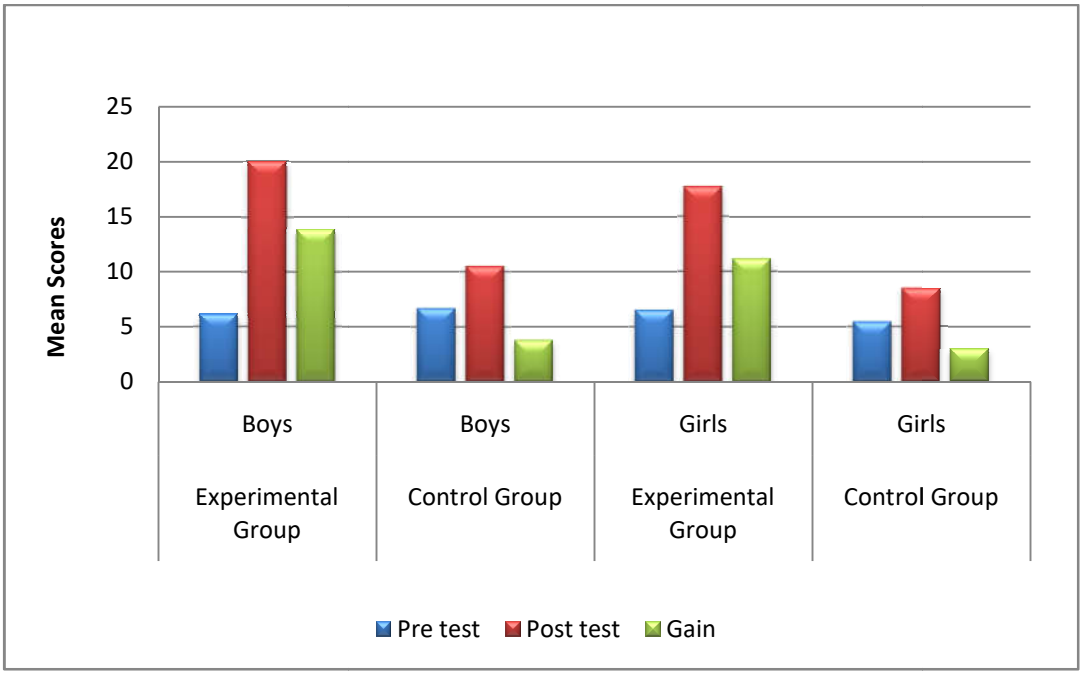
From the Table 39, it is evident that the t-values obtained are significant at .01 level of significance for the Subsamples of Boys, and Girls. This indicates that there exists a significant difference between the Gain scores of the Experimental and Control Groups for the Sub sample based on Boys, and Girls.

Hence it can be concluded that the Instructional Strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram are effective in enhancing the Problem Solving Ability in Geography of Secondary School Students for the Sub sample Boys, and Girls. The results

corresponding to Pretest, Posttest and Gain scores are graphically represented as shown in Figures 28.

Figure 28

Mean Pretest, Posttest and Gain Scores on Problem Solving Ability in Geography of Experimental and Control Group for the Sub sample based on Boys, and Girls



The graphical representation shows that there is not much difference between the Experimental and Control groups in their Pretest scores on Problem Solving Ability in Geography. However, it is evident that there is significant difference between the two groups in their Posttest and Gain scores on Problem Solving Ability in Geography.

The analysis of Posttest sores and Gain scores of the Experimental and Control groups revealed that the Posttest and Gain scores of Boys and Girls differ significantly in Problem solving ability in Geography after the treatment. However, it is important to note that the two groups were non-equivalent intact class room groups. As a result, it cannot be concluded that the difference in mean Posttest and Gain scores of Experimental and Control groups is solely due to the treatment.

Therefore, it becomes necessary to analyze the data using the statistical technique ANCOVA, which can statistically remove the difference in the initial status.

Comparison of the Scores on Problem Solving Ability in Geography of the Experimental and Control Groups for the Subsample based on Boys, and Girls using Analysis of Covariance

The scores on Problem solving ability in Geography of the Experimental and Control groups of Boys, and Girls were subjected to ANCOVA to determine the effectiveness of selected Instructional strategies based on Graphic organizers compared to the Existing Method. The total sum of squares, mean square variances and F-ratios of pretest and posttest scores of the Experimental and Control groups were calculated. The Fx and Fy values obtained were tested for significance.

The table values for df (1, 54) are 4.08 at .05 level and 7.31 at .01 level. For Boys, the Fx value obtained is 0.35 which is not significant at .05 level showing that initially the two groups were not significantly different. The Fy value obtained is 61.24 which is significant at .01 level. The table values for df (1, 52) are 4.08 at .05 level and 7.31 at .01 level. For Girls, the Fx value obtained is 1.61 which is not significant at .05 level which shows that initially the two groups were not significantly different. The Fy value obtained is 65.63 which is found to be significant at .01 level.

Thus, it can be concluded that there is significant difference between the groups after treatment. Therefore, the Adjusted sum of squares and the Adjusted mean square variances for the posttest were computed, and the F ratio was calculated. The summary of Analysis of Covariance for the Post-test scores on Problem solving ability in Geography for the Total sample is given in Table 40.

Table 40

Summary of Analysis of Covariance for the Pretest and Posttest Scores on Problem Solving Ability in Geography for the Subsample based on Boys, and Girls

Sub sample	Classification	Source of Variation	df	SS_x	SS_y	SS_{yx}	MS_{yx}	SD_{yx}	F_{yx}
Gender	Boys	Among Groups	1	3.848	69.554	1340.034	1340.034	3.95	85.59**
		Within Groups	55	589.71	382	861.05	15.66		
	Girls	Among Groups	1	15.421	1144.221	915.787	915.787	3.351	81.54**
		Within Groups	53	499.412	906.612	595.250	11.231		

** $p < .01$

The Table values for df (1, 55) are 4.08 at .05 level and 7.31 at .01 level. The Table values for df (1, 53) are 4.08 at .05 level and 7.31 at .01 level. The calculated Fyx value for Boys thus found to be significant (Fyx = 85.59) at .01 level. The computed value of Fyx for Girls is therefore found to be significant (Fyx = 81.54) at .01 level of significance.

These values demonstrate that there is a significant difference between the Means of the final scores after they have been adjusted for differences in initial scores for the subsample based on Boys, and Girls. Further analysis was conducted to find out which treatment is better. The significant F ratio necessitates testing the difference separately using the test of significance of difference between Means.

Comparison of the Scores on Problem Solving Ability in Geography of the Experimental and Control Groups using Adjusted Means

The Adjusted means of Posttest scores on Problem solving ability in Geography for the Experimental and Control groups were calculated. The results are shown in Table 41.

Table 41

Data of Adjusted Means of Posttest Scores on Problem Solving Ability in Geography of the Experimental and Control Groups for the Subsample based on Boys, and Girls

Subsample	Classification	Groups	n	Mx	My	Myx (adjusted)	t-value
Gender	Boys	Experimental	30	6.167	20	20.170	9.28**
		Control	26	6.692	10.5	10.33	
	Girls	Experimental	25	6.52	17.68	17.26	9.17**
		Control	29	5.45	8.45	8.87	

** - p < .01

The Adjusted means of Posttest scores were tested for significance. The *t* value obtained for Boys, and Girls are found to be significant. So the obtained values for Boys and Girls are significant at .01 level. The results showed that the two groups differ significantly on their Problem solving ability in Geography after the Experiment. Therefore, it was concluded that the Instructional strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram is effective in enhancing the Problem solving ability in Geography compared to Conventional method of teaching for the Sub sample based on Boys, and Girls.

Hence from the tables 30, 32, 33, 34, 35, 36, 37, 38, 39, 40 and 41, as well as from the figures 23, 24, 25, 26, 27 and 28 it is clear that the Experimental group, treated with Instructional Strategies such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram has significantly enhanced the Problem Solving Ability compared to the Control group taught with Conventional Method of Teaching for the Total Sample and Sub sample based on Boys, and Girls. Thus, it can be concluded that for the

problem solving ability in Geography the instructional strategy based on selected Graphic Organizer are better than the Conventional Method of Teaching for the Total Sample as well as the Sub sample of Boys, and Girls in terms of enhancing Problem Solving Ability in Geography.

Chapter 5

SUMMARY, MAJOR FINDINGS, AND CONCLUSION

- Study in Retrospect
  - Restatement of the Problem
  - Variables of the Study
  - Objectives of the Study
  - Hypotheses of the Study
  - Methodology in Brief
- Major Findings
- Tenability of Hypotheses
- Conclusion

This chapter presents the entire study in a nutshell, highlighting the major findings of the study, the tenability of hypotheses, and the conclusion arrived at.

Study in Retrospect

This section looks back at the title, variables, objectives, hypotheses, tools and statistical techniques used in the study.

Restatement of the Problem

The present study was entitled ***"Effectiveness of certain Instructional Strategies based on Graphic Organizers on Achievement, Retention and Problem Solving Ability in Geography among Secondary School Students."***

Variables of the Study

The dependent variables, independent variables, and the Control variables of the present study are detailed below.

Dependent Variables

- Achievement in Geography
- Retention in Geography
- Problem Solving Ability in Geography

Independent Variables

Instructional Strategy based on;

- Conventional Method of Teaching
- Graphic Organizers (Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram)

Control Variable

- Pretest scores in Geography

Objectives of the Study

Main Objective

To find out the effectiveness of Instructional Strategies based on selected Graphic Organizers on Achievement, Retention and Problem Solving Ability in Geography among Secondary School Students.

Specific Objectives

The specific objectives of the study are as follows;

1. To find out whether there exists any significant difference in Achievement in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.
2. To find out whether there exists any significant difference in Achievement in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.
3. To find out whether there exists any significant difference in Retention in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.
4. To find out whether there exists any significant difference in Retention in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.
5. To find out whether there exists any significant difference in Problem Solving Ability in Geography while using Instructional Strategies based on

certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.

6. To find out whether there exists any significant difference in Problem Solving Ability in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.

Hypotheses of the Study

1. There exists significant difference in Achievement in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.
2. There exists significant difference in Achievement in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.
3. There exists significant difference in Retention in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.
4. There exists significant difference in Retention in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.
5. There exists significant difference in Problem Solving Ability in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.

6. There exists significant difference in Problem Solving Ability in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.

Methodology in Brief

The present study attempted to investigate the Effectiveness of Instructional Strategies based on selected Graphic Organizers on Achievement, Retention and Problem Solving Ability in Geography among Secondary school students. Hence the study was conducted to compare the effectiveness of two types of instructional strategies: Graphic Organizers and Conventional Method of Teaching in enhancing the Achievement, Retention and Problem Solving Ability in Geography among secondary school students. To achieve the objectives of the investigation, a ***quasi-experimental pretest-posttest non equivalent group design*** was used for the study. The study proceeded in three phases.

Phase 1

Exploration for the identification of the major limitations of the traditional approach to Achievement, Retention and Problem Solving Ability in Geography was conducted, along with a detailed analysis of different strategies. Through this analysis, Graphic Organizers were identified as one of the best strategies to enhance Achievement, Retention and Problem Solving Ability in Geography.

Phase 2

Following the detailed analysis of topics, certain Instructional Strategies based on Graphic Organizers were selected. This phase involved designing Graphic Organizer based lesson transcripts and developing measurement tools for use in the experimental phase.

Phase 3

The effect of the Graphic Organizer was tested using a quasi experimental pretest-posttest non-equivalent group design.

Design of the Experimental Phase of the Study

The symbolic representation of the study is given below

G_1 O_1 X_1 O_2

G_2 O_3 X_2 O_4

O_1 and O_3 – pre tests

O_2 and O_4 – post tests

G_1 – Experimental Group

G_2 – Control Group

O_2-O_1, O_4-O_3 – Gain Scores

X_1 – Application of Experimental Treatment

X_2 – Application of Control Treatment

Sample used in the Experiment

The standardization of the tools developed for the study was conducted with a sample of 100 standard IX students from seven secondary schools. For the experimental phase of the study, a sample of 110 standard IX students from a secondary school was chosen. The sample included two intact class divisions of 110 students with 55 students in the Experimental Group and 55 students in the Control Group, respectively from GVHSS Madappally in Kozhikode district. These students were following Kerala syllabus prescribed by SCERT).

Tools used for the Study

The following tools were used to measure the independent and dependent variables.

i. Achievement test in Geography (Ramakrishnan & Reshma, 2017)

ii. Problem Solving Ability test in Geography (Ramakrishnan & Reshma, 2017)

iii. Lesson transcripts based on Instructional Strategies based on selected Graphic Organizers (Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram)

iv. Lesson transcripts based on Conventional Method of Teaching

Statistical Techniques used in the Study

The following statistical techniques were used for the analysis of data in the present study.

- **Descriptive Analysis**

  1) Arithmetic Mean
  2) Median
  3) Standard Deviation
  4) Skewness
  5) Kurtosis

- **Inferential Analysis**

  1) Mean difference analysis
  2) ANCOVA

Major Findings

The important findings of the study can be summarized as follows.

1. Effectiveness of Instructional Strategies based on Selected Graphic Organizers Compared to Conventional Method of Teaching on Achievement in Geography for the Total Sample

The obtained t-value for the Total sample was found to be significant ($t = 6.65$; $p < .01$) at .01 level. This indicates that there is significant difference between

the Posttest scores on Achievement in Geography of the Experimental and Control Groups.

The obtained F-value for the Total sample was found to be significant ($F = 152.46$; $p < .01$) at .01 level. This indicates that there is significant difference between the means of final scores on Achievement in Geography of the Experimental and Control Groups. And also the adjusted mean value (12.36) was significant at .01 level.

From these values, it can be inferred that the Mean value of the Experimental Group is higher than that of the Control Group. This means the Experimental Group excelled in Achievement in Geography compared to the Control Group.

Therefore, it can be concluded that teaching through Concept Map, Spider Map, Main Idea web, Venn Diagram, Fish Bone Diagram and Flow Chart has significantly enhanced Achievement in Geography among Secondary school students when compared to the Conventional method of teaching for the Total sample.

2. Effectiveness of Instructional Strategies based on Selected Graphic Organizers Compared to Conventional Method of Teaching on Achievement in Geography for the Subsample based on Boys, and Girls.

The t-values obtained for the Sub sample Boys, and Girls (for Boys, $t = 5.26$, $p < .01$; for Girls, $t = 4.09$, $p < .01$) are significant at .01 level. This indicates that there is a significant difference between the Posttest scores and Gain scores of the Experimental and Control Groups on Achievement in Geography for the Sub sample Boys, and Girls after the Experiment.

The F-value obtained for the Sub sample Boys, and Girls (for Boys, $F = 52.75$, $p < .01$; for Girls, $F = 133.19$, $p < .01$) are significant at .01 level. This indicates that the Experimental and Control Groups differ significantly on Achievement in Geography for the Sub sample Boys, and Girls after the Experiment. And also the adjusted mean scores (Boys, $t = 7.29$, $p < .01$; Girls, $t = 11.79$, $p < .01$) are found to be significant at .01 level.

From these values, it can be inferred that the Mean values of the Experimental Groups of Boys, and Girls excelled in Achievement in Geography compared to the Control Groups.

Thus, it can be concluded that teaching through Concept Map, Spider Map, Main Idea web, Venn Diagram, Fish Bone Diagram and Flow Chart has significantly enhanced the Achievement in Geography of Secondary school students for the Sub sample Boys, and Girls when compared with the Conventional method of teaching.

3. Effectiveness of Instructional Strategies based on selected Graphic Organizers compared to Conventional Method of Teaching on Retention in Geography for the Total Sample

The t-value obtained for the Total sample is significant ($t = 8.83$; $p < .01$) at .01 level. This indicates that there is a significant difference between the Delayed test scores in Geography of the Experimental group and the Control group. Since the Mean value of the Experimental Group is found to be higher than that of the Control Group, it can be inferred that the Experimental Group excelled in Retention in Geography compared to the Control Group.

Therefore, it can be concluded that teaching through Concept Map, Spider Map, Main Idea web, Venn Diagram, Fish Bone Diagram and Flow Chart has significantly enhanced the Retention in Geography of Secondary school students when compared with the Conventional method of teaching for Total sample.

4. Effectiveness of Instructional Strategies based on Selected Graphic Organizers Compared to Conventional Method of Teaching on Retention in Geography for the Sub sample based on Boys, and Girls

The t-values obtained are significant for the Sub sample Boys, and Girls (for Boys, $t = 7.51$, $p < .01$; for Girls, $t = 5.21$, $p < .01$) at .01 level. This indicates that

there is a significant difference between the Delayed test scores of the Experimental and Control Groups on Retention in Geography for the Sub sample Boys, and Girls. The Mean values also show that the Experimental Groups of Boys, and Girls excelled in the Scores of Retention in Geography compared to the Control Groups.

Thus, it can be concluded that teaching through Concept Map, Spider Map, Main Idea web, Venn Diagram, Fish Bone Diagram and Flow Chart has significantly enhanced the Retention in Geography among secondary school students of both Boys as well as Girls when compared with the Conventional method of teaching.

5. Effectiveness of Instructional Strategies based on selected Graphic Organizers compared to Conventional Method of Teaching on Problem Solving Ability in Geography for the Total Sample

The t-value obtained for the Total sample is significant ($t = 11.16$; $p < .01$) at .01 level. This indicates that there is significant difference between the Posttest scores on Problem Solving Ability in Geography of the Experimental and Control Groups.

The obtained F-value for the Total sample was found to be significant ($F = 165.37$; $p < .01$) at .01 level. This indicates that there is significant difference between the means of final scores on Problem Solving Ability in Geography of the Experimental and Control Groups. And also the adjusted mean value (12.87) was significant at .01 level.

From these values, it can be inferred that the Mean value of the Experimental Group is higher than that of the Control Group. This means that the Experimental Group excelled in Problem Solving Ability in Geography when compared to the Control Group.

Therefore, it can be concluded that teaching through Concept Map, Spider Map, Main Idea web, Venn Diagram, Fish Bone Diagram and Flow Chart has

significantly enhanced the Problem Solving Ability in Geography for Secondary school students when compared to the Conventional Method of Teaching for the Total sample.

6. Effectiveness of Instructional Strategies based on selected Graphic Organizers compared to Conventional Method of Teaching on Problem Solving Ability in Geography for the Sub sample based on Boys, and Girls

The t-values obtained are significant for the Sub sample Boys, and Girls (for Boys, $t = 8.01$, $p < .01$; for Girls, $t = 7.85$, $p < .01$) at .01 level. This indicates that there is significant difference between the Posttest scores and Gain scores of the Experimental and Control Groups on Problem Solving Ability in Geography for the Sub sample Boys, and Girls after the Experiment.

The F-value obtained for the Sub sample Boys, and Girls (for Boys, $F = 85.59$, $p < .01$; for Girls, $F = 81.54$, $p < .01$) are significant at .01 level. This indicates that the Experimental and Control Groups differ significantly on Problem Solving Ability in Geography for the Sub sample Boys, and Girls after the Experiment. And also the adjusted mean scores (Boys, $t = 9.28$, $p < .01$; Girls, $t = 9.17$, $p < .01$) are found to be significant at .01 level.

From these values it can be inferred that the Mean values of the Experimental Groups of Boys, and Girls excelled in Problem Solving Ability in Geography compared to the Control Groups.

Thus, it can be concluded that teaching through Concept Map, Spider Map, Main Idea web, Venn Diagram, Fish Bone Diagram and Flow Chart has significantly enhanced the Problem Solving Ability in Geography of Secondary school students for the Sub sample Boys, and Girls when compared with Conventional Method of Teaching.

Tenability of Hypotheses

- **Hypothesis 1.** There is a significant difference in Achievement in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.

  Since the t-value and the F value obtained for the Total sample is significant at .01 level, there exists a significant difference between the Posttest scores on Achievement in Geography of the Experimental and Control Groups. **Hence the hypothesis is accepted.**

- **Hypothesis 2.** There is a significant difference in Achievement in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.

  Since the t-value as well as the F value obtained for the Sub sample Boys, and Girls are significant at .01 level, there exists a significant difference between the Posttest scores on Achievement in Geography of the Experimental and Control Groups. **Hence the hypothesis is accepted.**

- **Hypothesis 3.** There is a significant difference in Retention in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.

  Since the t-value obtained for the Total sample is significant at .01 level, there is a significant difference between the Delayed test(Retention) scores in Geography of the Experimental and the Control groups for the Total sample and for the Sub sample. **Hence the hypothesis is accepted.**

- **Hypothesis 4.** There is a significant difference in Retention in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.

  Since the t-value obtained for the Sub sample based on Boys, and Girls are significant at .01 level, there is a significant difference between the Delayed test (Retention) scores in Geography of the Experimental and the Control groups for the Total sample and for the Sub sample. **Hence the hypothesis is accepted.**

- **Hypothesis 5.** There is a significant difference in Problem Solving Ability in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Total Sample.

  Since the obtained t-value as well as the F value for the Total sample is significant at .01 level, it can be inferred that there exists a significant difference between the Posttest scores on Problem Solving Ability in Geography of the Experimental and Control Groups. **Thus the hypothesis is accepted**.

- **Hypothesis 6.** There is a significant difference in Problem Solving Ability in Geography while using Instructional Strategies based on certain Graphic Organizers and Conventional Method of Teaching among Secondary School Students for the Sub sample based on Boys, and Girls.

  Since the t-value and the F value obtained for the Sub sample based on Boys, and Girls are significant at .01 level, it can be inferred that there exists a significant difference between the Posttest scores on Problem Solving Ability in Geography of the Experimental and Control Groups. **Thus the hypothesis is accepted**.

Chapter 6

RECOMMENDATIONS

- Educational Implications of the Study
- Recommendations for further Studies
- Conclusion

Educational Implications of the Study

This study demonstrated the effectiveness of instructional strategies based on selected Graphic Organizers on achievement, retention and problem solving ability in geography among secondary school students for the total sample and sub sample based on boys, and girls. The study reveals that as an instructional strategy, Graphic Organizers can significantly increase Achievement, Retention and Problem solving ability in Geography among Secondary School students compared to the Conventional method of teaching.

1) Instead of the Conventional Method of Teaching, the instructional strategy based on selected Graphic Organizers, such as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram should be promoted as preferential pedagogical tools to deliver the Geography curriculum among Secondary school students.
2) Subject experts may prepare the model lesson transcripts based on graphic organizers and make them available to the teachers through handbook.
3) The selection and use of content material that is appropriate to the various Graphic Organizers should be detailed and practically guided by curriculum planners to the teachers.
4) Organizing workshops and seminars for teachers can be an effective way to equip them with the necessary skills of preparing and utilizing Graphic Organizers in teaching a wide range of Geography topics.
5) With the assistance of expert teachers, students should be encouraged to create their own Graphic Organizers, as this can significantly enhance their conceptual understanding.
6) The school labs and class rooms should be redesigned and strengthened with sufficient devices and equipment to cope up with the demands of the Graphic Organizer strategy.

7) Since Graphic Organizer based learning is student-centered, interactive, and activity oriented, the classroom environment should be redesigned accordingly.
8) Researches for exploring innovative techniques and tools for implementing the Graphic Organizer method should be promoted.
9) Among the conventional method of teaching, lecture demonstration method is currently practiced in our Geography classrooms as the curriculum transaction strategy. However, it leads students to become inattentive, bored and fatigued in class and hindering effective Geography learning. Therefore, as far as possible lecture demonstration method should be avoided in the Geography classroom.
10) Students may have different learning styles and preferences. Offering a variety of graphic organizers and instructional approaches to the students may cater to individual needs. By providing personalized instruction, educators can better engage students and optimize their learning outcomes.
11) Graphic organizers can be used as instructional tools to develop students' critical thinking skills. This may encourage the students to analyze, synthesize, and evaluate geographical information within the context of the graphic organizers. This approach helps students become more proficient problem solvers and analytical thinkers.
12) Offering constructive feedback on students' use of graphic organizers may guide them in refining their organizational skills and help them grasp geographical concepts more effectively.
13) Making the students realize the probability of graphic organizers beyond the classroom may foster a deeper appreciation for geography's practical significance.
14) Since the graphic organizers Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram enhance retention in geography among students, teachers should develop and organize their teaching techniques that foster pupil’s learning for a longer duration.

15) Graphic organizers can minimize cognitive load and free working memory for continued learning (Sweller, 1998). The findings of the present study also support this notion, as Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram lessen the cognitive load. Therefore, Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram can be used in an inclusive classroom, especially for pupils with learning disabilities.

Recommendations for further Research

The present study has many limitations. However, beyond these limitations, the study demonstrated that the Instructional strategy based on Graphic organizers enhanced Achievement, Retention and Problem solving ability in Geography among Secondary School students compared to Conventional Method of Teaching. Based on the major findings of the study, some possible areas for further research are listed below;

1. While the researcher investigated the effectiveness of Concept Map, Flowchart, Spider Map, Main Idea Web, Venn Diagram and Fishbone Diagram on Achievement, Retention and Problem Solving Ability in Geography, further studies could explore the effectiveness of other Graphic Organizers on Achievement, Retention and Problem Solving Ability in Geography among Secondary School students.
2. A comparative study on the effectiveness of various graphic organizers on Achievement, Retention and Problem Solving Ability in Geography may be conducted.
3. The investigator limited the study to explore the effectiveness of selected Graphic Organizers on Achievement, Retention and Problem Solving Ability

in Geography. Further research can explore the effectiveness of these selected Graphic Organizers on other dependent variables.

4. This study was limited to investigating the effectiveness of selected Graphic Organizers on Achievement, Retention and Problem Solving Ability in Geography. Subsequent research could investigate the effectiveness of selected Graphic Organizers on other subjects.
5. The effectiveness of selected Graphic Organizers on various subject in lower classes may be investigated.
6. The sub sample of the study is limited to gender specific groups, boys and girls only. The effectiveness of selected Graphic Organizers on other sub samples can be investigated.
7. In the present study, the effectiveness of selected Graphic Organizers on the components of dependent variables was not analyzed. Such a study can be conducted.
8. A comparative study on the effectiveness of Graphic Organizers and models of teaching such as concept attainment model, advance organizer model on Achievement, Retention and Problem Solving Ability in Geography for Secondary School students can be investigated.
9. A comparative study on the effectiveness of Graphic Organizers and the Flipped learning method on Achievement, Retention and Problem Solving Ability in Geography for Secondary School students can be investigated.
10. In the present study, the investigator exclusively utilized teacher constructed Graphic Organizers. Another study may be conducted to evaluate the effectiveness of student-constructed Graphic Organizers instead.
11. The problems faced by teachers in handling classrooms while adopting Graphic Organizers for curriculum transaction may be studied.

12. Studies can be carried out to test the effectiveness of Graphic Organizer on Achievement, Retention and Problem Solving Ability in Geography among differently abled students
13. A survey study on the attitude of Secondary School students and teachers towards the instructional strategy Graphic Organizer can be conducted.

Conclusion

The present study has unveiled that teaching through graphic organizers significantly enhanced the achievement, retention, and problem-solving ability in Geography among secondary school students as compared to the conventional method of teaching.

The studies conducted by Cahyani et al. (2021), Mehta (2016), Totappa et al. (2016), Kamble and Tembe (2012), Alan (2009), and Clark(2007) on the effect of graphic organizers on problem solving ability skills revealed that there was a positive effect of graphic organizers on problem solving ability skills of the students. The results of the studies conducted by Tandog and Bucayong (2019), Odewumi et al. (2019), Kaur and Kamini (2018), Kansızoglu (2017), Gordon (2014), Antoine (2013), Eissa (2012), Malik and Zaman (2012), Karakuyu (2010), Asan (2007), Kirschbaum (2004), and Schweitzer (1995) found that graphic organizers are more effective than the conventional method of teaching in terms of academic achievement.

According to Samba et al. (2020), and Djudin and Amir (2018) the graphic organizer enhanced students' achievement, critical thinking and metacognitive knowledge. Rani (2020), Ezeudu (2013), Gill (2004), and Smith (1993) found that the instructional material based on graphic organizers was more effective than the traditional method of teaching in relation to achievement, and retention. The results

of the studies conducted by Zercie (2005), Altin (2002), DiCecco and Gleason (2002), and Mazure (1996) also revealed that the use of Graphic Organizers had a positive impact on the retention and recall of factual information and concepts.

The above mentioned studies align with the findings of the present study, “Effectiveness of Certain Instructional Strategies based on Graphic Organizers on Achievement, Retention and Problem Solving Ability in Geography among Secondary School Students” providing further support for the efficacy of utilizing graphic organizers in Geography education.

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APPENDICES

Appendix A1

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE

Research Centre in Education (University of Calicut)

LESSON TRANSCRIPTS BASED ON GRAPHIC ORGANIZER

RESHMA P T
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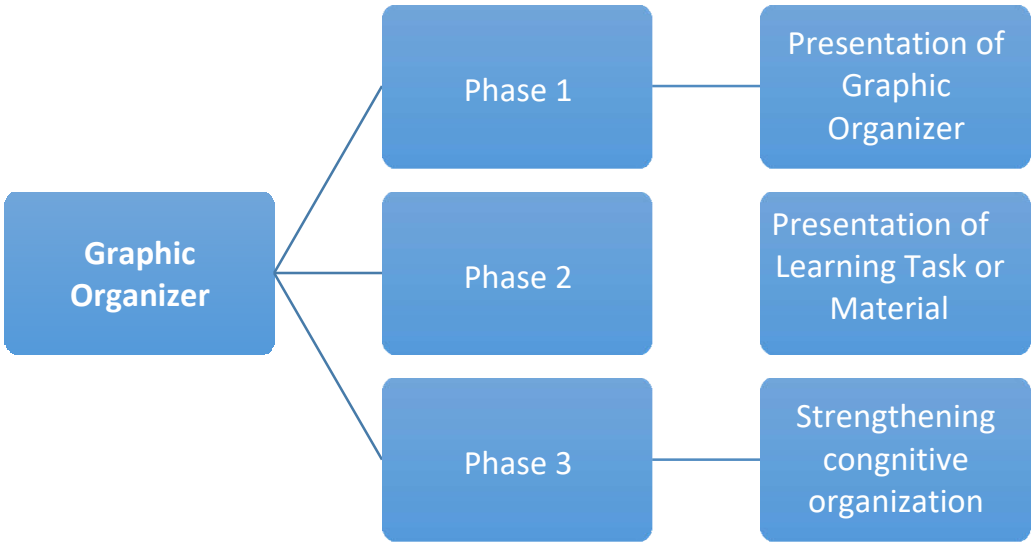
Preliminary Deatails

Name of Teacher: Reshma P T		Name of School	: GVHSS Madappally
Subject	: Geography	Class	: IX
Unit	: Sun: The Ultimate Source	Duration	: 45 Minutes



Topic 1: Solar Radiation

Learning objective : Enable the learners,

- to identify the elements of weather and climate
- to comprehend the relationship between aphelion and perihelion and illustrate them
- to construct the idea of insolation

Graphic organizers used:

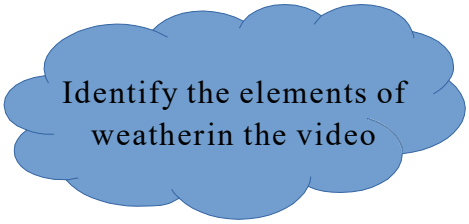
- Concept map : to identify the elements of weather and climate
- Main idea web : to comprehend the relationship between aphelion and perihelion
- Venn diagram : to understand the differences and similarities of aphelion and perihelion

Syntax

Phase I – Presentation of Graphic Organizer

https://www.youtube.com/watch?v=OPCJI808xvk

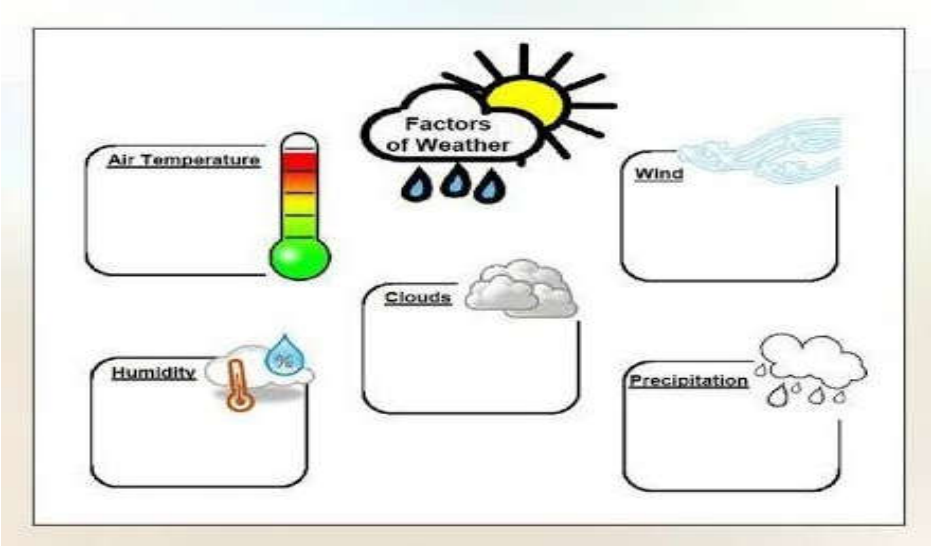
Teacher shows the video on elements of weather and climate, and asks the students that,



Students watch the video and elicit the ideas. Teacher collect the responses of students and consolidated that

The main elements of atmosphere which are subject to change and which influence human life on earth are temperature, pressure, winds, humidity, clouds and precipitation.

Teacher explains the elements of weather and climate by showing pictures.



By showing a graphic organizer, teacher conclude that the main elements of weather and climate are temperature, pressure, winds, humidity, clouds and precipitation.

Among the elements of weather and climate, teacher discuss about solar radiation.

The earth receives almost all of its energy from the sun, it is in short wave length. The energy received by the earth is known as incoming solar radiation which in short is known as insolation

Phase II – Presentation of the Learning Material

Teacher asks the students that,

Identify the month have highest temperature and lowest temperature, what is the reason for that?

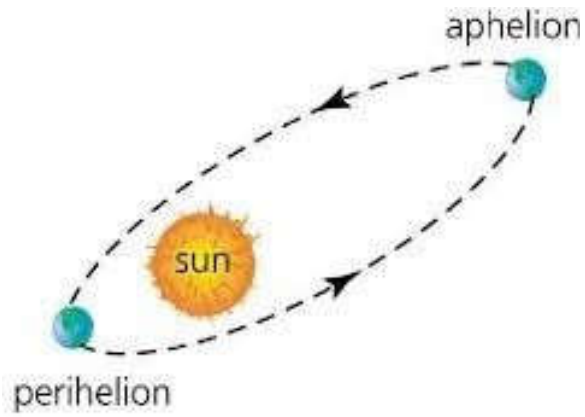
Students raise the responses that,

Equatorial region get direct rays, position of the sun, distance between sun and earth etc.

Teacher collect the responses from students and explain that

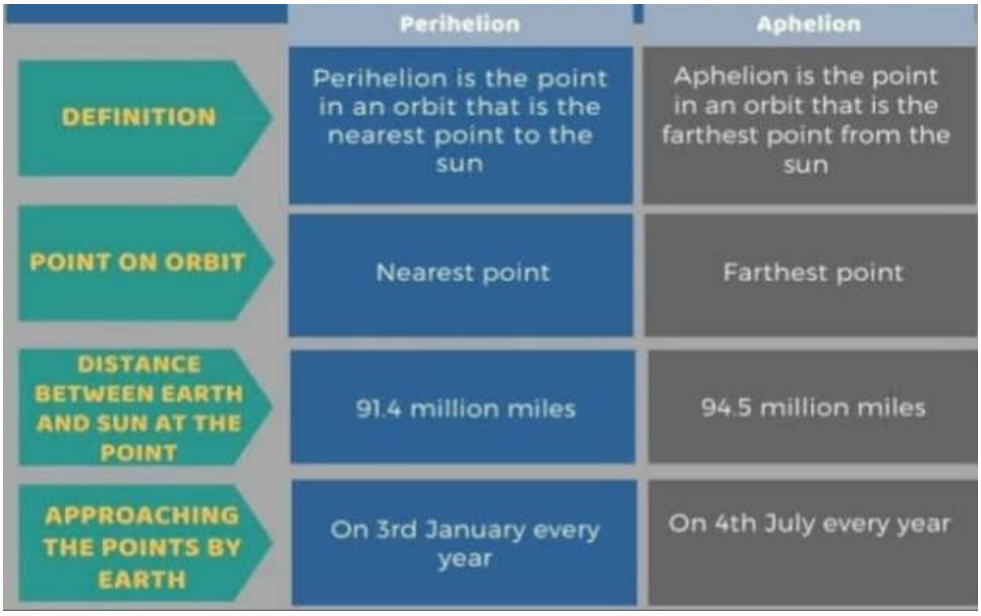
The solar output received at the top of the atmosphere varies slightly in a year due to the variations in the distance between the earth and sun.

Teacher shows pictures of aphelion and perihelion.



Phase III – Strengthening Cognitive Structure

Teacher presents a graphic organizer of aphelion and perihelion, helps students to strengthen their cognitive structure.



	Perihelion	Aphelion
DEFINITION	Perihelion is the point in an orbit that is the nearest point to the sun	Aphelion is the point in an orbit that is the farthest point from the sun
POINT ON ORBIT	Nearest point	Farthest point
DISTANCE BETWEEN EARTH AND SUN AT THE POINT	91.4 million miles	94.5 million miles
APPROACHING THE POINTS BY EARTH	On 3rd January every year	On 4th July every year

After one minute teacher divides the students in to two groups, one group is named as aphelion and one group is perihelion. And two groups are tell their specialities. Teacher conclude the activity that,

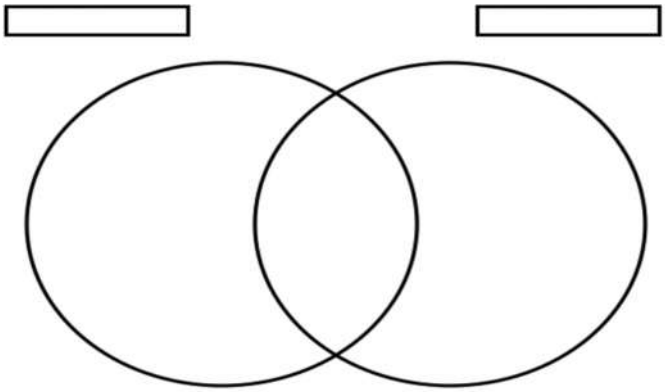
During its revolution around the sun, the earth is farthest from the sun (152 million km) on 4th July. This position of earth is called aphelion. On 3rd January the earth the nearest to the sun (147 million km). This position of earth is called perihelion.

Follow up Activity

Using Venn diagram, write the similarities and differences of aphelion and perihelion.

Choose your answer from the phrases given below;

a) farthest from the sun
b)152 million km away from the sun
c) nearest to the sun
d) happens in early of January
e) points in the orbit of the sun
f)147 million km away from the sun
g) happens in early of July



Topic 2: Variability of Insolation

Learning objective: Enable the learners,

- to identify the passage of solar radiation through the atmosphere
- to understand the variability of insolation at the surface of the earth
- to construct the idea of equinox and solstices

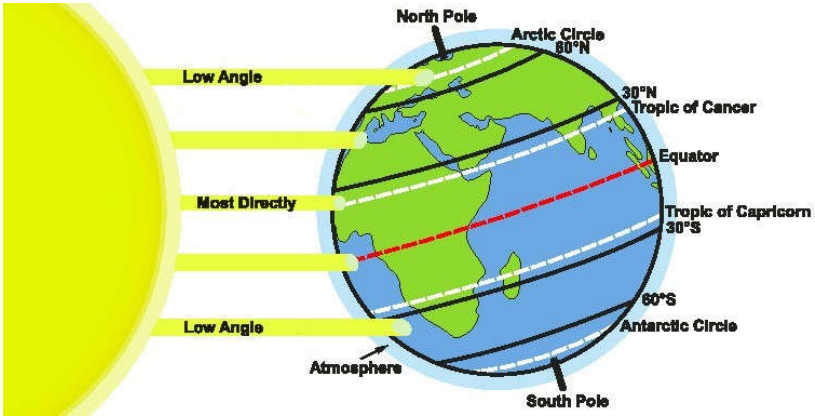
Graphic organizers used:

- Fish bone diagram : to identify the factors that cause the variability of insolation at the earth's surface
- Main idea Web : to construct the idea of equinox and solstices
- Dash board diagram: to understand the variability of insolation at the earth's surface

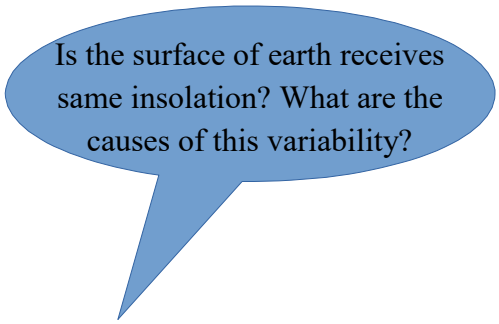
Syntax

Phase I – Presentation of Graphic Organizer

Teacher shows the pictures related to the solar radiation and asks students that what are seen in this picture?



Teacher collect the responses and explain the variability of insolation at the surface of the earth. The amount and the intensity of insolation vary during a day, in a season and in a year.

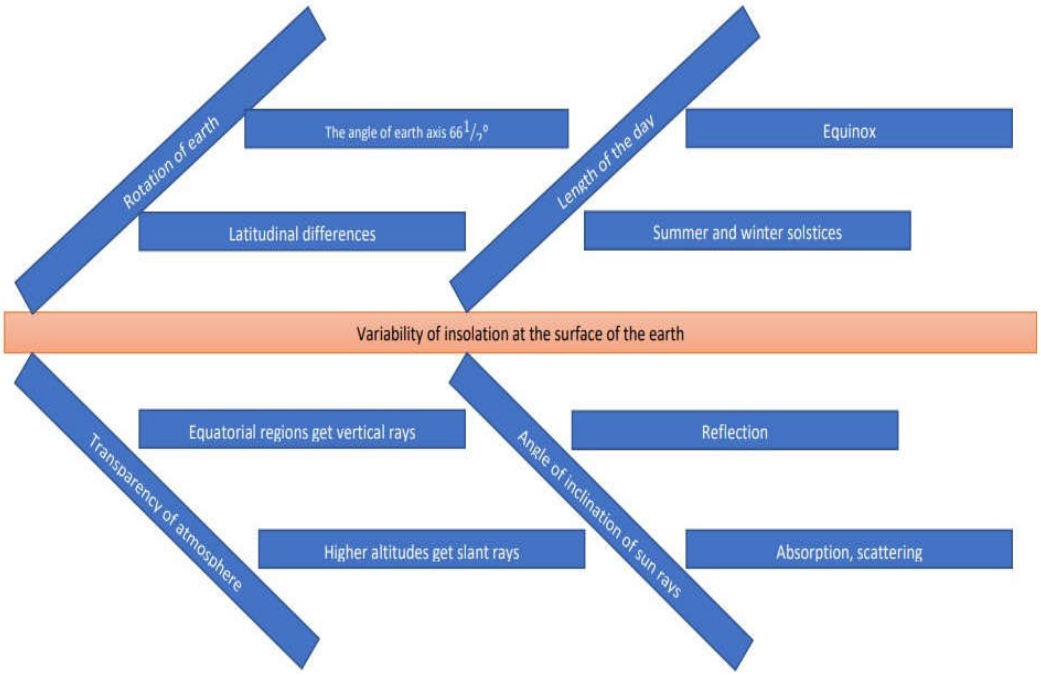


Students express their responses. Teacher collects the response from students and explains that,

Yes, some factors that cause the variations in insolation, they are rotation of earth, length of the day, angle of inclination of sun's rays and transparency of atmosphere.

Teacher presents a graphic organizer of the factors that cause the variability of insolation.

Students can strengthen the cognitive structure with the help of graphic organizer.



Phase II – Presentation of the Learning Material

Teacher asks the students that,

Is the length of day and night are equal always? Why?

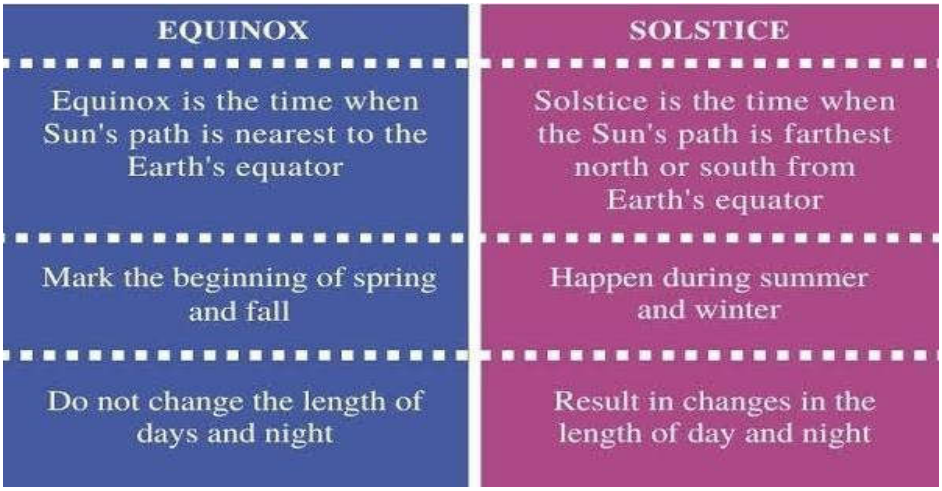
Students raise their responses, teacher collect the responses and present the idea of equinox and solstices. And also shows a table of the variations in the duration of the day at different latitudes of solstices.

Latitude	0^0	20^0	40^0	60^0	90^0
Dec 22	12hr	10hr 48m	9hr 8m	5hr 33m	0
June 21	12hr	13hr 12m	14hr 52m	18hr 27m	6 months

Teacher divide the students in to groups and let them asks;

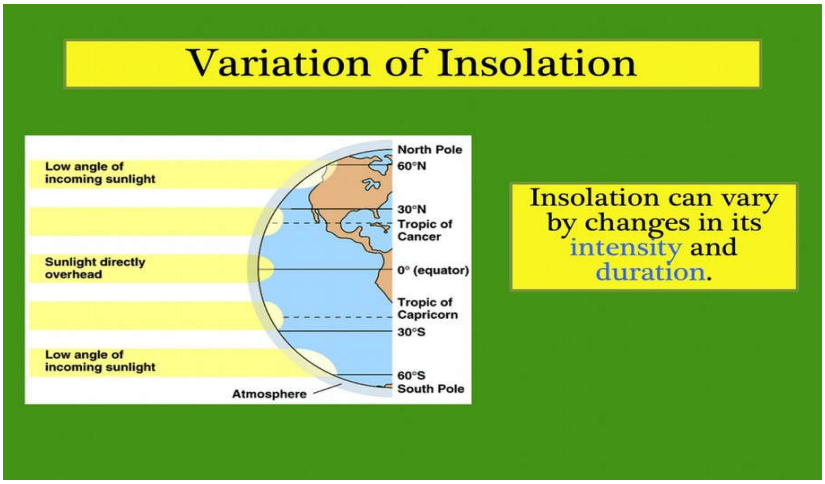
To write the variations in the duration at different latitudes of solstices with the help of the table

By showing a graphic organizer teacher helps the students to strengthen the concept of equinox and solstices.



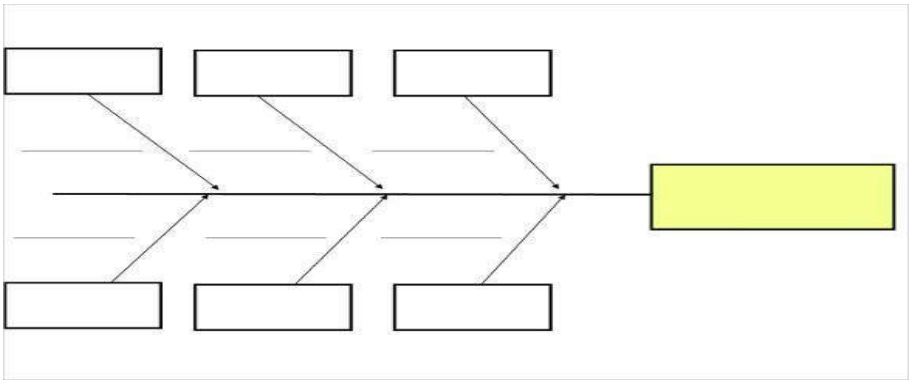
Phase III – Strengthening Cognitive Structure

Teacher use a graphic organizer of the factors that cause the variability of insolation, to conclude the topic and students can easily understand the concept of variability of insolation.



Follow up Activity

Write the factors that causes the variability of insolation in the fish bone diagram given below;



Topic 3 : Heating and Cooling of Atmosphere

Learning objective: Enable the learners,

- to identify the four ways of heating and cooling of atmosphere
- to understand the differences of insolation and terrestrial radiation
- to define conduction, convection, advection and terrestrial radiation.

Graphic organizers used:

- flow chart : to identify the four ways of heating and cooling of atmosphere
- main idea chart : to understand the idea of conduction, convection, advection and terrestrial radiation
- spider map : to strengthen the idea of four ways of heating and cooling of atmosphere

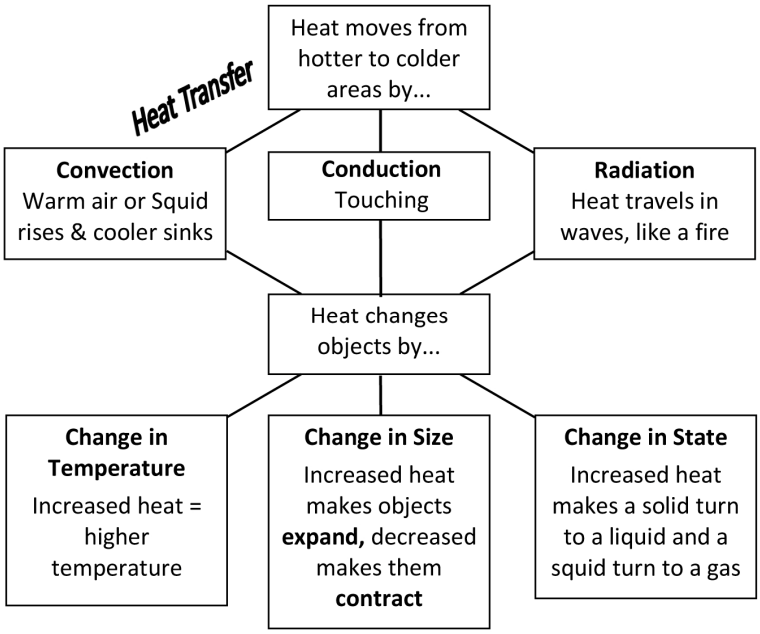
Syntax

Phase I – Presentation of Graphic Organizer

Teacher checks previous knowledge of students with the help of some pictures related to the topic. Teacher explains the topic with the help of graphic organizer.

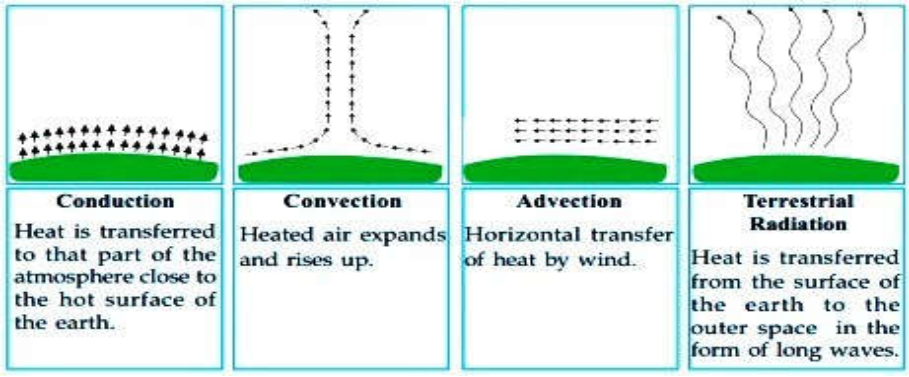
> The earth's surface facing the sun gets heated by Insolation, which begins with sunrise lasts till sunset. The heat is then transferred to the atmosphere from the Surface of the earth through various processes.

Teacher presents the topic with lecturing and illustrating with suitable graphic organizer.



Phase II – Presentation of the Learning Material

Teacher presents the learning material by using the graphic organizer.



Phase III – Strengthening Cognitive Structure

Teacher explains the learning material with the help of graphic organizer.

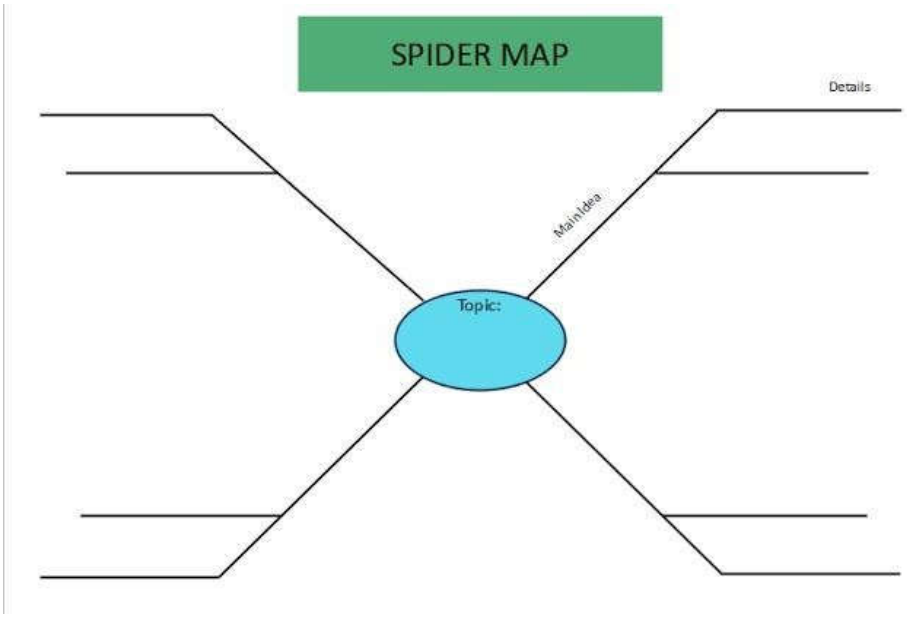
Conduction takes place when two bodies of unequal temperature are in contact with one another, there is a flow of energy from the warmer to cooler body. The air in contact with the earth rises vertically on heating in the form of currents and further transmits the heat of the atmosphere. This process of vertical heating of the atmosphere is known as convection. The transfer of heat through horizontal movement of air is called advection. The re-radiation of energy from the surface of the earth back to the outer space in the form of long waves is called terrestrial radiation.

Teacher asks the students to fill the given table of heat transfer of atmosphere.

Heat Transfer	Conduction	Convection	Advection	Radiation
Defintion				
Example				
Draw a picture				

Follow up activity

Write the four ways of heating and cooling of atmosphere in the spider map given below;



Topic 4 : Heat Budget of the Earth

Learning objective: Enable the learners,

- to identify reflection, scattering, and absorption
- to understand and illustrate heat budget of the earth
- to define albedo of earth

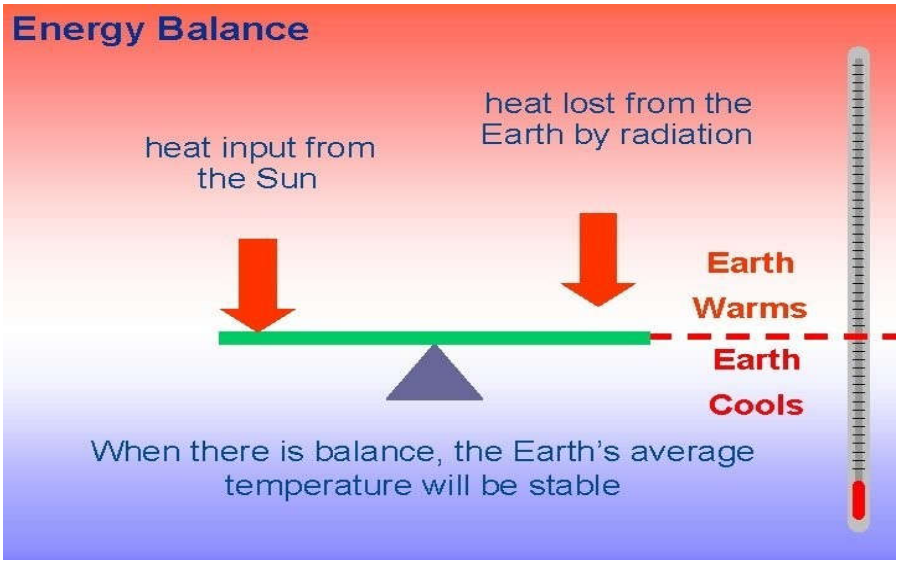
Graphic organizers used:

- main idea diagram : to define the heat balance of earth
- main idea chart : to understand the heat budget of earth
- concept map : to strengthen the idea of heat budget of earth

Syntax

Phase I – Presentation of Graphic Organizer

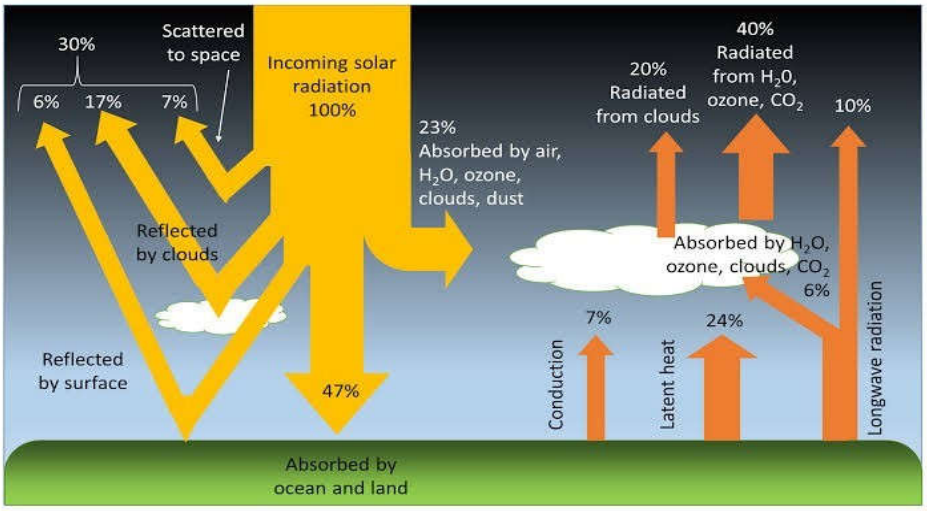
Teacher shows the pictures related to the heat balance and asks students that what are seen in this picture?



Teacher collect the responses from students and explain that when there is balance, the earth's average temperature will be stable. Teacher makes a good rapport with the students by showing graphic organizer and checks previous knowledge. The earth as a whole does not accumulate or loose heat, it maintains its temperature. This can happen only if the amount of heat received in the form of insolation equals the amount lost by the earth through terrestrial radiation.

Phase II – Presentation of the Learning Material

Teacher presents learning material by using graphic organizer. Consider the total amount of insolation reaching the outer surface of the atmosphere as 100 units. While passing through the atmosphere some amount of energy is reflected, scattered and absorbed. Only the remaining part reaches the earth surface.



Teacher presents the learning material with the help of graphic organizer.

Phase III – Strengthening Cognitive Structure

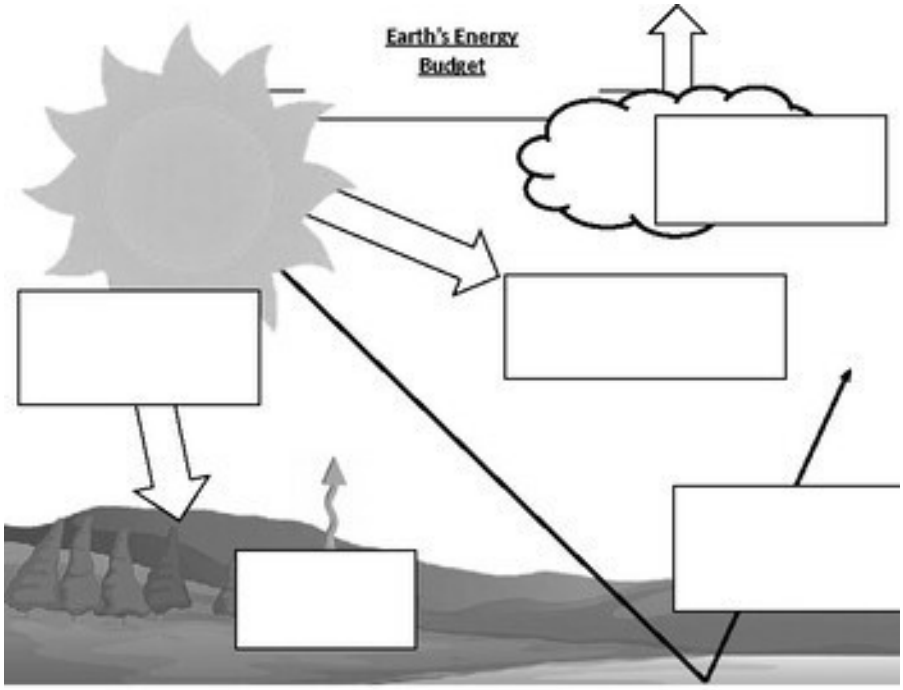
Teacher explains heat budget, by using a graphic organizer, that help the students to strengthen the cognitive structure.

Amount of energy reflected by the atmosphere	35 unit	Direct terrestrial radiation	17 unit
Energy reaching earth's surface	51 unit	Radiation from atmosphere	48 unit
Energy absorbed by the atmosphere	14 unit		
Total energy received by the atmosphere and surface of the earth	65 unit	Total energy radiated back from the earth's surface and the atmosphere	65 unit

Teacher asks students to prepare a note based on the table and graphic organizer.

Follow up activity

Write the four ways of heating and cooling of atmosphere in the spider map given below;



Topic 5 : Factors controlling Air Temperature

Learning objective: Enable the learners,

- to understand different factors controlling the air temperature
- to identify the instrument used to measure air temperature
- to understand the differences between diurnal range of temperature and annual range of temperature

Graphic organizers used:

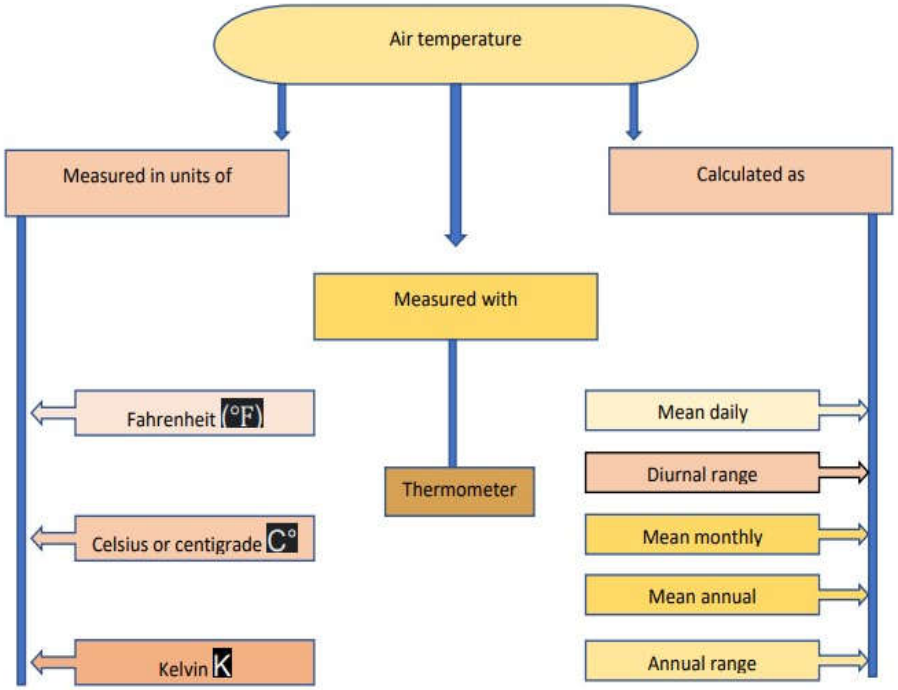
- concept map : to identify the instrument used to measure air temperature
- flow chart : to understand the different types of temperature calculations
- main idea diagram : to calculate mean daily and mean annual range of temperature.

Syntax

Phase I – Presentation of Graphic Organizer

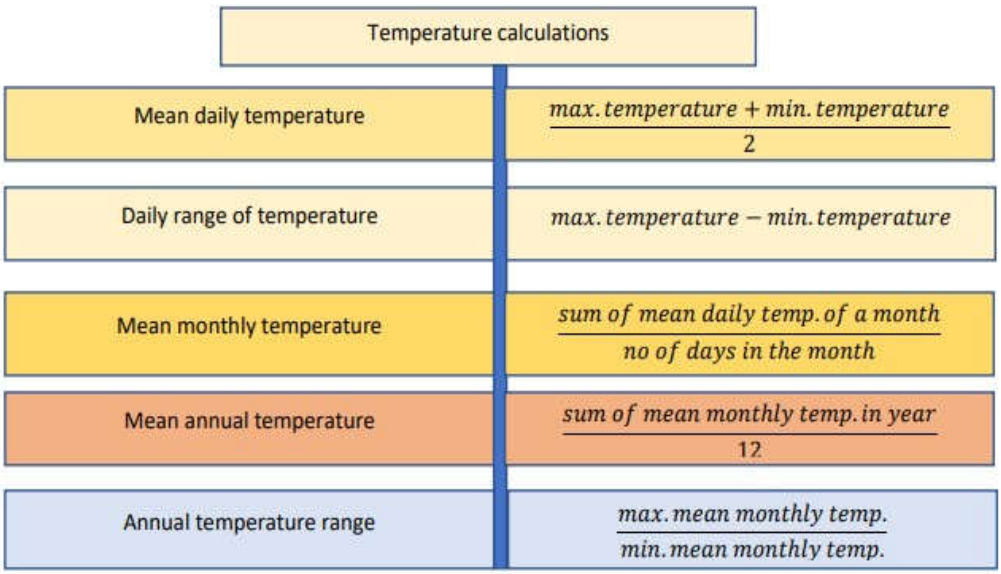
Teacher checks previous knowledge of students by showing some pictures and videos of air temperature.

Teacher explains that, temperature is the degree of hotness of the atmosphere. It is from the weather condition at 2pm that the meteorologists measure the maximum temperature of a day. The minimum temperature is taken just before the sunrise.



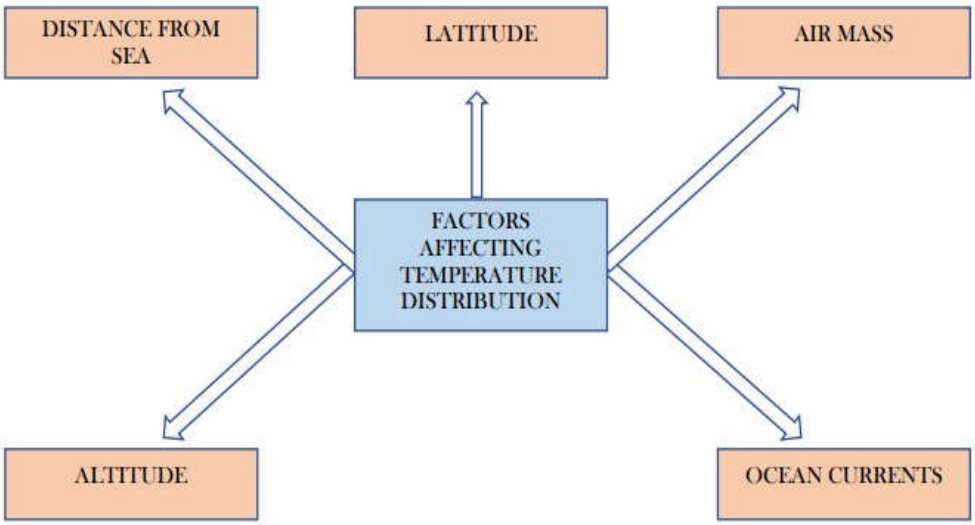
Phase II – Presentation of the Learning Material

Teacher presents the topic, temperature calculations with the help of a graphic organizer.



Teacher explains temperature calculations with the help of graphic organizer.

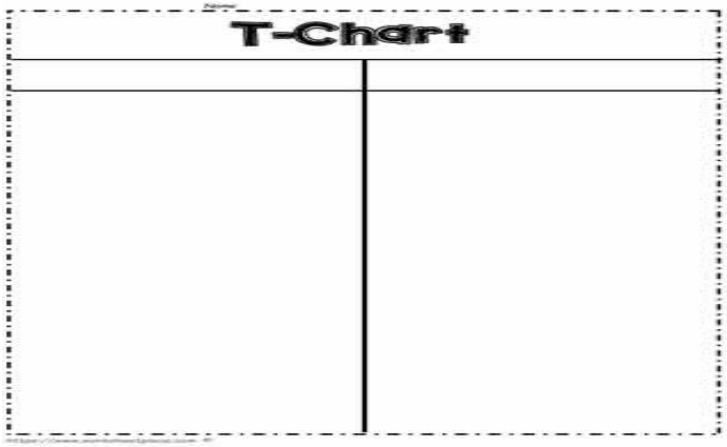
Phase III – Strengthening Cognitive StructureTeacher explains the topic, factors influencing distribution of temperature with the help of a graphic organizer.



Teacher explain that the temperature of air at any place is influenced by i) the latitude of the place, ii) the altitude of the place, iii) distance from the sea, the airmass circulation, iv) the presence of warm and cold ocean currents, v) local aspects etc.

Follow up Activity

Asks students to calculate mean daily and mean annual range of temperature and write in the chart given below;



Appendix A2

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

LESSON TRANSCRIPTS BASED ON CONVENTIONAL METHOD OF TEACHING

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Preliminary Deatails

Name of Teacher: Reshma P T		Name of School	: GVHSS Madappally
Subject	: Geography	Class	: IX
Unit	: Sun: The Ultimate Source	Duration	:
Topic	: Solar Radiation	Date	:

Learning Outcomes

- toidentifytheelementsofweatherandclimate
- tocomprehendtherelationshipbetweenaphelionandperihelion
- toconstructtheidea ofinsolation

Content Analysis

Terms:

Insolation, Aphelion and Perihelion

Concepts:

Solar Radiation - The earth receives almost all of itsenergyfromthesun

Definition:

The energy received by the earth from sun is known as solar radiation

Values and Attitude:

Appreciates the atmospheric processes in retaining life on earth

Learning Strategy:

Discussion, activity

Learning Resources:

Powerpoint presentation, globe, reading material

Previous Knowledge:

Variation of temperature on earth

Expected Product:

Learners can illustrate aphelion and perihelion

Learning Experiences	Responses
INTRODUCTORY ACTIVITY Teacher begins the class through casual talk with students. Teacher shows a video and asks them to identify the elements of weather and climate. Among the elements of weather and climate, teacher discuss about solar radiation. The earth receives almost all of itsenergyfromthesun,itisinshortwavelength. The energy received by theearthis known asincoming solar radiation whichin short is known as insolation. Teacher asks the students that identify the hottest month and coldest month. **DEVELOPMENTAL ACTIVITY** **Activity 1:** Teacher lightning a candle at center of the class and marks two lines on the floor The first line is very far from candle second one is very closer to candle which can feel the temperature from the candle flame very easy. Class divided in to two groups and teacher asks students to feel the candle flame temperature. From students response teacher explains that energy transfer through radiation it's because closer line students feel more temperature but they not touch the flame. **Activity 2:** Teacher shows a picture and divides the students in to group, and asks the questions 1. What are the terms you noticed in this picture? 2. What is the difference between aphelion and perihelion? Teacher conclude the activity that the solar output received at the top ofthe atmosphere varies slightly in a year due to the variations in the distance between the earth and sun. Perihelion is the point in an orbit that is the nearest point to the sun. Aphelion is the point in an orbit that is the farthest point from the sun. **Activity 3:** With the help of reading material teacher explains aphelion and perihelion. Teacher divides the students in to two groups, named as	

aphelion and perihelion. After discussion write about aphelion and perihelion.

Teacher conclude the activity and collect responses from students. During its revolution around the sun, the earth is farthest from the sun (152 million km) on 4th July.This position of earth is called aphelion. On 3rdJanuary the earth the nearest to the sun (147 million km).This positionof earth iscalled perihelion.

CONCLUDING ACTIVITY

Write about the features of aphelion and perihelion, using the given hints.

a) farthest from the sun
b)152 million km away from the sun
c) nearest to the sun
d) happens in early of January
e) points in the orbit of the sun
f)147 million km away from the sun
g) happens in early of July

FOLLOW UP ACTIVITY

Explain the significance of aphelion and perihelion in relation to the changing seasons on earth

Efficacy of Certain Graphic Organizers

Appendix B1

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

ACHIEVEMENT TEST IN GEOGRAPHY (PRETEST)

(DRAFT ENGLISH)

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Class: IX **Subject: Geography** **Unit: Sun the Ultimate Source** **Max Mark:30** **Time:1Hr**

General Instructions:

- This test paper consists of 30 questions
- Answer all the questions. Each question carry 1 score
- No negative marks for wrong answers

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1. What happens to the wind speed if there is less friction?
   a) Will be more b) Will be less
   c) Constant d) No change
2. Dense opaque clouds do not transmit sunlight. Which?
   a) Cirrus b) Nimbus c) Stratus d) Cumulus
3. By which process is the atmosphere mainly warmed?
   a) Solar radiation b) Terrestrial radiation
   c) Reflection d) Scattering
4. What is the name of the storm that descends like the trunk of an elephant?
   a) Tornado b) Hurricane
   c) Willy Willis d) Typhoon
5. What wind would you feel if you were in a valley at night?
   a) Mountain breeze b) Valley breeze c) Sea breeze d) Land breeze
6. What happens to relative humidity if the temperature in an area rises suddenly?
   a) increases b) decreases
   c) Constant d) Varying
7. What causes tropical cyclones to rotate?
   a) Gravity b) Friction
   c) Coriolis effect d) Tension force
8. What is the primary purpose of a barometer
   a) measuring temperature b) measuring humidity
   c) measuring air pressure d) measuring wind speed

9. Which of the following is a planetary wind?
   a) Monsoon b) Loo
   c) Westerlies d) Tornado
10. What is the geographical importance of January 3rd?
   a) The Sun will be at the tropic of cancer
   b) The Sun will be over the equator
   c) Earth is located nearest to the Sun
   d) Earth is located farthest from the Sun
11. Coastal areas have ……. rainfall than inland areas.
   a) More b) Less
   c) No change d) None of these
12. Write the single term for the radiation from the sun to the earth.
   a) Insolation b) Terrestrial radiation
   c) Reflection d) Absorption
13. What happens to atmospheric pressure when the sky becomes cloudy?
   a) Increases b) Decreases
   c) No change d) None of these
14. The amount of actual water vapor present in the atmosphere is known by what name?
   a) Absolute humidity b) Relative humidity
   c) Dew point d) Precipitation
15. If the position of the sun is vertically above the equator what is the name given to this condition?
   a) Solstices b) Equinox
   c) Spring d) Seasons
16. What type of wind is monsoon in India?
   a) Westerlies b) Seasonal wind
   c) Local wind d) Trade wind
17. By what name is the continuous circulation of water through the hydrosphere, lithosphere and atmosphere?
   a) Water circulation b) Hydrologic cycle
   c) Hydro-equilibrium d) Precipitation
18. Which of the following is not a form of precipitation?
   a) Snow b) Fog
   c) Rain d) Frost

19. Atmospheric pressure in tropical regions as compared to colder regions?

a) Will be less b) Will be more
c) No change d) Will be equal

20. The annual range of temperature is defined as the:

a) Difference between the highest and lowest temperatures recorded in a day
b) Average temperature recorded over the course of a year
c) Difference between the highest and lowest temperatures recorded in a year
d) Temperature range during the summer season

21. Dew point is a measure of?

a) Atmospheric pressure b) Air temperature
c) Relative Humidity d) Moisture content in the air

22. What inferences can you make when the isotherms are widely spaced?

a) The temperature will be less b) The temperature will be more
c) No change d) None of these

23. The regions near the earth's surface get warm even after sunset, why?

a) Due to solar radiation b) Due to terrestrial radiation
c) Due to convection d) Due to conduction

24. Which of the following is the albedo of the earth?

a) amount of radiation absorbed by the atmosphere
b) Terrestrial radiation
c) amount of radiation reaching the earth
d) reflected amount of radiation before reaching the earth

25. The temperature in the troposphere decreases by one degree Celsius for every 165 meters of altitude. What is the name of this process?

a) Normal lapse rate b) Isotherm
c) Inversion of temperature d) Air drainage

26. Why is there temperature inversion in mountainous regions?

a) Due to air drainage b) Due to dust particles
c) Due to gravity d) Due to water vapor

27. The air that forms over vast oceans and open areas is known by what name?

a) Humidity b) Airmass
c) Precipitation d) Pressure

28. The small round pieces of ice that fall from the sky like rain are known by what name?

a) Rain b) Hail
c) Frost d) Fog

29. The leeward side of a mountain is often referred to as the?

a) Rain shadow side b) cloudy side
c) windy side d) equatorial side

30. Cirrus clouds are most likely to form at what altitude?

a) Below 5000 feet b) between 5000 and 10000 feet
c) Above 20000 feet d) at ground level

ACHIEVEMENT TEST IN GEOGRAPHY (PRETEST)

(DRAFT MALYALAM)

RESHMA P T
Research Scholar
GCTE Kozhikode

Dr. K RAMAKRISHNAN
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Class: IX **Subject: Geography** **Unit: Sun the Ultimate Source** **Max Mark:30** **Time:1Hr**

പൊതു നിർദ്ദേശങ്ങൾ:

- ഈ ടെസ്റ്റ് പേപ്പറിൽ 30 ചോദ്യങ്ങൾ അടങ്ങിയിരിക്കുന്നു
- എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം നൽകുക. ഓരോ ചോദ്യത്തിനും 1 സ്കോർ ഉണ്ടായിരിക്കും
- തെറ്റായ ഉത്തരങ്ങൾക്ക് നെഗറ്റീവ് മാർക്ക് ഇല്ല

1. ഘർഷണം കുറവാണെങ്കിൽ കാറ്റിന്റെ വേഗതയ്ക്ക് എന്ത് സംഭവിക്കും?
   a) കൂടുതലായിരിക്കും b) കുറവായിരിക്കും
   c) സ്ഥിരമായിരിക്കും d) മാറ്റമില്ല
2. സാന്ദ്രത കൂടിയ അതാര്യമായ മേഘങ്ങൾ സൂര്യപ്രകാശം കടത്തിവിടുന്നില്ല. ഏത്?
   a) സിറസ് b) നിംബസ്
   c) സ്ട്രാറ്റസ്. റ) ക്യുമുലസ്
3. അന്തരീക്ഷം പ്രധാനമായും ചൂടാകുന്ന പ്രക്രിയ ഏത്?
   a) സൗരവികിരണം b) ഭൗമ താപവികിരണം
   c) പ്രതിഫലനം d) പ്രസരണം
4. ആനയുടെ തുമ്പിക്കൈ പോലെ താഴേക്കിറങ്ങി വരുന്ന കൊടുങ്കാറ്റ് ഏത് പേരിൽ അറിയപ്പെടുന്നു?
   a) ടൊർണാഡോ b) ഹരിക്കെയിൻ.
   c) വില്ലി വില്ലിസ് d) ടൈഫൂൺ
5. രാത്രി സമയത്ത് നിങ്ങൾ താഴ്വരയിൽ ആണെങ്കിൽ നിങ്ങൾക്ക് അനുഭവപ്പെടുന്ന കാറ്റ് ഏതായിരിക്കും?
   a) പർവ്വത കാറ്റ് b) താഴ്വര കാറ്റ്
   c) കടൽ കാറ്റ് d) കരക്കാറ്റ്
6. ഒരു പ്രദേശത്തെ ഊഷ്മാവ് പെട്ടെന്ന് കൂടുകയാണെങ്കിൽ ആപേക്ഷിക ആർദ്രത യ്ക്ക് എന്ത് സംഭവിക്കും?
   a) കൂടുന്നു b) കുറയുന്നു
   c) സ്ഥിരമായിരിക്കും d) മാറിക്കൊണ്ടിരിക്കും
7. ഉഷ്ണമേഖല ചക്രവാതങ്ങൾ കറങ്ങിക്കൊണ്ടിരിക്കാൻ കാരണമെന്ത്?
   a) ഗുരുത്വാകർഷണം b) ഘർഷണം
   c) കൊറിയോലിസ് പ്രഭാവം d) ടെൻഷൻ ഫോഴ്സ്

8. ഒരു ബാരോമീറ്ററിന്റെ പ്രാഥമിക ലക്ഷ്യം എന്താണ്

a) താപനില അളക്കുന്നു b) ഈർപ്പം അളക്കുന്നു

c) വായു മർദ്ദം അളക്കൽ d) കാറ്റിന്റെ വേഗത അളക്കൽ

9. താഴെ കൊടുത്തവയിൽ ഏതാണ് സ്ഥിര വാതങ്ങളിൽ പെടുന്നത്?

a) മൺസൂൺ b) ലൂ

c) പശ്ചിമവാതങ്ങൾ d) ടൊർണാഡോ

10. ജനുവരി 3 ന്റെ ഭൂമിശാസ്ത്രപരമായ പ്രത്യേകത എന്ത്?

a) സൂര്യൻ ഉത്തരായന രേഖയ്ക്ക് നേരെയാണ്

b) സൂര്യൻ ഭൂമധ്യരേഖയ്ക്ക് നേരെയാണ്

c) ഭൂമി സൂര്യനോട് അടുത്ത് സ്ഥിതി ചെയ്യുന്നു

d) ഭൂമി സൂര്യനിൽ നിന്നും അകലെ സ്ഥിതിചെയ്യുന്നു

11. തീരപ്രദേശങ്ങളിൽ ഉൾപ്രദേശങ്ങളേക്കാൾ മഴ .....

a) കൂടുതലാണ് b) കുറവാണ്

c) മാറ്റമില്ല d) ഇവയൊന്നുമല്ല

12. സൂര്യനിൽ നിന്നും ഭൂമിയിലേക്ക് വരുന്ന വികിരണത്തിന്റെ ഒറ്റപ്പദം എഴുതുക.

a) സൗരവികിരണം b) ഭൗമവികിരണം

c) പ്രതിഫലനം d) ആഗിരണം

13. ആകാശം മേഘാവൃതം ആകുമ്പോൾ അന്തരീക്ഷ മർദ്ദത്തിന് എന്ത് സംഭവിക്കും?

a) കൂടുന്നു b) കുറയുന്നു

c) മാറ്റമില്ല d) ഇവയൊന്നുമല്ല

14. അന്തരീക്ഷത്തിൽ അടങ്ങിയിരിക്കുന്ന യഥാർത്ഥ ജലബാഷ്പത്തിന്റെ അളവ് ഏത് പേരിൽ അറിയപ്പെടുന്നു?

a) കേവല ആർദ്രത b) ആപേക്ഷിക ആർദ്രത

c) തുഷാരാങ്കം d) വർഷണം

15. സൂര്യന്റെ സ്ഥാനം ഭൂമധ്യരേഖയ്ക്ക് നേരെ ആണെങ്കിൽ ഈ അവസ്ഥയ്ക്ക് പറയുന്ന പേര് എന്ത്?

a) അയനാന്തം b) സമരാത്രങ്ങൾ

c) വസന്തം. d) ഋതുക്കൾ

16. ഇന്ത്യയിൽ ലഭിക്കുന്ന മൺസൂൺ ഏത് തരം കാറ്റാണ്?

a) പശ്ചിമവാതങ്ങൾ b) കാലികവാതങ്ങൾ

c) പ്രാദേശികവാതങ്ങൾ d) വാണിജ്യവാതങ്ങൾ

17. ജലമണ്ഡലം, ശിലാമണ്ഡലം, വായുമണ്ഡലം എന്നിവയിലൂടെയുള്ള ജലത്തിന്റെ തുടർച്ചയായ ചാക്രിക സഞ്ചാരം ഏത് പേരിൽ അറിയപ്പെടുന്നു?

a) ജലചംക്രമണം b) ജലചക്രം

c) ജലസന്തുലിതാവസ്ഥ d) വർഷണം

18. താഴെ കൊടുത്തവയിൽ ഏതാണ് വർഷണരൂപം അല്ലാത്തത്?

a) മഞ്ഞ് b) മൂടൽമഞ്ഞ്

c) മഴ d) തുഷാരം

19. തണുപ്പേറിയ പ്രദേശങ്ങളെ അപേക്ഷിച്ച് ഉഷ്ണമേഖലാ പ്രദേശങ്ങളിൽ അന്തരീക്ഷമർദ്ദം?

a) കുറവായിരിക്കും b) കൂടുതലായിരിക്കും

c) മാറ്റമില്ല d) തുല്യമായിരിക്കും

20. താപനിലയുടെ വാർഷിക താപാന്തരം നിർവചിച്ചിരിക്കുന്നത്:

a) ഒരു ദിവസം രേഖപ്പെടുത്തിയ ഏറ്റവും ഉയർന്നതും താഴ്ന്നതുമായ താപനിലകൾ തമ്മിലുള്ള വ്യത്യാസം

b) ഒരു വർഷത്തിനിടെ രേഖപ്പെടുത്തിയ ശരാശരി താപനില

c) ഒരു വർഷത്തിൽ രേഖപ്പെടുത്തിയ ഏറ്റവും ഉയർന്നതും താഴ്ന്നതുമായ താപനിലകൾ തമ്മിലുള്ള വ്യത്യാസം

d) വേനൽക്കാലത്ത് താപനില പരിധി

21. തുഷാരാങ്കം (dew point) ഒരു അളവുകോലാണ്. ഏതിന്റെ?

a) അന്തരീക്ഷമർദ്ദം b) വായുവിന്റെ താപനില

c) ആപേക്ഷിക ആർദ്രത d) വായുവിലെ ഈർപ്പം

22. ഒരു സ്ഥലത്തെ സമതാപ രേഖകൾ തമ്മിലുള്ള അകലം കൂടുതൽ ആണെങ്കിൽ അതിൽ നിന്നും നിങ്ങൾക്ക് എന്ത് അനുമാനിക്കാൻ കഴിയും?

a) താപം കുറവായിരിക്കും b) താപം കൂടുതലായിരിക്കും

c) മാറ്റമുണ്ടാകില്ല d) ഇവയൊന്നുമല്ല

23. ഭൂമിയുടെ ഉപരിതലത്തിനോട് ചേർന്ന പ്രദേശങ്ങളിൽ സൂര്യാസ്തമയത്തിന് ശേഷവും ചൂട് ലഭിക്കുന്നു, എന്തുകൊണ്ട്?

a) സൗരവികിരണം കാരണം b) ഭൗമ താപവികിരണം കാരണം

c) സംവഹനം കാരണം d) സംനയനം കാരണം

24. താഴെ കൊടുത്തവയിൽ ഏതാണ് ഭൂമിയുടെ ആൽബഡോ?

a) അന്തരീക്ഷം ആഗിരണം ചെയ്യുന്ന സൗരോർജ്ജം

b) ഭൗമവികിരണം

c) ഭൂമിയിലെത്തുന്ന സൗരോർജ്ജം

d) ഭൂമിയിലെത്തും മുൻപ് പ്രതിഫലിപ്പിക്കപ്പെടുന്ന സൗരോർജ്ജം

25. ട്രോപ്പോസ്ഫിയറിലെ താപനില ഓരോ 165 മീറ്റർ ഉയരത്തിലും ഒരു ഡിഗ്രി സെൽഷ്യസ് എന്ന തോതിൽ കുറയുന്നു. ഈ പ്രക്രിയയുടെ പേരെന്ത്?

a) നോർമൽ ലാപ്സ് റേറ്റ് b) സമതാപരേഖ

c) താപവൈപരീത്യം d) വായുനിർഗമനം

26. പർവ്വത പ്രദേശങ്ങളിൽ താപവൈപരീത്യംഉണ്ടാകുന്നത് എന്തുകൊണ്ട്?

a) വായു നിർഗമനം കാരണം b) പൊടിപടലങ്ങൾ കാരണം

c) ഗുരുത്വാകർഷണം കാരണം d) ജലബാഷ്പം കാരണം

27. വിശാലമായ സമുദ്രത്തിന്റെയും തുറസ്സായ പ്രദേശങ്ങളുടെയും മുകളിൽ രൂപംകൊള്ളുന്ന വായു ഏത് പേരിലറിയപ്പെടുന്നു?

a) ആർദ്രത b) വായു സഞ്ചയം.

c) വർഷണം d) മർദ്ദം

28. മഴ പെയ്യുന്നത് പോലെ ആകാശത്തു നിന്നും വീഴുന്ന ചെറിയ ഉരുണ്ട ഐസ് കഷണങ്ങൾ ഏത് പേരിൽ അറിയപ്പെടുന്നു?

a) മഴ
b) ആലിപ്പഴം
c) തുഷാരം
d) മൂടൽമഞ്ഞ്

29. പർവതത്തിൽ കാറ്റ് വീശുന്നതിന്റെ എതിർവശം ഏത് പേരിൽ അറിയപ്പെടുന്നു?

a) മഴനിഴൽ വശം
b) മേഘാവൃതമായ വശം
c) കാറ്റുള്ള വശം
d) ഭൂമധ്യരേഖാ വശം

30. ഏത് ഉയരത്തിലാണ് സിറസ് മേഘങ്ങൾ രൂപപ്പെടാൻ സാധ്യത?

a) 5000 അടിയിൽ താഴെ
b) 5000 നും 10000 അടിക്കും ഇടയിൽ
c) 20000 അടിക്ക് മുകളിൽ
d) തറനിരപ്പിൽ

Appendix B2

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

ACHIEVEMENT TEST IN GEOGRAPHY (PRETEST)

(FINAL ENGLISH)

RESHMA P T
Research Scholar
GCTE Kozhikode

Dr. K RAMAKRISHNAN
Rtd. Associate Professor
GCTE Kozhikode

Class: IX **Subject: Geography** **Unit: Sun the Ultimate Source** **Max Mark: 25** **Time:1Hr**

General Instructions:

- This test paper consists of 25 questions
- Answer all the questions. Each question carry 1 score
- No negative marks for wrong answers

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1. Dense opaque clouds do not transmit sunlight. Which?
   a) Cirrus b) Nimbus
   c) Stratus d) Cumulus
2. By which process is the atmosphere mainly warmed?
   a) Solar radiation b) Terrestrial radiation
   c) Reflection d) Scattering
3. What is the name of the storm that descends like the trunk of an elephant?
   a) Tornado b) Hurricane
   c) Willy Willis d) Typhoon
4. What wind would you feel if you were in a valley at night?
   a) Mountain breeze b) Valley breeze
   c) Sea breeze d) Land breeze
5. What happens to relative humidity if the temperature in an area rises suddenly?
   a) increases b) decreases
   c) Constant d) Varying
6. What is the primary purpose of a barometer
   a) measuring temperature b) measuring humidity
   c) measuring air pressure d) measuring wind speed
7. Which of the following is a planetary wind?
   a) Monsoon b) Loo
   c) Westerlies d) Tornado

8. What is the geographical importance of January 3rd?
   a) The Sun will be at the tropic of cancer
   b) The Sun will be over the equator
   c) Earth is located nearest to the Sun
   d) Earth is located farthest from the Sun
9. Write the single term for the radiation from the sun to the earth.
   a) Insolation b) Terrestrial radiation
   c) Reflection d) Absorption
10. What happens to atmospheric pressure when the sky becomes cloudy?
   a) Increases b) Decreases
   c) No change d) None of these
11. The amount of actual water vapor present in the atmosphere is known by what name?
   a) Absolute humidity b) Relative humidity
   c) Dew point d) Precipitation
12. If the position of the sun is vertically above the equator what is the name given to this condition?
   a) Solstices b) Equinox
   c) Spring d) Seasons
13. What type of wind is monsoon in India?
   a) Westerlies b) Seasonal wind
   c) Local wind d) Trade wind
14. Which of the following is not a form of precipitation?
   a) Snow b) Fog
   c) Rain d) Frost
15. Atmospheric pressure in tropical regions as compared to colder regions?
   a) Will be less b) Will be more
   c) No change d) Will be equal
16. The annual range of temperature is defined as the:
   a) Difference between the highest and lowest temperatures recorded in a day
   b) Average temperature recorded over the course of a year
   c) Difference between the highest and lowest temperatures recorded in a year
   d) Temperature range during the summer season
17. Dew point is a measure of?
   a) Atmospheric pressure b) Air temperature
   c) Relative Humidity d) Moisture content in the air

18. What inferences can you make when the isotherms are widely spaced?
    a) The temperature will be less b) The temperature will be more
    c) No change d) None of these
19. The regions near the earth's surface get warm even after sunset, why?
    a) Due to solar radiation b) Due to terrestrial radiation
    c) Due to convection d) Due to conduction
20. Which of the following is the albedo of the earth?
    a) amount of radiation absorbed by the atmosphere
    b) Terrestrial radiation
    c) amount of radiation reaching the earth
    d) reflected amount of radiation before reaching the earth
21. The temperature in the troposphere decreases by one degree Celsius for every 165 meters of altitude. What is the name of this process?
    a) Normal lapse rate b) Isotherm
    c) Inversion of temperature d) Air drainage
22. Why is there temperature inversion in mountainous regions?
    a) Due to air drainage b) Due to dust particles
    c) Due to gravity d) Due to water vapor
23. The small round pieces of ice that fall from the sky like rain are known by what name?
    a) Rain b) Hail
    c) Frost d) Fog
24. The leeward side of a mountain is often referred to as the?
    a) Rain shadow side b) cloudy side
    c) windy side d) equatorial side
25. Cirrus clouds are most likely to form at what altitude?
    a) Below 5000 feet b) between 5000 and 10000 feet
    c) Above 20000 feet d) at ground level

ACHIEVEMENT TEST IN GEOGRAPHY (PRETEST)

(FINAL MALAYALAM)

RESHMA P T
Research Scholar
GCTE Kozhikode

Dr. K RAMAKRISHNAN
Rtd. Associate Professor
GCTE Kozhikode

Class: IX Subject: Geography Unit: Sun the Ultimate Source Max Mark: 25 Time:1Hr

പൊതു നിർദ്ദേശങ്ങൾ:

- ഈ ടെസ്റ്റ് പേപ്പറിൽ 25 ചോദ്യങ്ങൾ അടങ്ങിയിരിക്കുന്നു
- എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം നൽകുക. ഓരോ ചോദ്യത്തിനും 1 സ്കോർ ഉണ്ടായിരിക്കും
- തെറ്റായ ഉത്തരങ്ങൾക്ക് നെഗറ്റീവ് മാർക്ക് ഇല്ല

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1. സാന്ദ്രത കൂടിയ അതാര്യമായ മേഘങ്ങൾ സൂര്യപ്രകാശം കടത്തിവിടുന്നില്ല. ഏത്?
   a) സിറസ് b) നിംബസ്
   c) സ്ട്രാറ്റസ്. റ) ക്യുമുലസ്
2. അന്തരീക്ഷം പ്രധാനമായും ചൂടാകുന്ന പ്രക്രിയ ഏത്?
   a) സൗരവികിരണം b) ഭൗമ താപവികിരണം
   c) പ്രതിഫലനം d) പ്രസരണം
3. ആനയുടെ തുമ്പിക്കൈ പോലെ താഴേക്കിറങ്ങി വരുന്ന കൊടുങ്കാറ്റ് ഏത് പേരിൽ അറിയപ്പെടുന്നു?
   a) ടൊർണാഡോ b) ഹരിക്കെയിൻ.
   c) വില്ലി വില്ലിസ് d) ടൈഫൂൺ
4. രാത്രി സമയത്ത് നിങ്ങൾ താഴ്വരയിൽ ആണെങ്കിൽ നിങ്ങൾക്ക് അനുഭവപ്പെടുന്ന കാറ്റ് ഏതായിരിക്കും?
   a) പർവ്വത കാറ്റ് b) താഴ്വര കാറ്റ്
   c) കടൽ കാറ്റ് d) കരക്കാറ്റ്
5. ഒരു പ്രദേശത്തെ ഊഷ്മാവ് പെട്ടെന്ന് കൂടുകയാണെങ്കിൽ ആപേക്ഷിക ആർദ്രത യ്ക്ക് എന്ത് സംഭവിക്കും?
   a) കൂടുന്നു b) കുറയുന്നു
   c) സ്ഥിരമായിരിക്കും d) മാറിക്കൊണ്ടിരിക്കും
6. ഒരു ബാരോമീറ്ററിന്റെ പ്രാഥമിക ലക്ഷ്യം എന്താണ്
   a) താപനില അളക്കുന്നു b) ഈർപ്പം അളക്കുന്നു
   c) വായു മർദ്ദം അളക്കൽ d) കാറ്റിന്റെ വേഗത അളക്കൽ
7. താഴെ കൊടുത്തവയിൽ ഏതാണ് സ്ഥിര വാതങ്ങളിൽ പെടുന്നത്?
   a) മൺസൂൺ b) ലൂ
   c) പശ്ചിമവാതങ്ങൾ d) ടൊർണാഡോ

8. ജനുവരി 3 ന്റെ ഭൂമിശാസ്ത്രപരമായ പ്രത്യേകത എന്ത്?

a) സൂര്യൻ ഉത്തരായന രേഖയ്ക്ക് നേരെയാണ്

b) സൂര്യൻ ഭൂമധ്യരേഖയ്ക്ക് നേരെയാണ്

c) ഭൂമി സൂര്യനോട് അടുത്ത് സ്ഥിതി ചെയ്യുന്നു

d) ഭൂമി സൂര്യനിൽ നിന്നും അകലെ സ്ഥിതിചെയ്യുന്നു

9. സൂര്യനിൽ നിന്നും ഭൂമിയിലേക്ക് വരുന്ന വികിരണത്തിന്റെ ഒറ്റപ്പദം എഴുതുക.

a) സൗരവികിരണം b) ഭൗമവികിരണം

c) പ്രതിഫലനം d) ആഗിരണം

10. ആകാശം മേഘാവൃതം ആകുമ്പോൾ അന്തരീക്ഷ മർദ്ദത്തിന് എന്ത് സംഭവിക്കും?

a) കൂടുന്നു b) കുറയുന്നു

c) മാറ്റമില്ല d) ഇവയൊന്നുമല്ല

11. അന്തരീക്ഷത്തിൽ അടങ്ങിയിരിക്കുന്ന യഥാർത്ഥ ജലബാഷ്പത്തിന്റെ അളവ് ഏത് പേരിൽ അറിയപ്പെടുന്നു?

a) കേവല ആർദ്രത b) ആപേക്ഷിക ആർദ്രത

c) തുഷാരാങ്കം d) വർഷണം

12. സൂര്യന്റെ സ്ഥാനം ഭൂമധ്യരേഖയ്ക്ക് നേരെ ആണെങ്കിൽ ഈ അവസ്ഥയ്ക്ക് പറയുന്ന പേര് എന്ത്?

a) അയനാന്തം b) സമരാത്രങ്ങൾ

c) വസന്തം. d) ഋതുക്കൾ

13. ഇന്ത്യയിൽ ലഭിക്കുന്ന മൺസൂൺ ഏത് തരം കാറ്റാണ്?

a) പശ്ചിമവാതങ്ങൾ b) കാലികവാതങ്ങൾ

c) പ്രാദേശികവാതങ്ങൾ d) വാണിജ്യവാതങ്ങൾ

14. താഴെ കൊടുത്തവയിൽ ഏതാണ് വർഷണരൂപം അല്ലാത്തത്?

a) മഞ്ഞ് b) മൂടൽമഞ്ഞ്

c) മഴ d) തുഷാരം

15. തണുപ്പേറിയ പ്രദേശങ്ങളെ അപേക്ഷിച്ച് ഉഷ്ണമേഖലാ പ്രദേശങ്ങളിൽ അന്തരീക്ഷമർദ്ദം?

a) കുറവായിരിക്കും b) കൂടുതലായിരിക്കും

c) മാറ്റമില്ല d) തുല്യമായിരിക്കും

16. താപനിലയുടെ വാർഷിക താപാന്തരം നിർവചിച്ചിരിക്കുന്നത്:

a) ഒരു ദിവസം രേഖപ്പെടുത്തിയ ഏറ്റവും ഉയർന്നതും താഴ്ന്നതുമായ താപനിലകൾ തമ്മിലുള്ള വ്യത്യാസം

b) ഒരു വർഷത്തിനിടെ രേഖപ്പെടുത്തിയ ശരാശരി താപനില

c) ഒരു വർഷത്തിൽ രേഖപ്പെടുത്തിയ ഏറ്റവും ഉയർന്നതും താഴ്ന്നതുമായ താപനിലകൾ തമ്മിലുള്ള വ്യത്യാസം

d) വേനൽക്കാലത്ത് താപനില പരിധി

17. തുഷാരാങ്കം (dew point) ഒരു അളവുകോലാണ്. ഏതിന്റെ?

a) അന്തരീക്ഷമർദ്ദം b) വായുവിന്റെ താപനില

c) ആപേക്ഷിക ആർദ്രത d) വായുവിലെ ഈർപ്പം

18. ഒരു സ്ഥലത്തെ സമതാപ രേഖകൾ തമ്മിലുള്ള അകലം കൂടുതൽ ആണെങ്കിൽ അതിൽ നിന്നും നിങ്ങൾക്ക് എന്ത് അനുമാനിക്കാൻ കഴിയും?

a) താപം കുറവായിരിക്കും b) താപം കൂടുതലായിരിക്കും

c) മാറ്റമുണ്ടാകില്ല d) ഇവയൊന്നുമല്ല

19. ഭൂമിയുടെ ഉപരിതലത്തിനോട് ചേർന്ന പ്രദേശങ്ങളിൽ സൂര്യാസ്തമയത്തിന് ശേഷവും ചൂട് ലഭിക്കുന്നു, എന്തുകൊണ്ട്?

a) സൗരവികിരണം കാരണം b) ഭൗമ താപവികിരണം കാരണം

c) സംവഹനം കാരണം d) സംനയനം കാരണം

20. താഴെ കൊടുത്തവയിൽ ഏതാണ് ഭൂമിയുടെ ആൽബഡോ?

a) അന്തരീക്ഷം ആഗിരണം ചെയ്യുന്ന സൗരോർജ്ജം

b) ഭൗമവികിരണം

c) ഭൂമിയിലെത്തുന്ന സൗരോർജ്ജം

d) ഭൂമിയിലെത്തും മുൻപ് പ്രതിഫലിപ്പിക്കപ്പെടുന്ന സൗരോർജ്ജം

21. ട്രോപ്പോസ്ഫിയറിലെ താപനില ഓരോ 165 മീറ്റർ ഉയരത്തിലും ഒരു ഡിഗ്രി സെൽഷ്യസ് എന്ന തോതിൽ കുറയുന്നു. ഈ പ്രക്രിയയുടെ പേരെന്ത്?

a) നോർമൽ ലാപ്സ് റേറ്റ് b) സമതാപരേഖ

c) താപവൈപരീത്യം d) വായുനിർഗമനം

22. പർവ്വത പ്രദേശങ്ങളിൽ താപവൈപരീത്യംഉണ്ടാകുന്നത് എന്തുകൊണ്ട്?

a) വായു നിർഗമനം കാരണം b) പൊടിപടലങ്ങൾ കാരണം

c) ഗുരുത്വാകർഷണം കാരണം d) ജലബാഷ്പം കാരണം

23. മഴ പെയ്യുന്നത് പോലെ ആകാശത്തു നിന്നും വീഴുന്ന ചെറിയ ഉരുണ്ട ഐസ് കഷണങ്ങൾ ഏത് പേരിൽ അറിയപ്പെടുന്നു?

a) മഴ b) ആലിപ്പഴം

c) തുഷാരം d) മൂടൽമഞ്ഞ്

24. പർവതത്തിൽ കാറ്റ് വീശുന്നതിന്റെ എതിർവശം ഏത് പേരിൽ അറിയപ്പെടുന്നു?

a) മഴനിഴൽ വശം b) മേഘാവൃതമായ വശം

c) കാറ്റുള്ള വശം d) ഭൂമധ്യരേഖാ വശം

25. ഏത് ഉയരത്തിലാണ് സിറസ് മേഘങ്ങൾ രൂപപ്പെടാൻ സാധ്യത?

a) 5000 അടിയിൽ താഴെ b) 5000 നും 10000 അടിക്കും ഇടയിൽ

c) 20000 അടിക്ക് മുകളിൽ d) തറനിരപ്പിൽ

Appendix B3

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE

Research Centre in Education (University of Calicut)

ACHIEVEMENT TEST IN GEOGRAPHY (PRETEST)

RESPONSE SHEET

Name of the student: ……. Gender: Male / Female

Class:…….Subject: ……..Name of the School :……..

Put [✓] mark only on the box corresponding to the right answer

Eg:-If the right answer is C

A	B	C✓	D

Q. NO				
1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D
11	A	B	C	D
12	A	B	C	D
13	A	B	C	D
14	A	B	C	D

Q. NO				
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D
19	A	B	C	D
20	A	B	C	D
21	A	B	C	D
22	A	B	C	D
23	A	B	C	D
24	A	B	C	D
25	A	B	C	D

TOTAL SCORE	

Efficacy of Certain Graphic Organizers

Appendix B4

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

ACHIEVEMENT TEST IN GEOGRAPHY (PRETEST)

SCORING KEY

English

1. b) Nimbus
2. b) Terrestrial radiation
3. a) Tornadoe
4. a) Mountain breeze
5. b) Decreases
6. c) measuring air pressure
7. c) Westerlies
8. c) Earth is located nearest to the Sun
9. a) Insolation
10. b) Decreases
11. a) Absolute humidity
12. b) Equinox
13. b) Seasonal wind
14. d) Frost
15. a) will be less
16. c) Difference between the highest and lowest temperatures recorded in a year
17. d) Moisture content in the air
18. a) The temperature will be less
19. b) Due to terrestrial radiation
20. d) reflected amount of radiation before reaching the earth
21. a) Normal lapse rate
22. a) Due to air drainage
23. b) Hail
24. a) Rain shadow side
25. c) Above 20000 feet

ACHIEVEMENT TEST IN GEOGRAPHY (PRETEST)

SCORING KEY

Malayalam

1. b) നിംബസ്
2. b) ഭൗമ താപവികിരണം
3. a) ടൊർണാഡോ
4. a) പർവത കാറ്റ്
5. b) കുറയുന്നു
6. c) വായു മർദ്ദം അളക്കൽ
7. c) പശ്ചിമവാതങ്ങൾ
8. c) ഭൂമി സൂര്യനോട് അടുത്ത് സ്ഥിതി ചെയ്യുന്നു
9. a) സൗരവികിരണം
10. b) കുറയുന്നു
11. a) കേവല ആർദ്രത
12. b) സമരാത്രങ്ങൾ
13. b) കാലികവാതങ്ങൾ
14. d) തുഷാരം
15. a) കുറവായിരിക്കും
16. c) ഒരു വർഷത്തിൽ രേഖപ്പെടുത്തിയ ഏറ്റവും ഉയർന്നതും താഴ്ന്നതു മായ താപനിലകൾ തമ്മിലുള്ള വ്യത്യാസം
17. d) വായുവിലെ ഈർപ്പം
18. a) താപം കുറവായിരിക്കും
19. b) ഭൗമ താപവികിരണം കാരണം
20. d) ഭൂമിയിലെത്തും മുൻപ് പ്രതിഫലിപ്പിക്കപ്പെടുന്ന സൗരോർജ്ജം
21. a) നോർമൽ ലാപ്സ് റേറ്റ്
22. a) വായു നിർഗമനം കാരണം
23. b) ആലിപ്പഴം
24. a) മഴനിഴൽ വശം
25. c) 20000 അടിക്ക് മുകളിൽ

Appendix C1

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

ACHIEVEMENT TEST IN GEOGRAPHY (POSTTEST)

(DRAFT ENGLISH)

RESHMA P T
Research Scholar
GCTE Kozhikode

Dr. K RAMAKRISHNAN
Rtd. Associate Professor
GCTE Kozhikode

Class: IX **Subject: Geography** **Unit: Sun the Ultimate Source** **Max Mark: 30** **Time:1Hr**

General Instructions:

- This test paper consists of 30 questions
- Answer all the questions. Each question carry 1 score
- No negative marks for wrong answers

1. What would the pressure gradient be if there was no significant pressure difference in adjacent regions?
   a) Pressure gradient will be more
   b) Pressure gradient will be less
   c) There is no change in pressure gradient
   d) The pressure gradient will always change
2. Dark rain clouds found at low altitudes are known by what name?
   a) nimbus b) circus
   c) cumulus d) stratus
3. As the air temperature increases, the air heats up, expands and rises. What is the name of this process?
   a) Convection b) Advection
   c) Conduction d) Terrestrial radiation
4. Which of the following cyclones has the highest speed?
   a) Hurricane b) Tornado
   c) Typhoon d) Cyclone
5. If you get a cold breeze while sitting on the beach during the day, what kind of breeze is it?
   a) Sea breeze b) Land breeze
   c) Mountain breeze d) Valley breeze

6. Assume that the relative humidity in the atmosphere is 100%. So what happens to atmospheric temperature?
   a) Atmospheric temperature decreases
   b) Atmospheric temperature increases
   c) Atmospheric temperature will be constant
   d) No change in atmospheric temperature
7. Which of the following would be the climate of the center known as the eye of the cyclone?
   a) Rain with thunder and lightning b) Light wind and clear sky
   c) Extreme weather of cyclone d) Very fast wind
8. The level of mercury in a barometer placed in the open air drops suddenly. What does this indicate?
   a) It is going to rain b) It is going to be a storm
   c) It is going to be very hot d) It is going to be very cold
9. What is the direction of trade winds in the Southern Hemisphere if the direction of Earth's rotation is east-west?
   a) Southwest b) Southeast
   c) Northeast d) Northwest
10. The solar radiation received by the Earth is higher on January 3rd than on July 4th. Why?
    a) Distance between earth and sun is less on July 4
    b) Distance between earth and sun is more on July 4
    c) Distance between Earth and Sun is less on January 3
    d) Distance between Earth and Sun is more on January 3
11. Which type of rainfall occurs in the equatorial regions and in the continental interior of the Northern Hemisphere?
    a) Orographic rainfall b) Convectional rainfall
    c) Frontal rainfall d) Cyclonic rainfall
12. Which of the following has the greatest influence on the intensity of solar radiation?
    a) Altitude above sea level b) Nature of topography
    c) Wind d) Latitude
13. What causes different types of clouds to form at different altitudes in the atmosphere?
    a) Difference in temperature b) Difference in temperature and pressure
    c) Difference in pressure d) Difference in humidity
14. What is the relative humidity at saturation?
    a) 10% b) 70% c) 90% d) 100%

15. During an equinox, which of the following is true?
    a) the earth is closest to the sun
    b) the earth is farthest from the sun
    c) the earth's axial tilt is inclined towards the sun
    d) the axial tilt is not inclined towards the sun
16. Which region is well known for its monsoon season?
    a) Sahara desert b) Amazon Rainforest
    c) Arctic Tundra d) Indian Subcontinent
17. Evaporation is the process by which:
    a) Liquid water is converted into ice
    b) Water vapour condenses to form clouds
    c) Liquid water changes into water vapour
    d) Water vapour absorbs sunlight
18. If atmospheric air rises suddenly and cools to form…….
    a) Mist b) Mist
    c) Hail d) Snow
19. A cool and cloudy day, weather forecasters predict that a high pressure system will move into the region during the next 24 hours. What weather will this system bring to the area?
    a) Storm b) Sunny
    c) Snow d) Hot
20. If the temperature at sea level is 30 degrees Celsius, what will be the temperature at an altitude of 1000 meters?
    a) 18°C b) 20°C c) 17°C d) 19°C
21. Which of the following is dew point?
    a) The amount of actual water vapor in the air
    b) Air that has reached saturated condition
    c) Low pressure system in the lower atmosphere
    d) Temperature required for air to reach saturation
22. Isotherms are more or less parallel in the Southern Hemisphere than in the Northern Hemisphere. What is the reason?
    a) Because it is warmer in the Northern Hemisphere
    b) Because land area is more in Northern Hemisphere
    c) Because it is warmer in the Southern Hemisphere
    d) Because land area is more in Southern Hemisphere
23. The process of heat transfer horizontally by wind is known by what name?
    a) Conduction b) Convection c) Solar radiation d) Advection

24. Part of the solar energy is reflected from the Earth into space. By what name is it known?

    a) Terrestrial radiation b) Solar radiation c) Albedo d) Heat loss

25. If the maximum temperature of a region is 23°C and the minimum temperature is 13°C, what is the annual range of temperature of that region?

    a) 8°C b) 6°C c) 5°C d) 4°C

26. Which of the following is the most suitable situation for the inversion of temperature to occur?

    i) Long nights
    ii) Cloudy sky
    iii) Calm and steady air
    iv) Dry air

    a) i and ii b) i, ii and iii c) ii, iii, and iv d) i, iii and iv

27. cT is one of the letter codes indicating the type of air mass, identify it and write the correct name?

    a) Tropical oceans b) Tropical continents
    c) Polar oceans d) Polar oceans

28. If the temperature of the air is warm, its humidity decreases and becomes …….

    a) Rain b) Sleet
    c) Hail d) Snow

29. The rain shadow region is associated with which of the following rainfall?

    a) Cyclonic rainfall b) Orographic rainfall
    c) Convectional rainfall d) Frontal rainfall

30. Precipitation from cirrus clouds does not reach the earth's surface. What are the reasons?

    i) Due to low density
    ii) Due to less amount of water vapour
    iii) As the vapor turns into ice crystals
    iv) As evaporation takes place

    a) i and ii b) ii and iii
    c) i, ii, iii and iv d) none of these

ACHIEVEMENT TEST IN GEOGRAPHY (PRETEST)

(DRAFT IN MALAYALAM)

RESHMA P T
Research Scholar
GCTE Kozhikode

Dr. K RAMAKRISHNAN
Rtd. Associate Professor
GCTE Kozhikode

Class: IX **Subject: Geography** **Unit: Sun the Ultimate Source** **Max Mark: 30** **Time:1Hr**

പൊതു നിർദ്ദേശങ്ങൾ:

- ഈ ടെസ്റ്റ് പേപ്പറിൽ 30 ചോദ്യങ്ങൾ അടങ്ങിയിരിക്കുന്നു
- എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം നൽകുക. ഓരോ ചോദ്യത്തിനും 1 സ്കോർ ഉണ്ടായിരിക്കും
- തെറ്റായ ഉത്തരങ്ങൾക്ക് നെഗറ്റീവ് മാർക്ക് ഇല്ല

1. സമീപ പ്രദേശങ്ങളിൽ മർദ്ദത്തിന് കാര്യമായ വ്യത്യാസം ഇല്ലെങ്കിൽ മർദ്ദചെരിവ് മാനബലം എപ്രകാരമായിരിക്കും?
   a) മർദ്ദ ചെരിവ് മാനബലം കൂടുതലായിരിക്കും
   b) മർദ്ദ ചെരിവ് മാനബലം കുറവായിരിക്കും
   c) മർദ്ദചെരിവ് മാനബലത്തിൽ മാറ്റമുണ്ടാകില്ല
   d) മർദ്ദ ചെരിവ് മാനബലം മാറിക്കൊണ്ടിരിക്കും
2. താഴ്ന്ന വിതാനങ്ങളിൽ കാണപ്പെടുന്ന ഇരുണ്ട മഴമേഘങ്ങൾ ഏത് പേരിൽ അറിയപ്പെടുന്നു?
   a) നിംബസ് b) സിറസ്
   c) ക്യുമുലസ് d) സ്ട്രാറ്റസ്
3. അന്തരീക്ഷ ഊഷ്മാവ് കൂടുമ്പോൾ വായു ചൂട് പിടിക്കുകയും വികസിക്കുകയും ഉയർന്നു പൊങ്ങുകയും ചെയ്യുന്നു. ഈ പ്രക്രിയയ്ക്ക് പറയുന്ന പേരെന്ത്?
   a) സംവഹനം (convection) b) അഭിവഹനം (advection)
   c) സംനയനം (conduction) d) ഭൗമവികിരണം (terrestrial radiation)
4. താഴെ കൊടുത്ത ചുഴലിക്കാറ്റുകളിൽ ഏതിനാണ് വേഗത ഏറ്റവും കൂടുതൽ?
   a) ഹരിക്കെയിൻ b) ടൊർണാഡോ
   c) ടൈഫൂൺ d) സൈക്ലോൺ
5. പകൽസമയത്ത് ബീച്ചിൽ ഇരിക്കുമ്പോൾ തണുത്ത കാറ്റ് നിങ്ങൾക്ക് ലഭിക്കുന്നു വെങ്കിൽ അത് ഏത് തരം കാറ്റായിരിക്കും?
   a) കടൽക്കാറ്റ് b) കരക്കാറ്റ്
   c) പർവത കാറ്റ് d) താഴ്വര കാറ്റ്
6. അന്തരീക്ഷത്തിലെ ആപേക്ഷിക ആർദ്രത 100% ആണെന്ന് കരുതുക. അപ്പോൾ അന്തരീക്ഷ ഊഷ്മാവിന് എന്ത് സംഭവിക്കും?
   a) അന്തരീക്ഷ ഊഷ്മാവ് കുറയുന്നു
   b) അന്തരീക്ഷ ഊഷ്മാവ് കൂടുന്നു
   c) അന്തരീക്ഷ ഊഷ്മാവ് സ്ഥിരമായിരിക്കും
   d) അന്തരീക്ഷ ഊഷ്മാവിൽ മാറ്റമുണ്ടാകില്ല

7. ചുഴലിക്കാറ്റിന്റെ കണ്ണ് എന്നറിയപ്പെടുന്ന കേന്ദ്രത്തിന്റെ കാലാവസ്ഥ താഴെ കൊടുത്തവയിൽ ഏതായിരിക്കും?

   a) ഇടിമിന്നലോട് കൂടിയ മഴ

   b) നേരിയ കാറ്റും തെളിഞ്ഞ ആകാശവും

   c) ചുഴലികാറ്റിന്റെ ഭീകര കാലാവസ്ഥ

   d) വളരെ വേഗതകൂടിയ കാറ്റ്

8. തുറന്ന അന്തരീക്ഷത്തിൽ വെച്ച ഒരു ബാരോമീറ്ററിലെ രസത്തിന്റെ നില പെട്ടെന്ന് താഴുന്നു. ഇത് എന്തിനെ സൂചിപ്പിക്കുന്നു?

   a) മഴ വരാൻ പോകുന്നു b) കൊടുങ്കാറ്റ് വരാൻ പോകുന്നു

   c) ചൂട് കൂടാൻ പോകുന്നു d) അതിശൈത്യമുണ്ടാകാൻ പോകുന്നു

9. ഭൂമിയുടെ ഭ്രമണ ദിശ കിഴക്ക് പടിഞ്ഞാറ് ആണെങ്കിൽ ദക്ഷിണാർദ്ധഗോളത്തിൽ വാണിജ്യ വാതത്തിന്റെ ദിശ എന്തായിരിക്കും?

   a) തെക്ക് പടിഞ്ഞാറ് b) തെക്ക് കിഴക്ക്

   c) വടക്ക് കിഴക്ക് d) വടക്ക് പടിഞ്ഞാറ്

10. ഭൂമിയിൽ ലഭിക്കുന്ന സൗരവികിരണം ജനുവരി മൂന്നിന് ജൂലായ് നാലിനേക്കാൾ കൂടുതലായിരിക്കും. എന്തുകൊണ്ട്?

    a) ജൂലൈ 4 ന് ഭൂമിയും സൂര്യനും തമ്മിലുള്ള അകലം കുറവാണ്

    b) ജൂലൈ 4 ന് ഭൂമിയും സൂര്യനും തമ്മിലുള്ള അകലം കൂടുതലാണ്

    c) ജനുവരി 3 ന് ഭൂമിയും സൂര്യനും തമ്മിലുള്ള അകലം കുറവാണ്

    d) ജനുവരി 3 ന് ഭൂമിയും സൂര്യനും തമ്മിലുള്ള അകലം കൂടുതലാണ്

11. ഭൂമധ്യരേഖ പ്രദേശങ്ങളിലും ഉത്തരാർദ്ധഗോളത്തിലെ വൻകരകളുടെ ഉൾപ്രദേശങ്ങളിലും അനുഭവപ്പെടുന്ന മഴ ഏതാണ്?

    a) പർവത വൃഷ്ടി b) സംവഹന വൃഷ്ടി

    c) ശൈലവൃഷ്ടി d) ചക്രവാത വൃഷ്ടി

12. താഴെ കൊടുത്തവയിൽ സൗരവികിരണത്തിന്റെ തീവ്രതയെ ഏറ്റവും കൂടുതൽ സ്വാധീനിക്കുന്ന ഘടകം ഏതാണ്?

    a) സമുദ്ര നിരപ്പിൽ നിന്നുള്ള ഉയരം b) ഭൂപ്രകൃതിയുടെ സ്വഭാവം

    c) കാറ്റ് d) അക്ഷാംശം

13. അന്തരീക്ഷത്തിൽ വ്യത്യസ്ത ഉയരങ്ങളിൽ വ്യത്യസ്ത തരം മേഘങ്ങൾ രൂപം കൊള്ളാൻ കാരണമെന്ത്?

    a) ഊഷ്മാവിലുള്ള വ്യത്യാസം

    b) ഊഷ്മാവിലും മർദ്ദത്തിലും ഉള്ള വ്യത്യാസം

    c) മർദ്ദത്തിൽ ഉള്ള വ്യത്യാസം

    d) ആർദ്രതയിൽ ഉള്ള വ്യത്യാസം

14. പൂരിതാവസ്ഥയിൽ ആപേക്ഷിക ആർദ്രത എത്രയായിരിക്കും?

    a) 10% b) 70%

    c) 90% d) 100%

15. സമരാത്രങ്ങൾ (equinox), താഴെ കൊടുത്തവയിൽ ഏതാണ് ശരി?

a) ഭൂമി സൂര്യനോട് ഏറ്റവും അടുത്താണ്

b) ഭൂമി സൂര്യനിൽ നിന്ന് ഏറ്റവും അകലെയാണ്

c) ഭൂമിയുടെ അച്ചുതണ്ടിന്റെ ചരിവ് സൂര്യനിലേക്ക് ചരിഞ്ഞിരിക്കുന്നു

d) അക്ഷീയ ചരിവ് സൂര്യനിലേക്ക് ചായുന്നില്ല

16. മൺസൂൺ കാലത്തിന് പേരുകേട്ട പ്രദേശം?

a) സഹാറ മരുഭൂമി
b) ആമസോൺ മഴക്കാടുകൾ
c) ആർട്ടിക് തുന്ദ
d) ഇന്ത്യൻ ഉപഭൂഖണ്ഡം

17. ബാഷ്പീകരണം താഴെ കൊടുത്തവയിൽ ഏത് പ്രക്രിയയാണ്:

a) ജലം ഐസായി മാറുന്നു

b) ജലബാഷ്പം ഘനീഭവിച്ച് മേഘങ്ങൾ രൂപപ്പെടുന്നു

c) ജലം ജലബാഷ്പമായി മാറുന്നു

d) ജലബാഷ്പം സൂര്യപ്രകാശത്തെ ആഗിരണം ചെയ്യുന്നു

18. അന്തരീക്ഷ വായു പെട്ടെന്ന് തന്നെ മുകളിലേക്ക് ഉയർന്ന് തണുത്താൽ ..... രൂപപ്പെടുന്നു

a) തുഷാരം
b) മൂടൽമഞ്ഞ്
c) ആലിപ്പഴം
d) മഞ്ഞ്

19. തണുത്ത് മേഘാവൃതമായ ഒരു ദിവസം, അടുത്ത 24 മണിക്കൂറിനുള്ളിൽ ഉയർന്ന മർദ്ദ സംവിധാനം ഈ പ്രദേശത്തേക്ക് നീങ്ങുമെന്ന് കാലാവസ്ഥ നിരീക്ഷകർ പ്രവചിക്കുന്നു. ഏത് കാലാവസ്ഥ ആയിരിക്കും ഈ സംവിധാനം പ്രദേശത്തേക്കു കൊണ്ടുവരുന്നത്?

a) കൊടുങ്കാറ്റ്
b) വെയിൽ
c) മഞ്ഞ്
d) ചൂട്

20. സമുദ്രനിരപ്പിൽ ഊഷ്മാവ് 30 ഡിഗ്രി സെൽഷ്യസ് ആണെങ്കിൽ 1000 മീറ്റർ ഉയരത്തിൽ ഊഷ്മാവ് എത്രയായിരിക്കും?

a) 18°C
b) 20°C
c) 17°C
d) 19°C

21. തുഷാരാങ്കം (dew point) ഇവയിൽ ഏതാണ്?

a) വായുവിലെ യഥാർത്ഥ ജലബാഷ്പത്തിന്റെ അളവ്

b) പൂരിത അവസ്ഥയിൽ എത്തിയ വായു

c) അന്തരീക്ഷത്തിന്റെ താഴ്ഭാഗത്ത് ഉണ്ടാകുന്ന ന്യൂനമർദ്ദ വ്യവസ്ഥ

d) വായു പൂരിതാവസ്ഥയിൽ എത്താൻ വേണ്ട ഉഷ്മാവ്

22. ഉത്തരാർദ്ധഗോളത്തെ അപേക്ഷിച്ച് ദക്ഷിണാർദ്ധഗോളത്തിൽ സമതാപ രേഖകൾ ഏറെക്കുറെ സമാന്തരങ്ങൾ ആണ്. കാരണമെന്ത്?

a) ഉത്തരാർദ്ധഗോളത്തിൽ ചൂട് കൂടുതലായതുകൊണ്ട്

b) ഉത്തരാർദ്ധഗോളത്തിൽ കരഭാഗം കൂടുതലായതുകൊണ്ട്

c) ദക്ഷിണാർദ്ധഗോളത്തിൽ ചൂട് കൂടുതലായതുകൊണ്ട്

d) ദക്ഷിണാർദ്ധഗോളത്തിൽ കരഭാഗം കൂടുതലായതുകൊണ്ട്

23. കാറ്റിലൂടെ തിരശ്ചീന തലത്തിൽ താപം വ്യാപിക്കുന്ന പ്രക്രിയ ഏത് പേരിൽ അറിയപ്പെടുന്നു?

a) സംനയനം b) സംവഹനം

c) സൗരവികിരണം d) അഭിവഹനം

24. സൗരോർജ്ജത്തിന്റെ ഒരു ഭാഗം ഭൂമിയിൽ നിന്നും ശൂന്യാകാശത്തിലേക്ക് പ്രതിഫലിക്കുന്നു. ഇത് ഏത് പേരിൽ അറിയപ്പെടുന്നു?

a) ഭൗമ വികിരണം b) സൗരവികിരണം

c) ആൽബഡോ d) താപനഷ്ടം

25. ഒരു പ്രദേശത്തെ കൂടിയ താപനില 23 ഡിഗ്രി സെൽഷ്യസും, കുറഞ്ഞ താപനില 13 ഡിഗ്രി സെൽഷ്യസും ആണെങ്കിൽ ആ പ്രദേശത്തിന്റെ വാർഷിക താപാന്തരം എത്രയായിരിക്കും?

a) 8°C b) 6°C c) 5°C d) 4°C

26. താപ വൈപരീത്യ പ്രഭാവം ഉണ്ടാകുന്നതിന് താഴെ കൊടുത്തവയിൽ ഏതാണ് ഏറ്റവും അനുയോജ്യമായ സാഹചര്യം?

i) ദൈർഘ്യമുള്ള രാത്രികൾ

ii) മേഘാവൃതമായ ആകാശം

iii) ശാന്തവും സ്ഥിരവുമായ വായു

iv) വരണ്ട വായു

a) i and ii b) i, ii and iii

c) ii, iii, and iv d) i, iii and iv

27. വായു സഞ്ചയങ്ങളുടെ തരം കാണിക്കുന്ന അക്ഷര കോഡുകളിൽ ഒന്നാണ് ര0, ഇതേതെന്ന് തിരിച്ചറിഞ്ഞ് ശരിയായ പേര് എഴുതുക?

a) ഉഷ്ണമേഖല സമുദ്രങ്ങൾ b) ഉഷ്ണമേഖല വൻകരകൾ

c) ധ്രുവപ്രദേശ സമുദ്രങ്ങൾ d) ധ്രുവ പ്രദേശ സമുദ്രങ്ങൾ

28. വായുവിന്റെ താപനില ചൂടുള്ളതാണെങ്കിൽ, അതിന്റെ ഈർപ്പം കുറഞ്ഞു ..... ആയിമാറുന്നു.

a) മഴ b) മഴയുടെയും മഞ്ഞിന്റെയും മിശ്രിതം

c) ആലിപ്പഴം d) മഞ്ഞ്

29. മഴനിഴൽ മേഖല താഴെ കൊടുത്തവയിൽ ഏത് മഴയുമായി ബന്ധപ്പെട്ടിരിക്കുന്നു?

a) ചുഴലിക്കാറ്റ് മഴ b) പർവ്വത വൃഷ്ടി

c) സംവഹന വൃഷ്ടി d) വാതമുഖ വൃഷ്ടി

30. സിറസ് മേഘങ്ങളിൽ നിന്നുണ്ടാകുന്ന മഴ ഭൂമിയുടെ ഉപരിതലത്തിൽ എത്താറില്ല. കാരണങ്ങൾ എന്തൊക്കെയാണ്?

i) സാന്ദ്രത കുറവായതുകൊണ്ട്

ii) നീരാവിയുടെ അളവ് കുറവായതു കൊണ്ട്

iii) നീരാവി ഐസ് പരലുകൾ ആയി മാറുന്നത് കൊണ്ട്

iv) ബാഷ്പീകരണം നടക്കുന്നത് കൊണ്ട്

a) i and ii b) ii and iii

c) i, ii, iii and iv d) ഇവയൊന്നുമല്ല

Appendix C2

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

ACHIEVEMENT TEST IN GEOGRAPHY (POSTTEST)

(FINAL ENGLISH)

RESHMA P T
Research Scholar
GCTE Kozhikode

Dr. K RAMAKRISHNAN
Rtd. Associate Professor
GCTE Kozhikode

Class: IX **Subject: Geography** **Unit: Sun the Ultimate Source** **Max Mark: 30** **Time:1Hr**

General Instructions:

- This test paper consists of 30 questions
- Answer all the questions. Each question carry 1 score
- No negative marks for wrong answers

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1. Dark rain clouds found at low altitudes are known by what name?
   a) nimbus b) circus
   c) cumulus d) stratus
2. As the air temperature increases, the air heats up, expands and rises. What is the name of this process?
   a) Convection b) Advection
   c) Conduction d) Terrestrial radiation
3. If you get a cold breeze while sitting on the beach during the day, what kind of breeze is it?
   a) Sea breeze b) Land breeze
   c) Mountain breeze d) Valley breeze
4. Assume that the relative humidity in the atmosphere is 100%. So what happens to atmospheric temperature?
   a) Atmospheric temperature decreases
   b) Atmospheric temperature increases
   c) Atmospheric temperature will be constant
   d) No change in atmospheric temperature
5. Which of the following would be the climate of the center known as the eye of the cyclone?
   a) Rain with thunder and lightning b) Light wind and clear sky
   c) Extreme weather of cyclone d) Very fast wind

6. The level of mercury in a barometer placed in the open air drops suddenly. What does this indicate?
   a) It is going to rain b) It is going to be a storm
   c) It is going to be very hot d) It is going to be very cold
7. The solar radiation received by the Earth is higher on January 3rd than on July 4th. Why?
   a) Distance between earth and sun is less on July 4
   b) Distance between earth and sun is more on July 4
   c) Distance between Earth and Sun is less on January 3
   d) Distance between Earth and Sun is more on January 3
8. Which type of rainfall occurs in the equatorial regions and in the continental interior of the Northern Hemisphere?
   a) Orographic rainfall b) Convectional rainfall
   c) Frontal rainfall d) Cyclonic rainfall
9. Which of the following has the greatest influence on the intensity of solar radiation?
   a) Altitude above sea level b) Nature of topography
   c) Wind d) Latitude
10. What causes different types of clouds to form at different altitudes in the atmosphere?
    a) Difference in temperature b) Difference in temperature and pressure
    c) Difference in pressure d) Difference in humidity
11. What is the relative humidity at saturation?
    a) 10% b) 70% c) 90% d) 100%
12. During an equinox, which of the following is true?
    a) the earth is closest to the sun
    b) the earth is farthest from the sun
    c) the earth's axial tilt is inclined towards the sun
    d) the axial tilt is not inclined towards the sun
13. Which region is well known for its monsoon season?
    a) Sahara desert b) Amazon Rainforest
    c) Arctic Tundra d) Indian Subcontinent
14. Evaporation is the process by which:
    a) Liquid water is converted into ice
    b) Water vapour condenses to form clouds
    c) Liquid water changes into water vapour
    d) Water vapour absorbs sunlight
15. If atmospheric air rises suddenly and cools to form…….
    a) Mist b) Mist c) Hail d) Snow

16. A cool and cloudy day, weather forecasters predict that a high pressure system will move into the region during the next 24 hours. What weather will this system bring to the area?

    a) Storm b) Sunny c) Snow d) Hot

17. If the temperature at sea level is 30 degrees Celsius, what will be the temperature at an altitude of 1000 meters?

    a) 18°C b) 20°C c) 17°C d) 19°C

18. Which of the following is dew point?

    a) The amount of actual water vapor in the air
    b) Air that has reached saturated condition
    c) Low pressure system in the lower atmosphere
    d) Temperature required for air to reach saturation

19. Isotherms are more or less parallel in the Southern Hemisphere than in the Northern Hemisphere. What is the reason?

    a) Because it is warmer in the Northern Hemisphere
    b) Because land area is more in Northern Hemisphere
    c) Because it is warmer in the Southern Hemisphere
    d) Because land area is more in Southern Hemisphere

20. The process of heat transfer horizontally by wind is known by what name?

    a) Conduction b) Convection c) Solar radiation d) Advection

21. Part of the solar energy is reflected from the Earth into space. By what name is it known?

    a) Terrestrial radiation b) Solar radiation c) Albedo d) Heat loss

22. If the maximum temperature of a region is 23°C and the minimum temperature is 13°C, what is the annual range of temperature of that region?

    a) 8°C b) 6°C c) 5°C d) 4°C

23. Which of the following is the most suitable situation for the inversion of temperature to occur?

    i) Long nights
    ii) Cloudy sky
    iii) Calm and steady air
    iv) Dry air

    a) i and ii b) i, ii and iii c) ii, iii, and iv d) i, iii and iv

24. If the temperature of the air is warm, its humidity decreases and becomes …….

    a) Rain b) Sleet c) Hail d) Snow

25. The rain shadow region is associated with which of the following rainfall?

    a) Cyclonic rainfall b) Orographic rainfall
    c) Convectional rainfall d) Frontal rainfall

ACHIEVEMENT TEST IN GEOGRAPHY (POSTTEST)

(FINAL IN MALAYALAM)

RESHMA P T
Research Scholar
GCTE Kozhikode

Dr. K RAMAKRISHNAN
Rtd. Associate Professor
GCTE Kozhikode

Class: IX Subject: Geography Unit: Sun the Ultimate Source Max Mark: 30 Time:1Hr

പൊതു നിർദ്ദേശങ്ങൾ:

- ഈ ടെസ്റ്റ് പേപ്പറിൽ 30 ചോദ്യങ്ങൾ അടങ്ങിയിരിക്കുന്നു
- എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം നൽകുക. ഓരോ ചോദ്യത്തിനും 1 സ്കോർ ഉണ്ടായിരിക്കും
- തെറ്റായ ഉത്തരങ്ങൾക്ക് നെഗറ്റീവ് മാർക്ക് ഇല്ല

1. താഴ്ന്ന വിതാനങ്ങളിൽ കാണപ്പെടുന്ന ഇരുണ്ട മഴമേഘങ്ങൾ ഏത് പേരിൽ അറിയപ്പെടുന്നു?

   a) നിംബസ് b) സിറസ്

   c) ക്യുമുലസ് d) സ്ട്രാറ്റസ്

2. അന്തരീക്ഷ ഊഷ്മാവ് കൂടുമ്പോൾ വായു ചൂട് പിടിക്കുകയും വികസിക്കുകയും ഉയർന്നു പൊങ്ങുകയും ചെയ്യുന്നു. ഈ പ്രക്രിയയ്ക്ക് പറയുന്ന പേരെന്ത്?

   a) സംവഹനം (convection) b) അഭിവഹനം (advection)

   c) സംനയനം (conduction) d) ഭൗമവികിരണം (terrestrial radiation)

3. പകൽസമയത്ത് ബീച്ചിൽ ഇരിക്കുമ്പോൾ തണുത്ത കാറ്റ് നിങ്ങൾക്ക് ലഭിക്കുന്നു വെങ്കിൽ അത് ഏത് തരം കാറ്റായിരിക്കും?

   a) കടൽക്കാറ്റ് b) കരക്കാറ്റ്

   c) പർവത കാറ്റ് d) താഴ്വര കാറ്റ്

4. അന്തരീക്ഷത്തിലെ ആപേക്ഷിക ആർദ്രത 100% ആണെന്ന് കരുതുക. അപ്പോൾ അന്തരീക്ഷ ഊഷ്മാവിന് എന്ത് സംഭവിക്കും?

   a) അന്തരീക്ഷ ഊഷ്മാവ് കുറയുന്നു

   b) അന്തരീക്ഷ ഊഷ്മാവ് കൂടുന്നു

   c) അന്തരീക്ഷ ഊഷ്മാവ് സ്ഥിരമായിരിക്കും

   d) അന്തരീക്ഷ ഊഷ്മാവിൽ മാറ്റമുണ്ടാകില്ല

5. ചുഴലിക്കാറ്റിന്റെ കണ്ണ് എന്നറിയപ്പെടുന്ന കേന്ദ്രത്തിന്റെ കാലാവസ്ഥ താഴെ കൊടുത്തവയിൽ ഏതായിരിക്കും?

   a) ഇടിമിന്നലോട് കൂടിയ മഴ

   b) നേരിയ കാറ്റും തെളിഞ്ഞ ആകാശവും

   c) ചുഴലികാറ്റിന്റെ ഭീകര കാലാവസ്ഥ

   d) വളരെ വേഗതകൂടിയ കാറ്റ്

6. തുറന്ന അന്തരീക്ഷത്തിൽ വെച്ച ഒരു ബാരോമീറ്ററിലെ രസത്തിന്റെ നില പെട്ടെന്ന് താഴുന്നു. ഇത് എന്തിനെ സൂചിപ്പിക്കുന്നു?

a) മഴ വരാൻ പോകുന്നു
b) കൊടുങ്കാറ്റ് വരാൻ പോകുന്നു
c) ചൂട് കൂടാൻ പോകുന്നു
d) അതിശൈത്യമുണ്ടാകാൻ പോകുന്നു

7. ഭൂമിയിൽ ലഭിക്കുന്ന സൗരവികിരണം ജനുവരി മൂന്നിന് ജൂലായ് നാലിനേക്കാൾ കൂടുതലായിരിക്കും. എന്തുകൊണ്ട്?

a) ജൂലൈ 4 ന് ഭൂമിയും സൂര്യനും തമ്മിലുള്ള അകലം കുറവാണ്
b) ജൂലൈ 4 ന് ഭൂമിയും സൂര്യനും തമ്മിലുള്ള അകലം കൂടുതലാണ്
c) ജനുവരി 3 ന് ഭൂമിയും സൂര്യനും തമ്മിലുള്ള അകലം കുറവാണ്
d) ജനുവരി 3 ന് ഭൂമിയും സൂര്യനും തമ്മിലുള്ള അകലം കൂടുതലാണ്

8. ഭൂമധ്യരേഖ പ്രദേശങ്ങളിലും ഉത്തരാർദ്ധഗോളത്തിലെ വൻകരകളുടെ ഉൾപ്രദേശങ്ങളിലും അനുഭവപ്പെടുന്ന മഴ ഏതാണ്?

a) പർവത വൃഷ്ടി
b) സംവഹന വൃഷ്ടി
c) ശൈലവൃഷ്ടി
d) ചക്രവാത വൃഷ്ടി

9. താഴെ കൊടുത്തവയിൽ സൗരവികിരണത്തിന്റെ തീവ്രതയെ ഏറ്റവും കൂടുതൽ സ്വാധീനിക്കുന്ന ഘടകം ഏതാണ്?

a) സമുദ്ര നിരപ്പിൽ നിന്നുള്ള ഉയരം
b) ഭൂപ്രകൃതിയുടെ സ്വഭാവം
c) കാറ്റ്
d) അക്ഷാംശം

10. അന്തരീക്ഷത്തിൽ വ്യത്യസ്ത ഉയരങ്ങളിൽ വ്യത്യസ്ത തരം മേഘങ്ങൾ രൂപം കൊള്ളാൻ കാരണമെന്ത്?

a) ഊഷ്മാവിലുള്ള വ്യത്യാസം
b) ഊഷ്മാവിലും മർദ്ദത്തിലും ഉള്ള വ്യത്യാസം
c) മർദ്ദത്തിൽ ഉള്ള വ്യത്യാസം
d) ആർദ്രതയിൽ ഉള്ള വ്യത്യാസം

11. പൂരിതാവസ്ഥയിൽ ആപേക്ഷിക ആർദ്രത എത്രയായിരിക്കും?

a) 10%
b) 70%
c) 90%
d) 100%

12. സമരാത്രങ്ങൾ (equinox), താഴെ കൊടുത്തവയിൽ ഏതാണ് ശരി?

a) ഭൂമി സൂര്യനോട് ഏറ്റവും അടുത്താണ്
b) ഭൂമി സൂര്യനിൽ നിന്ന് ഏറ്റവും അകലെയാണ്
c) ഭൂമിയുടെ അച്ചുതണ്ടിന്റെ ചരിവ് സൂര്യനിലേക്ക് ചരിഞ്ഞിരിക്കുന്നു
d) അക്ഷീയ ചരിവ് സൂര്യനിലേക്ക് ചായുന്നില്ല

13. മൺസൂൺ കാലത്തിന് പേരുകേട്ട പ്രദേശം?

a) സഹാറ മരുഭൂമി
b) ആമസോൺ മഴക്കാടുകൾ
c) ആർട്ടിക് തുന്ദ
d) ഇന്ത്യൻ ഉപഭൂഖണ്ഡം

14. ബാഷ്പീകരണം താഴെ കൊടുത്തവയിൽ ഏത് പ്രക്രിയയാണ്:

a) ജലം ഐസായി മാറുന്നു
b) ജലബാഷ്പം ഘനീഭവിച്ച് മേഘങ്ങൾ രൂപപ്പെടുന്നു
c) ജലം ജലബാഷ്പമായി മാറുന്നു
d) ജലബാഷ്പം സൂര്യപ്രകാശത്തെ ആഗിരണം ചെയ്യുന്നു

15. അന്തരീക്ഷ വായു പെട്ടെന്ന് തന്നെ മുകളിലേക്ക് ഉയർന്ന് തണുത്താൽ ..... രൂപ പ്പെടുന്നു

a) തുഷാരം b) മൂടൽമഞ്ഞ്

c) ആലിപ്പഴം d) മഞ്ഞ്

16. തണുത്ത് മേഘാവൃതമായ ഒരു ദിവസം, അടുത്ത 24 മണിക്കൂറിനുള്ളിൽ ഉയർന്ന മർദ്ദ സംവിധാനം ഈ പ്രദേശത്തേക്ക് നീങ്ങുമെന്ന് കാലാവസ്ഥ നിരീക്ഷകർ പ്രവ ചിക്കുന്നു. ഏത് കാലാവസ്ഥ ആയിരിക്കും ഈ സംവിധാനം പ്രദേശത്തേക്കു കൊണ്ടുവരുന്നത്?

a) കൊടുങ്കാറ്റ് b) വെയിൽ

c) മഞ്ഞ് d) ചൂട്

17. സമുദ്രനിരപ്പിൽ ഊഷ്മാവ് 30 ഡിഗ്രി സെൽഷ്യസ് ആണെങ്കിൽ 1000 മീറ്റർ ഉയരത്തിൽ ഊഷ്മാവ് എത്രയായിരിക്കും?

a) 18°C b) 20°C

c) 17°C d) 19°C

18. തുഷാരാങ്കം (റലം ുീശി്ല) ഇവയിൽ ഏതാണ്?

a) വായുവിലെ യഥാർത്ഥ ജലബാഷ്പത്തിന്റെ അളവ്

b) പൂരിത അവസ്ഥയിൽ എത്തിയ വായു

c) അന്തരീക്ഷത്തിന്റെ താഴ്ഭാഗത്ത് ഉണ്ടാകുന്ന ന്യൂനമർദ്ദ വ്യവസ്ഥ

d) വായു പൂരിതാവസ്ഥയിൽ എത്താൻ വേണ്ട ഉഷ്മാവ്

19. ഉത്തരാർദ്ധഗോളത്തെ അപേക്ഷിച്ച് ദക്ഷിണാർദ്ധഗോളത്തിൽ സമതാപ രേഖകൾ ഏറെക്കുറെ സമാന്തരങ്ങൾ ആണ്. കാരണമെന്ത്?

a) ഉത്തരാർദ്ധഗോളത്തിൽ ചൂട് കൂടുതലായതുകൊണ്ട്

b) ഉത്തരാർദ്ധഗോളത്തിൽ കരഭാഗം കൂടുതലായതുകൊണ്ട്

c) ദക്ഷിണാർദ്ധഗോളത്തിൽ ചൂട് കൂടുതലായതുകൊണ്ട്

d) ദക്ഷിണാർദ്ധഗോളത്തിൽ കരഭാഗം കൂടുതലായതുകൊണ്ട്

20. കാറ്റിലൂടെ തിരശ്ചീന തലത്തിൽ താപം വ്യാപിക്കുന്ന പ്രക്രിയ ഏത് പേരിൽ അറിയ പ്പെടുന്നു?

a) സംനയനം b) സംവഹനം

c) സൗരവികിരണം d) അഭിവഹനം

21. സൗരോർജ്ജത്തിന്റെ ഒരു ഭാഗം ഭൂമിയിൽ നിന്നും ശൂന്യാകാശത്തിലേക്ക് പ്രതിഫലി ക്കുന്നു. ഇത് ഏത് പേരിൽ അറിയപ്പെടുന്നു?

a) ഭൗമ വികിരണം b) സൗരവികിരണം

c) ആൽബഡോ d) താപനഷ്ടം

22. ഒരു പ്രദേശത്തെ കൂടിയ താപനില 23 ഡിഗ്രി സെൽഷ്യസും, കുറഞ്ഞ താപനില 13 ഡിഗ്രി സെൽഷ്യസും ആണെങ്കിൽ ആ പ്രദേശത്തിന്റെ വാർഷിക താപാന്തരം എത്രയായിരിക്കും?

a) 8°C b) 6°C c) 5°C d) 4°C

23. താപ വൈപരീത്യ പ്രഭാവം ഉണ്ടാകുന്നതിന് താഴെ കൊടുത്തവയിൽ ഏതാണ് ഏറ്റവും അനുയോജ്യമായ സാഹചര്യം?

i) ദൈർഘ്യമുള്ള രാത്രികൾ

ii) മേഘാവൃതമായ ആകാശം

iii) ശാന്തവും സ്ഥിരവുമായ വായു

iv) വരണ്ട വായു

a) i and ii
b) i, ii and iii
c) ii, iii, and iv
d) i, iii and iv

24. വായുവിന്റെ താപനില ചൂടുള്ളതാണെങ്കിൽ, അതിന്റെ ഈർപ്പം കുറഞ്ഞു ..... ആയിമാറുന്നു.

a) മഴ
b) മഴയുടെയും മഞ്ഞിന്റെയും മിശ്രിതം
c) ആലിപ്പഴം
d) മഞ്ഞ്

25. മഴനിഴൽ മേഖല താഴെ കൊടുത്തവയിൽ ഏത് മഴയുമായി ബന്ധപ്പെട്ടിരിക്കുന്നു?

a) ചുഴലിക്കാറ്റ് മഴ
b) പർവ്വത വൃഷ്ടി
c) സംവഹന വൃഷ്ടി
d) വാതമുഖ വൃഷ്ടി

Efficacy of Certain Graphic Organizers

Appendix C3

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE

Research Centre in Education (University of Calicut)

ACHIEVEMENT TEST IN GEOGRAPHY (POSTTEST)

RESPONSE SHEET

Name of the student: ……. Gender: Male / Female

Class:…….Subject: ……..Name of the School :……..

Put [✓] mark only on the box corresponding to the right answer

Eg:-If the right answer is C

A	B	✓C	D

Q. NO				
1	A	B	C	D
2	A	B	C	D
3	A	B	C	D
4	A	B	C	D
5	A	B	C	D
6	A	B	C	D
7	A	B	C	D
8	A	B	C	D
9	A	B	C	D
10	A	B	C	D
11	A	B	C	D
12	A	B	C	D
13	A	B	C	D
14	A	B	C	D

Q. NO				
15	A	B	C	D
16	A	B	C	D
17	A	B	C	D
18	A	B	C	D
19	A	B	C	D
20	A	B	C	D
21	A	B	C	D
22	A	B	C	D
23	A	B	C	D
24	A	B	C	D
25	A	B	C	D

TOTAL SCORE	

Efficacy of Certain Graphic Organizers

Appendix C4

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

ACHIEVEMENT TEST IN GEOGRAPHY (POSTTEST)

SCORING KEY

(English)

1. b) Nimbus
2. a) Convection
3. a) Sea breeze
4. b) Atmospheric temperature increases
5. b) Light wind and clear sky
6. b) It is going to be a storm
7. c) Distance between Earth and Sun is less on January 3
8. b) Convectional rainfall
9. b) Nature of topography
10. b) Difference in temperature and pressure
11. d) 100%
12. c) the earth's axial tilt is inclined towards the sun
13. d) Indian Subcontinent
14. c) Liquid water changes into water vapour
15. c) hail
16. b) Sunny
17. c) 17°C
18. d) Temperature required for air to reach saturation
19. b) Because land area is more in Northern Hemisphere
20. d) Advection
21. c) Albedo
22. c) 5°C
23. d) i, iii and iv
24. b) Sleet
25. b) Orographic rainfall

ACHIEVEMENT TEST IN GEOGRAPHY (POSTTEST)

SCORING KEY

(Malayalam)

1. a) നിംബസ്
2. a) സംവഹനം (convection)
3. a) കടൽക്കാറ്റ്
4. b) അന്തരീക്ഷ ഊഷ്മാവ് കൂടുന്നു
5. b) നേരിയ കാറ്റും തെളിഞ്ഞ ആകാശവും
6. b) കൊടുങ്കാറ്റ് വരാൻ പോകുന്നു
7. c) ജനുവരി 3 ന് ഭൂമിയും സൂര്യനും തമ്മിലുള്ള അകലം കുറവാണ്
8. b) സംവഹന വൃഷ്ടി
9. b) ഭൂപ്രകൃതിയുടെ സ്വഭാവം
10. b) ഊഷ്മാവിലും മർദ്ദത്തിലും ഉള്ള വ്യത്യാസം
11. d) 100%
12. c) ഭൂമിയുടെ അച്ചുതണ്ടിന്റെ ചരിവ് സൂര്യനിലേക്ക് ചരിഞ്ഞിരിക്കുന്നു
13. d) ഇന്ത്യൻ ഉപഭൂഖണ്ഡം
14. c) ജലം ജലബാഷ്പമായി മാറുന്നു
15. c) ആലിപ്പഴം
16. b) വെയിൽ
17. c) 17°C
18. d) വായു പൂരിതാവസ്ഥയിൽ എത്താൻ വേണ്ട ഉഷ്മാവ്
19. b) ഉത്തരാർദ്ധഗോളത്തിൽ കരഭാഗം കൂടുതലായതുകൊണ്ട്
20. d) അഭിവഹനം
21. c) ആൽബഡോ
22. c) 5°C
23. d) i, iii and iv
24. b) മഴയുടെയും മഞ്ഞിന്റെയും മിശ്രിതം
25. b) പർവ്വത വൃഷ്ടി

Appendix D1

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

TEST OF PROBLEM SOLVING ABILITY IN GEOGRAPHY (PRETEST)

(DRAFT ENGLISH)

RESHMA P T
Research Scholar
GCTE Kozhikode

Dr. K RAMAKRISHNAN
Rtd. Associate Professor
GCTE Kozhikode

Class: IX Subject: Geography Unit: Sun the Ultimate Source Max Mark: 35 Time:1.30hrs

General Instructions:

- This test paper consists of 35 questions
- Answer all the questions. Each question carry 1 score
- Draw a tick mark beside the correct answer
- No negative marks for wrong answers

1. Which location receives more solar radiation?
   a) Location A (coastal area): Solar radiation received = 800 W/m², Average temperature = 28°C
   b) Location B (inland area): Solar radiation received = 1000 W/m², Average temperature = 35°C
   ☐ a) Location A ☐ b) Location B
2. Which area experiences a higher heat absorption due to its lower albedo?
   a) Urban Area: Albedo = 0.15, Heat absorbed by surfaces = 4500 W/m²
   b) Rural Area: Albedo = 0.25, Heat absorbed by surfaces = 3500 W/m²
   ☐ a) Urban Area ☐ b) Rural Area
3. What is the temperature lapse rate per 1000 meters of altitude increase?
   Altitude 0 meters: Temperature = 30°C
   Altitude 1000 meters: Temperature = 20°C
   ☐ a) 1°C per 1000 meters ☐ b) 2°C per 1000 meters
   ☐ c) 5°C per 1000 meters ☐ d) 10°C per 1000 meters
4. Define aphelion and perihelion in relation to Earth's orbit. (Use the information below)
   Aphelion: distance between sun and earth = 152 million km
   Perihelion: distance between sun and earth = 147 million km
   ☐ a) Aphelion is when Earth is closest to the Sun, and perihelion is when Earth is farthest from the Sun.
   ☐ b) Aphelion is when Earth is farthest from the Sun, and perihelion is when Earth is closest to the Sun.
   ☐ c) Both aphelion and perihelion refer to the same point in Earth's orbit.

5. Explain the relationship between Earth's distance from the Sun and its temperature during aphelion and perihelion. (Use the information below)

   Aphelion: Earth experiences aphelion on July 4th.

   Perihelion: Earth experiences perihelion on January 3rd.

   ☐ a) Earth is hotter during aphelion due to its closer distance to the Sun.

   ☐ b) Earth is hotter during perihelion due to its closer distance to the Sun.

   ☐ c) Earth is cooler during aphelion due to its farther distance from the Sun.

   ☐ d) Earth's distance from the Sun has no impact on temperature.

6. Conduction and convection are associated with atmospheric temperature changes, then which is the most accurate definition?"

   ☐ a) Conduction is the transfer of heat through a fluid, and convection is the transfer of heat through solids.

   ☐ b) Conduction is the transfer of heat through solids, and convection is the transfer of heat through a fluid.

   ☐ c) Conduction and convection both refer to the same process of heat transfer.

7. What is the reason behind urban areas experiencing higher temperatures than rural areas during both daytime and nighttime? Here are some of the special characteristics of urban and rural areas. Taking them as a basis, please write the answer.

   * Urban areas have more concrete, asphalt, and buildings that absorb and retain heat.

   * Rural areas have more vegetation and open spaces that provide shade and coolness.

   ☐ a) Urban areas have more trees and vegetation that release heat.

   ☐ b) Urban areas have more concrete and buildings that reflect heat.

   ☐ c) Urban areas have more heat-absorbing surfaces and less vegetation.

8. Identify three main factors that control the temperature distribution on Earth

   ☐ a) Distance from the Equator, altitude, and ocean currents

   ☐ b) Wind speed, humidity, and cloud cover

   ☐ c) Soil type, vegetation, and pollution

9. The details given below as a basis; explain how altitude affects atmospheric temperature.

   *As altitude increases, the atmospheric pressure decreases.

   *Temperature decreases with increasing altitude in the troposphere.

   ☐ a) As altitude increases, atmospheric pressure and temperature both increase.

   ☐ b) As altitude increases, atmospheric pressure decreases and temperature increases.

   ☐ c) As altitude increases, atmospheric pressure decreases and temperature decreases.

10."To represent the uniqueness of temperature, climate maps utilize annotations to correlate certain regions, using markings to connect certain areas in the climate map." The lines known as "isotherms" in a climate map represent what?

☐ a) Lines connecting places with the same atmospheric pressure.

☐ b) Lines connecting places with the same temperature.

☐ c) Lines indicating wind speed and direction.

11. Temperature inversions often occur on calm, clear nights. “During a temperature inversion, the normal temperature lapse rate is reversed”. Describe the typical temperature lapse rate in the atmosphere.

☐ a) Temperature increases with increasing altitude.

☐ b) Temperature decreases with increasing altitude.

☐ c) Temperature remains constant with increasing altitude.

12. Explain how atmospheric pressure changes with altitude.

*Atmospheric pressure is the force exerted by the weight of the air above us.

☐ a) Atmospheric pressure increases with increasing altitude.

☐ b) Atmospheric pressure decreases with increasing altitude.

☐ c) Atmospheric pressure remains constant at all altitudes.

13. With provided details; describe the characteristics of a low-pressure system.

*Low-pressure systems are associated with cloudy and rainy weather.

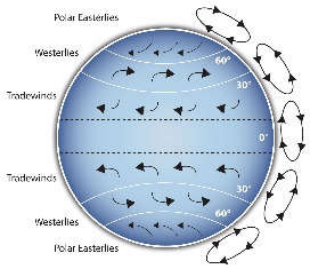
*High-pressure systems typically bring clear skies and fair weather.

☐ a) It is associated with clear skies and fair weather.

☐ b) It usually brings strong winds and heavy rainfall.

☐ c) It has a downward movement of air.

14. The picture given below as a basis Explain the Coriolis Effect and its influence on wind direction



☐ a) The Coriolis Effect is the result of wind blowing from high-pressure areas to low-pressure areas.

☐ b) The Coriolis Effect causes wind to blow directly north or south.

☐ c) The Coriolis Effect causes wind to deflect to the right in the Northern Hemisphere and to the left in the Southern Hemisphere.

15. Unequal heating of Earth's surface, which causes variations in air pressure and subsequently leads to the movement of air, impact the speed of wind due to temperature differences?

☐ a) Higher temperatures lead to slower wind speeds.
☐ b) Lower temperatures result in higher wind speeds.
☐ c) Temperature differences do not affect wind velocity.

16. The differences in temperature present in small areas influence the regional winds. If that's the case, what is the main factor that causes mountain and valley breezes?

☐ a) Gravity pulling air up the mountainsides.
☐ b) Temperature differences between mountains and valleys.
☐ c) The rotation of the Earth.

17. High humidity levels can lead to discomfort and impact weather patterns. How does high humidity affect human comfort?

☐ a) High humidity makes the air feel cooler and more comfortable.
☐ b) High humidity makes the air feel warmer and more comfortable.
☐ c) High humidity can make the air feel sticky and uncomfortable.

18. Evaporation and condensation are key processes in the water cycle. If that's the case, Define evaporation.

☐ a) The process of water molecules changing from a liquid to a gas due to heat
☐ b) The process of water molecules changing from a gas to a liquid due to cooling
☐ c) The process of water molecules freezing into ice.

19. Evaporation from oceans, lakes, and rivers contributes to the formation of clouds and precipitation. Explain how evaporation contributes to the water cycle?

☐ a) Evaporation decreases the amount of water vapor in the atmosphere
☐ b) Evaporation adds moisture to the atmosphere as water molecules change from liquid to gas
☐ c) Evaporation has no impact on the water cycle

20. When irrigation is carried out for plants, the humidity in the atmosphere increases. In such a case, how does vaporization benefit farmers in agriculture?

☐ a) Evaporation decreases the humidity in the atmosphere, which benefits crops
☐ b) Evaporation increases the temperature of the soil, helping crops grow faster
☐ c) Evaporation from irrigation provides water to crops, supporting their growth

21. The formation in structure according to the different types of clouds, influences climate, it is meteorological. What is commonly known by which term high-altitude clouds, with thin and wispy, resembling delicate strands or feathers?

☐ a) Cumulus ☐ b) Nimbostratus
☐ c) Cumulonimbus ☐ d) Cirrus

22. Clouds are formed when moist air rises, expands, and cools, causing water vapor to condense into tiny water droplets or ice crystals. Explain why this types of clouds form at higher altitudes?

☐ a) Clouds form at higher altitudes because the air is warmer there.
☐ b) Clouds form at higher altitudes due to increased air pressure.
☐ c) Clouds form at higher altitudes because the air is cooler there.

23. When altocumulus clouds appear along with drizzle or rain, cirrus clouds indicate pleasant weather conditions. In this case, if you were to stand at a coastal area when cirrus clouds are in the sky, what would be the uniqueness of the distant view?

☐ a) Due to Thunderstorms and heavy rain you can see more distant ships.
☐ b) Due to Clear and sunny conditions you can see more distant ships.
☐ c) Due to Steady rain and snow you can see more distant ships.
☐ d) Due to Fog and mist you can see more distant ships.

24. The precipitation falling from clouds, varying in shape according to their freezing process, is known by various names. Frozen precipitation consisting of ice crystals that fall in feathery flakes is identified by what term?

☐ a) Rain ☐ b) Sleet
☐ c) Snow ☐ d) Hail

25. When Sleet falls it goes through shallow layer of warm air then it melts partially and freeze before it reaching the ground.as per the information which type of precipitation is more likely to occur in cold weather condition?

☐ a) Rain ☐ b) Sleet
☐ c) Snow ☐ d) Hail

26. It is essential to understand the patterns of precipitation methods and analyze them for weather forecasting. What plays a crucial role in the meteorological prediction of precipitation is the contribution of a rain gauge for measuring rainfall.

☐ a) To measure atmospheric pressure
☐ b) To measure wind speed
☐ c) To measure temperature
☐ d) To measure the amount of rainfall over a specific period

27. Read the scenarios below and identify the type of rainfall that best fits each situation:

*A hot summer day leads to the rapid heating of the ground, causing warm air to rise, then it cool and condense, resulting in rain. Which type of rainfall is this?

☐ a) Convectional Rainfall
☐ b) Orographic Rainfall
☐ c) Frontal Rainfall

28. In a coastal region, moist air from the ocean is lifted upward by a mountain range, causing it to cool and release moisture as rain. What type of rainfall is this?

☐ a) Convectional Rainfall
☐ b) Orographic Rainfall
☐ c) Frontal Rainfall

29. Understanding the different types of rainfall is important in predicting local weather patterns. In which type of rainfall does warm air rise due to its lower density compared to surrounding cooler air?

☐ a) Convectional Rainfall
☐ b) Orographic Rainfall
☐ c) Frontal Rainfall

30. Read the descriptions of different regions and identify the appropriate world region from the list above for each description:

*This region experiences heavy rainfall throughout the year, with lush vegetation and diverse wildlife.

☐ a) Amazon Rainforest ☐ b) Sahara Desert
☐ c) Indian Monsoon Region ☐ d) Equatorial Africa

31. Diurnal temperature range refers to the difference between average temperatures during day and night. Which of the following factors can contribute to a larger diurnal temperature range?

☐ a) Cloud cover ☐ b) Urbanization
☐ c) Proximity to large bodies of water ☐ d) High humidity

32. A location has a maximum temperature of 30°C and a minimum temperature of 10°C during a day. What is the diurnal temperature range?

☐ a) 15°C ☐ b) 20°C ☐ c) 25°C ☐ d) 30°C

33. Which factor is likely to reduce the diurnal temperature range in a region?

☐ a) Clear skies ☐ b) Elevation
☐ c) Vegetation cover ☐ d) Dry air

34. Annual temperature range is calculated as the difference between highest and lowest temperatures recorded in a year. Which of the following would likely have the largest annual temperature range?

☐ a) Coastal city ☐ b) Tropical rainforest
☐ c) Desert region ☐ d) Mountain peak

35. Which involves the balance between incoming solar radiation and outgoing terrestrial radiation. How does the greenhouse effect influence Earth's heat budget?

☐ a) It decreases the amount of solar radiation reaching the surface.
☐ b) It increases the amount of heat absorbed by the oceans.
☐ c) It traps heat in the atmosphere, warming the planet.
☐ d) It enhances the albedo effect, reflecting solar radiation.

TEST OF PROBLEM SOLVING ABILITY IN GEOGRAPHY (PRETEST)

(DRAFT MALAYALAM)

RESHMA P T
Research Scholar
GCTE Kozhikode

Dr. K RAMAKRISHNAN
Rtd. Associate Professor
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Class: IX Subject: Geography Unit: Sun the Ultimate Source Max Mark: 35 Time:1.30hrs

പൊതു നിർദ്ദേശങ്ങൾ:

- ഈ ടെസ്റ്റ് പേപ്പറിൽ 30 ചോദ്യങ്ങൾ അടങ്ങിയിരിക്കുന്നു
- എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം നൽകുക. ഓരോ ചോദ്യത്തിനും 1 സ്കോർ ഉണ്ടായിരിക്കും
- ശരിയുത്തരങ്ങൾക്ക് നേരെ ടിക്ക് മാർക്കിടുക.
- തെറ്റായ ഉത്തരങ്ങൾക്ക് നെഗറ്റീവ് മാർക്ക് ഇല്ല

1. ഏത് സ്ഥലത്താണ് കൂടുതൽ സൗരവികിരണം ലഭിക്കുന്നത്?

   a) പ്രദേശം A (തീരപ്രദേശം): സൗരവികിരണം സ്വീകരിച്ചത് = 800 W/m², ശരാശരി താപനില = 28°C

   b) പ്രദേശം B (ഉൾപ്രദേശം): സൗരവികിരണം സ്വീകരിച്ചത് = 1000 ണ/ാദ്ധ, ശരാശരി താപനില = 35ത്ഥഇ

   ☐ a) സ്ഥലം എ ☐ b) സ്ഥാനം ബി

2. താഴ്ന്ന ആൽബിഡോ കാരണം ഉയർന്ന താപം ആഗിരണം ചെയ്യുന്ന പ്രദേശം ഏതാണ്?

   a) നഗരപ്രദേശം: ആൽബിഡോ = 0.15, പ്രതലങ്ങളാൽ ആഗിരണം ചെയ്യപ്പെടുന്ന താപം = 4500 W/m²

   b) ഗ്രാമപ്രദേശം: ആൽബിഡോ = 0.25, പ്രതലങ്ങളാൽ ആഗിരണം ചെയ്യപ്പെടുന്ന താപം = 3500 W/m²

   ☐ a) നഗര പ്രദേശം ☐ b) ഗ്രാമപ്രദേശം

3. ഉയരം കൂടുന്നതിനനുസരിച്ച്1000 മീറ്ററിൽ താപനില കുറയുന്നതിന്റെ നിരക്ക് എത്രയാണ്?

   ഉയരം 0 മീറ്റർ : താപനില = 30°C

   ഉയരം 1000 മീറ്റർ: താപനില = 20°C

   ☐ a) 1000 മീറ്ററിന് 1°C ☐ b) 1000 മീറ്ററിന് 2°C

   ☐ c) 1000 മീറ്ററിന് 5°C ☐ d) 1000 മീറ്ററിന് 10°C

4. ഭൂമിയുടെ ഭ്രമണപഥവുമായി ബന്ധപ്പെട്ട് അപ്ഹീലിയൻ, പെരിഹീലിയൻ എന്നിവ അനുബന്ധ വിവരങ്ങൾ ഉപയോഗിച്ച് നിർവ്വചിക്കുക

   അപ്ഹീലിയൻ: ഭൂമി സൂര്യനിൽ നിന്ന് ഏറ്റവും അകലെയാണ്, ദൂരം=152 ദശലക്ഷം കി.മീ.

   പെരിഹീലിയൻ: ഭൂമി സൂര്യനോട് ഏറ്റവും അടുത്താണ്, ദൂരം=147 ദശലക്ഷം കി.മീ

   ☐ a) ഭൂമി സൂര്യനോട് ഏറ്റവും അടുത്തായിരിക്കുമ്പോൾ അപ്ഹീലിയൻ, ഭൂമി സൂര്യനിൽ നിന്ന് ഏറ്റവും അകലെയായിരിക്കുമ്പോൾ പെരിഹീലിയൻ.

   ☐ b) ഭൂമി സൂര്യനിൽ നിന്ന് ഏറ്റവും അകലെയായിരിക്കുമ്പോൾ അപ്ഹീലിയൻ, ഭൂമി സൂര്യനോട് ഏറ്റവും അടുത്തായിരിക്കുമ്പോൾ പെരിഹീലിയൻ.

   ☐ c) അപ്ഹീലിയനും പെരിഹീലിയനും ഭൂമിയുടെ ഭ്രമണപഥത്തിലെ ഒരേ ബിന്ദുവിനെ സൂചിപ്പിക്കുന്നു.

5. സൂര്യനിൽ നിന്നുള്ള ഭൂമിയുടെ ദൂരവും അപ്ഹീലിയൻ, പെരിഹീലിയൻ സമയത്ത് ഭൂമിയുടെ താപനിലയും തമ്മിലുള്ള ബന്ധം അനുബന്ധ വിവരങ്ങൾ ഉപയോഗിച്ച് വിശദീകരിക്കുക.

   അപ്ഹീലിയൻ: ജൂലൈ 4 ന് ഭൂമിക്ക് അപ്ഹീലിയൻ അനുഭവപ്പെടുന്നു.
   പെരിഹീലിയൻ: ജനുവരി 3 ന് ഭൂമിക്ക് പെരിഹീലിയൻ അനുഭവപ്പെടുന്നു.

   ☐ a) സൂര്യനുമായി അടുത്ത അകലം ഉള്ളതിനാൽ അപ്ഹീലിയൻ സമയത്ത് ഭൂമി കൂടുതൽ ചൂടാകുന്നു.

   ☐ b) സൂര്യനിലേക്കുള്ള ദൂരം കാരണം പെരിഹീലിയൻ സമയത്ത് ഭൂമി കൂടുതൽ ചൂടാകുന്നു.

   ☐ c) സൂര്യനിൽ നിന്നുള്ള അകലം കാരണം അപ്ഹീലിയൻ സമയത്ത് ഭൂമി തണുപ്പാണ്.

   ☐ d) സൂര്യനിൽ നിന്നുള്ള ഭൂമിയുടെ ദൂരം താപനിലയെ ബാധിക്കുന്നില്ല.

6. ചാലകവും സംവഹനവും അന്തരീക്ഷത്തിലെ താപകൈമാറ്റവുമായി ബന്ധപ്പെട്ടിരിക്കുന്നു. അങ്ങനെയെങ്കിൽ ഏതു നിർവ്വചനമാണ് ഏറ്റവും കൃത്യമായത്?

   ☐ a) ചാലകം എന്നത് ഒരു ദ്രാവകത്തിലൂടെയുള്ള താപ കൈമാറ്റമാണ്, സംവഹനം എന്നത് ഖരവസ്തുക്കളിലൂടെയുള്ള താപ കൈമാറ്റമാണ്.

   ☐ b) ഖരവസ്തുക്കളിലൂടെയുള്ള താപം കൈമാറ്റം ചെയ്യുന്നതാണ് ചാലകം, ഒരു ദ്രാവകത്തിലൂടെയുള്ള താപ കൈമാറ്റമാണ് സംവഹനം.

   ☐ c) ചാലകവും സംവഹനവും താപ കൈമാറ്റത്തിന്റെ ഒരേ പ്രക്രിയയെ സൂചിപ്പിക്കുന്നു.

7. പകൽ സമയത്തും രാത്രി സമയത്തും ഗ്രാമപ്രദേശങ്ങളെ അപേക്ഷിച്ച് നഗരം പ്രദേശങ്ങളിൽ കൂടുതൽ ചൂട് അനുഭവപ്പെടാനുള്ള കാരണമെന്ത്? നഗര പ്രദേശങ്ങളുടെയും ഗ്രാമപ്രദേശങ്ങളുടെയും ചില പ്രത്യേകതകൾ താഴെ കൊടുത്തിരിക്കുന്നു അവയെ അടിസ്ഥാനമാക്കി ഉത്തരമെഴുതുക

   നഗരപ്രദേശങ്ങളിൽ കൂടുതൽ കോൺക്രീറ്റ്, അസ്ഫാൽറ്റ്, കെട്ടിടങ്ങൾ എന്നിവ ചൂട് ആഗിരണം ചെയ്യുകയും നിലനിർത്തുകയും ചെയ്യുന്നു.

   ഗ്രാമപ്രദേശങ്ങളിൽ തണലും തണുപ്പും നൽകുന്ന തുറസ്സായ സ്ഥലങ്ങളും കൂടുതൽ സസ്യജാലങ്ങളുമുണ്ട്.

   ☐ a) നഗരപ്രദേശങ്ങളിൽ ചൂട് പുറത്തുവിടുന്ന മരങ്ങളും സസ്യങ്ങളും കൂടുതലാണ്.

   ☐ b) നഗരപ്രദേശങ്ങളിൽ കൂടുതൽ കോൺക്രീറ്റും താപത്തെ പ്രതിഫലിപ്പിക്കുന്ന കെട്ടിടങ്ങളുമുണ്ട്.

   ☐ c) നഗരപ്രദേശങ്ങളിൽ കൂടുതൽ ചൂട് ആഗിരണം ചെയ്യുന്ന പ്രതലങ്ങളും കുറഞ്ഞ സസ്യജാലങ്ങളുമുണ്ട്.

8. ഭൂമിയിലെ താപനില വിതരണത്തെ നിയന്ത്രിക്കുന്ന മൂന്ന് പ്രധാന ഘടകങ്ങളെ തിരിച്ചറിയുക.

   ☐ a) ഭൂമധ്യരേഖയിൽ നിന്നുള്ള ദൂരം, ഉയരം, സമുദ്രജല പ്രവാഹങ്ങൾ

   ☐ b) കാറ്റിന്റെ വേഗത, ഈർപ്പം, മേഘാവൃതം

   ☐ c) മണ്ണിന്റെ തരം, സസ്യങ്ങൾ, മലിനീകരണം

9. താഴെ കൊടുത്തിരിക്കുന്ന വിവരങ്ങളെ അടിസ്ഥാനപ്പെടുത്തി ഉയരം അന്തരീക്ഷ താപനിലയെ എങ്ങനെ ബാധിക്കുന്നുവെന്ന് വ്യക്തമാക്കുക.

   ഉയരം കൂടുന്നതിനനുസരിച്ച് അന്തരീക്ഷമർദ്ദം കുറയുന്നു.

   ട്രോപോസ്ഫിയറിലെ ഉയരം കൂടുന്നതിനനുസരിച്ച് താപനില കുറയുന്നു.

   ☐ a) ഉയരം കൂടുന്നതിനനുസരിച്ച്, അന്തരീക്ഷമർദ്ദവും താപനിലയും വർദ്ധിക്കുന്നു.

   ☐ b) ഉയരം കൂടുന്നതിനനുസരിച്ച് അന്തരീക്ഷമർദ്ദം കുറയുകയും താപനില വർദ്ധിക്കുകയും ചെയ്യുന്നു.

   ☐ c) ഉയരം കൂടുന്നതിനനുസരിച്ച് അന്തരീക്ഷമർദ്ദം കുറയുകയും താപനില കുറയുകയും ചെയ്യുന്നു.

10. 'താപനിലയിലുള്ള പ്രത്യേകത പ്രതിനിധീകരിക്കാൻ കാലവസ്ഥാ ഭൂപടത്തിൽ ചിലപ്രദേശങ്ങളെ രേഖകൾ ഉയോഗിച്ച് ബന്ധിപ്പിക്കുന്നു'കാലാവസ്ഥാ ഭൂപടത്തിൽ സമതാപരേഖകൾ എന്നറിയപ്പെടുന്ന ഇവ എന്താണ് പ്രതിനിധീകരിക്കുന്നത്?

   ☐ a) ഒരേ അന്തരീക്ഷമർദ്ദമുള്ള സ്ഥലങ്ങളെ ബന്ധിപ്പിക്കുന്ന വരകൾ.

   ☐ b) ഒരേ താപനിലയുള്ള സ്ഥലങ്ങളെ ബന്ധിപ്പിക്കുന്ന വരകൾ.

   ☐ c) കാറ്റിന്റെ വേഗതയും ദിശയും സൂചിപ്പിക്കുന്ന വരകൾ.

11. താപവൈപരീത്യങ്ങൾ, ശാന്തമായ, തെളിഞ്ഞ രാത്രികളിൽ സംഭവിക്കാറുണ്ട്. ''ഒരു താപവൈപരീത്യസമയത്ത്, സാധാരണ താപനില നിരക്ക് വിപരീതമാണ്.'' വസ്തുത അടിസ്ഥാനപ്പെടുത്തിഅന്തരീക്ഷത്തിലെ താപനില കുറയുന്ന നിരക്ക് താരതമ്യം ചെയ്യുക.

   ☐ a) ഉയരം കൂടുന്നതിനനുസരിച്ച് താപനില വർദ്ധിക്കുന്നു.

   ☐ b) ഉയരം കൂടുന്തോറും താപനില കുറയുന്നു.

   ☐ c) ഉയരം കൂടുന്തോറും താപനില സ്ഥിരമായി തുടരുന്നു.

12. നമുക്ക് മുകളിലുള്ള വായു ചെലുത്തുന്ന ഭാരമാണ് അന്തരീക്ഷമർദ്ദം. അങ്ങനെയെങ്കിൽ ഉയരത്തിനനുസരിച്ച് അന്തരീക്ഷമർദ്ദം എങ്ങനെ മാറുന്നുവെന്ന് വിശദീകരിക്കുക.

   ☐ a) ഉയരം കൂടുന്നതിനനുസരിച്ച് അന്തരീക്ഷമർദ്ദം വർദ്ധിക്കുന്നു.

   ☐ b) ഉയരം കൂടുന്നതിനനുസരിച്ച് അന്തരീക്ഷമർദ്ദം കുറയുന്നു.

   ☐ c) എല്ലാ ഉയരങ്ങളിലും അന്തരീക്ഷമർദ്ദം സ്ഥിരമായി നിലകൊള്ളുന്നു.

13. തന്നിരിക്കുന്ന വിവരങ്ങൾ അടിസ്ഥാനമാക്കി താഴ്ന്ന മർദ്ദ സംവിധാനത്തിന്റെ സവിശേഷതകൾ വിവരിക്കുക.

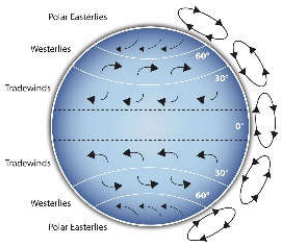
   * താഴ്ന്ന മർദ്ദ സംവിധാനങ്ങൾ മേഘാവൃതവും മഴയുള്ളതുമായ കാലാവസ്ഥയുമായി ബന്ധപ്പെട്ടിരിക്കുന്നു.
   * ഉയർന്ന മർദ്ദ സംവിധാനങ്ങൾ സാധാരണയായി തെളിഞ്ഞ ആകാശവും തെളിഞ്ഞ കാലാവസ്ഥയും നൽകുന്നു.

   ☐ a) ഇത് തെളിഞ്ഞ ആകാശവും ന്യായമായ കാലാവസ്ഥയുമായി ബന്ധപ്പെട്ടിരിക്കുന്നു.

   ☐ b) ഇത് സാധാരണയായി ശക്തമായ കാറ്റും കനത്ത മഴയും നൽകുന്നു.

   ☐ c) ഇതിന് വായുവിന്റെ താഴോട്ടുള്ള ചലനമുണ്ട്.

14. ചുവടെ കൊടുത്തിരിക്കുന്ന ചിത്രം അടിസ്ഥാനമാക്കി കോറിയോലിസ് പ്രഭാവവും കാറ്റിന്റെ ദിശയിൽ അതിന്റെ സ്വാധീനവും വിശദീകരിക്കുക.



☐ a) ഉയർന്ന മർദ്ദമുള്ള പ്രദേശങ്ങളിൽ നിന്ന് താഴ്ന്ന മർദ്ദമുള്ള പ്രദേശങ്ങളിലേക്ക് കാറ്റ് വീശുന്നതിന്റെ ഫലമാണ് കോറിയോലിസ് പ്രഭാവം.

☐ b) കോറിയോലിസ് പ്രഭാവം കാറ്റിനെ നേരിട്ട് വടക്കോട്ടോ തെക്കോ വീശുന്നതിന് കാരണമാകുന്നു.

☐ c) കോറിയോലിസ് പ്രഭാവം ഉത്തരാർദ്ധഗോളത്തിൽ വലത്തോട്ടും ദക്ഷിണാർദ്ധ ഗോളത്തിൽ ഇടത്തോട്ടും കാറ്റിനെ വ്യതിചലിപ്പിക്കുന്നു.

15. ഭൗമോപരിതലത്തിലെ അസന്തുലിതമായ താപവിതരണം വായു മണ്ഡലത്തിൽ മർദ്ദവ്യത്യാസം സൃഷ്ടിക്കുന്നു. ഇത് വായുവിന്റെ ചലനത്തിന് കാരണമാകുന്നു. മേൽപ്പറഞ്ഞിരിരിക്കുന്ന താപനിലാവ്യതിയാനം കാറ്റിന്റെ വേഗതയെ എങ്ങനെയാ ണ് സ്വാധീനിക്കുന്നത്?

☐ a) ഉയർന്ന താപനില കാറ്റിന്റെ വേഗത കുറയുന്നതിന് കാരണമാകുന്നു.

☐ b) കുറഞ്ഞ താപനില കാറ്റിന്റെ വേഗത വർദ്ധിപ്പിക്കുന്നു.

☐ c) താപനില വ്യത്യാസങ്ങൾ കാറ്റിന്റെ വേഗതയെ ബാധിക്കില്ല.

16. ചെറിയ തോതിലുള്ള താപനിലയിലും മർദ്ദത്തിലും ഉള്ള വ്യത്യാസങ്ങൾ പ്രാദേശിക കാറ്റുകളെ സ്വാധീനിക്കുന്നുണ്ട് അങ്ങനെയെങ്കിൽ പർവ്വതത്തിന്റെ മുകളിലും താഴ് വരകളിലും കാറ്റുവീശുന്നതിന്റെ കാരണമെന്ത്?

☐ a) ഗുരുത്വാകർഷണം പർവതനിരകളിലേക്ക് വായു വലിക്കുന്നു.

☐ b) പർവ്വതങ്ങങ്ങളുടെ മുകൾഭാഗവും താഴ് വരകളുംതമ്മിലുള്ള താപനില വ്യത്യാസം.

☐ c) ഭൂമിയുടെ ഭ്രമണം.

17. ഉയർന്ന അന്തരീക്ഷ ആർദ്രത കാലാവസ്ഥാ വ്യതിയാനത്തിനും ജീവജാലങ്ങൾക്ക് അസ്വാസ്ഥ്യത്തിനും ഇട വരുത്തുന്നു. മനുഷ്യനെ ഇതെങ്ങനെ സ്വാധീനിക്കുന്നു?

☐ a) ഉയർന്ന ഈർപ്പം വായുവിനെ തണുപ്പുള്ളതും കൂടുതൽ സുഖകരവുമാക്കുന്നു.

☐ b) ഉയർന്ന ഈർപ്പം വായുവിനെ കൂടുതൽ ഊഷ്മളവും കൂടുതൽ സുഖകരവു മാക്കുന്നു.

☐ c) ഉയർന്ന ഈർപ്പം വായുവിനെ ഒട്ടിപ്പിടിക്കുന്നതും അസ്വസ്ഥതയുമുള്ളതാക്കും.

18. ബാഷ്പീകരണം, ഘനീഭവിക്കൽ എന്നിവ ജലചംക്രമണത്തിലെ പ്രധാന പ്രക്രിയക ളാണ്. അങ്ങനെയെങ്കിൽ ബാഷ്പീകരണ പ്രക്രിയ നിർവ്വചിക്കുക.

☐ a) താപം മൂലം ജല തന്മാത്രകൾ ദ്രാവകത്തിൽ നിന്ന് വാതകമായി മാറുന്ന പ്രക്രിയ.

☐ b) തണുപ്പിക്കൽ മൂലം വാതകത്തിൽ നിന്ന് ദ്രാവകത്തിലേക്ക് മാറുന്ന ജല തന്മാത്രകളുടെ പ്രക്രിയ.

☐ c) ജല തന്മാത്രകൾ മഞ്ഞുപാളികളായി മാറുന്ന പ്രക്രിയ.

19. സമുദ്രങ്ങൾ, തടാകങ്ങൾ, നദികൾ എന്നിവയിൽ നിന്നുള്ള ബാഷ്പീകരണം മേഘങ്ങളുടെ രൂപീകരണത്തിനും മഴയ്ക്കും കാരണമാകുന്നു. അങ്ങനെയെങ്കിൽ ബാഷ്പീകരണം ജലചക്രത്തിന് എങ്ങനെ സംഭാവന നൽകുന്നുവെന്ന് വിശദീകരിക്കുക.

☐ a) ബാഷ്പീകരണം അന്തരീക്ഷത്തിലെ ജലബാഷ്പത്തിന്റെ അളവ് കുറയ്ക്കുന്നു.

☐ b) ജല തന്മാത്രകൾ ദ്രാവകത്തിൽ നിന്ന് വാതകത്തിലേക്ക് മാറുമ്പോൾ ബാഷ്പീകരണം അന്തരീക്ഷത്തിലേക്ക് ഊർപ്പം ചേർക്കുന്നു.

☐ c) ബാഷ്പീകരണത്തിന് ജലചക്രത്തിൽ യാതൊരു സ്വാധീനവുമില്ല.

20. വിളകൾക്ക് ജലസേചനം നടത്തുമ്പോൾ അന്തരീക്ഷത്തിലെ ആർദ്രത ഉയരുന്നു. അങ്ങനെയെങ്കിൽ ബാഷ്പീകരണം കൃഷിക്കാർക്ക് ഏതു തരത്തിലാണ് പ്രയോജനകരമാകുന്നത്?

☐ a) ബാഷ്പീകരണം അന്തരീക്ഷത്തിലെ ഊർപ്പം കുറയ്ക്കുന്നു, ഇത് വിളകൾക്ക് ഗുണം ചെയ്യും.

☐ b) ബാഷ്പീകരണം മണ്ണിന്റെ താപനില വർദ്ധിപ്പിക്കുന്നു, വിളകൾ വേഗത്തിൽ വളരാൻ സഹായിക്കുന്നു.

☐ c) ജലസേചനത്തിൽ നിന്നുള്ള ബാഷ്പീകരണം വിളകൾക്ക് വെള്ളം നൽകുന്നു, അവയുടെ വളർച്ചയെ സഹായിക്കുന്നു.

21. മേഘങ്ങളുടെ ഘടനാപരമായ വ്യത്യാസമനുസരിച്ച് കാലാവസ്ഥയിലുള്ള വ്യതിയാനം പ്രവചനീയമാണ്. ഉയരത്തിൽ കനം കുറഞ്ഞ നാരുകകൾ പോലെയോ തൂവൽ ആകൃതിയിലോ കാണപ്പെടുന്ന മേഘങ്ങൾ താഴെക്കൊടുത്തിരിക്കുന്നതിൽ എതു പേരിൽ അറിയപ്പെടുന്നു.

☐ a) കുമുലസ് ☐ b) നിംബോസ്ട്രാറ്റസ്

☐ c) കുമുലോനിംബസ് ☐ d) സിറസ്

22. ഊർപ്പമുള്ള വായു ഉയരുകയും വികസിക്കുകയും തണുക്കുകയും ചെയ്യുമ്പോൾ മേഘങ്ങൾ രൂപം കൊള്ളുന്നു, ഇത് ജലബാഷ്പം ചെറിയ ജലത്തുള്ളികളോ ഐസ് പരലുകളോ ആയി ഘനീഭവിക്കാൻ കാരണമാകുന്നു. ഉയരം കൂടുമ്പോൾ മേൽപ്പറഞ്ഞ തരത്തിലുള്ള മേഘങ്ങൾ രൂപപ്പെടുന്നത് എന്തുകൊണ്ടെന്ന് വിശദീകരിക്കുക?

☐ a) ഉയർന്ന ഉയരത്തിൽ വായു ചൂട് കൂടുതലാണ്.

☐ b) ഉയർന്ന അന്തരീക്ഷമർദ്ദം മൂലം ഉയർന്ന ഉയരത്തിൽ മേഘങ്ങൾ രൂപം കൊള്ളുന്നു.

☐ c) ഉയർന്ന ഉയരത്തിൽ വായു തണുത്തതാണ്.

23. ആൾട്രോസ് മേഘങ്ങളോടൊപ്പം മൂടൽമഞ്ഞ് അല്ലെങ്കിൽ മഴ കാണപ്പെടുന്നു. എന്നാൽ സിറസ് മേഘങ്ങൾ സുഖകരമായ കാലാവസ്ഥയെ സൂചിപ്പിക്കുന്നു. അങ്ങനെയെങ്കിൽ സിറസ് മേഖങ്ങൾ ആകാശത്തുള്ളപ്പോൾ നിങ്ങൾ കടൽത്തീരത്ത് നിൽക്കുകയാണെങ്കിൽ ദൂരക്കാഴ്ച്ചയുടെ പ്രത്യേകത എന്തായിരിക്കും?

☐ a) ഇടിമിന്നലും കനത്ത മഴയും കാരണം കൂടുതൽ ദൂരത്തിലുള കപ്പലുകൾ കാണാം

☐ b) തെളിഞ്ഞതും വെയിലും ഉള്ള അവസ്ഥ കാരണം കൂടുതൽ ദൂരത്തിലുള കപ്പലുകൾ കാണാം

☐ c) സ്ഥിരമായ മഴ അല്ലെങ്കിൽ മഞ്ഞ് കാരണം കൂടുതൽ ദൂരത്തിലുള കപ്പലുകൾ കാണാം

☐ d) മൂടൽമഞ്ഞ് കാരണം കൂടുതൽ ദൂരത്തിലുള കപ്പലുകൾ കാണാം

24. മേഘങ്ങളിൽ നിന്നും വീഴുന്ന വെള്ളത്തുള്ളികളുടെ വർഷണ രൂപത്തിനനുസരിച്ച് അവയെ വിവിധ പേരുകളിൽ അറിയപ്പെടുന്നു. തൂവൽ പോലെ കനം കുറഞ്ഞ അടരുകളായി ഐസ് പരലുകളായി ശൈത്യമേറിയ വർഷണ രൂപത്തെ ഏതു പേരിൽ അറിയപ്പെടുന്നു?

☐ a) മഴ ☐ b) മഴയുടെയും മഞ്ഞിന്റെയും മിശ്രിതം

☐ c) മഞ്ഞ് ☐ d) ആലിപ്പഴം

25. മഞ്ഞിന്റെയും മഴയുടെയും മിശ്രിതം കനം കുറഞ്ഞ ചൂട് വായു പാളികളിൽ കൂടി കടന്നു പോകുന്നോൾ പാതി ഉരുകുകയും ഭൂമിയിൽ എത്തുന്നതിന് മുൻപ് തന്നെ തണുത്തുറയുകയും ചെയ്യുന്നു. മേൽപ്പറഞ്ഞ വിവരങ്ങളുടെ അടിസ്ഥാനത്തിൽ തണുത്തുറഞ്ഞ കാലവസ്ഥയിൽ ഏതു തരത്തിലുള്ള വർഷണ രൂപത്തിനാണ് ഏറ്റവുമധികം സാധ്യതയുള്ളത്?

☐ a) മഴ ☐ b) മഴയുടെയും മഞ്ഞിന്റെയും മിശ്രിതം

☐ c) മഞ്ഞ് ☐ d) ആലിപ്പഴം

26. കാലാവസ്ഥാ രീതികൾ പ്രവചിക്കുന്നതിനും വിശകലനം ചെയ്യുന്നതിനും വർഷണ രീതികളുടെ തോത് അറിഞ്ഞിരിക്കേണ്ടത് അത്യാവശ്യമാണ്. കാലാവസ്ഥാ പ്രവച നത്തിന് മഴമാപിനി വഹിക്കുന്ന പങ്ക് എന്താണ്?

☐ a) അന്തരീക്ഷമർദ്ദം അളക്കാൻ

☐ b) കാറ്റിന്റെ വേഗത അളക്കാൻ

☐ c) താപനില അളക്കാൻ

☐ d) ഒരു നിശ്ചിത കാലയളവിൽ മഴയുടെ അളവ് അളക്കാൻ

27. താഴെയുള്ള സാഹചര്യങ്ങൾ വായിക്കുകയും സാഹചര്യത്തിന് ഏറ്റവും അനുയോ ജ്യമായ മഴയുടെ തരം തിരിച്ചറിയുകയും ചെയ്യുക:

*ചൂടുകൂടിയ പകൽ സമയത്ത് കര പെട്ടന്ന് ചൂടുപിടിക്കുന്നതു മൂലം അവിടെയുള്ള വായു വേഗത്തിൽ ചൂട് പിടിച്ച് മുകളിലേക്കുയർന്ന് തണുത്ത് മഴയായി പെയ്യുന്നു. ഇത്തരത്തിലുള്ള മഴ ഏതുതരം ഏതു തരം മഴയാണ്?

☐ a) സംവഹന വൃഷ്ടി ☐ b) പർവത വൃഷ്ടി ☐ c) ചക്രവാത വൃഷ്ടി

28. ഒരു തീരപ്രദേശത്ത്, സമുദ്രത്തിൽ നിന്നുള്ള ഈർപ്പമുള്ള വായു ഒരു പർവതനിര യിലൂടെ മുകളിലേക്ക് ഉയർത്തപ്പെടുന്നു, ഇത് തണുക്കുകയും ഈർപ്പം മഴയായി മഴയായി പെയ്യുന്നതിനും ഇടയാക്കുന്നു. ഇത് ഏത് തരത്തിലുള്ള മഴയാണ്?

☐ a) സംവഹന വൃഷ്ടി ☐ b) പർവത വൃഷ്ടി ☐ c) ചക്രവാത വൃഷ്ടി

29. പ്രാദേശിക കാലാവസ്ഥാ രീതികൾ പ്രവചിക്കുന്നതിൽ വ്യത്യസ്ത തരത്തിലുള്ള മഴയെ കുറിച്ച് മനസ്സിലാക്കുന്നത് പ്രധാനമാണ്. ഏത് തരത്തിലുള്ള മഴയിലാണ് ചുറ്റുമുള്ള തണുത്ത വായുവുമായി താരതമ്യപ്പെടുത്തുമ്പോൾ സാന്ദ്രത കുറവായ തിനാൽ ചൂട് വായു ഉയരുന്നത്?

☐ a) സംവഹന വൃഷ്ടി ☐ b) പർവത വൃഷ്ടി ☐ c) ചക്രവാത വൃഷ്ടി

30. വിവിധ പ്രദേശങ്ങളുടെ വിവരണങ്ങൾ വായിക്കുകയും ഓരോ വിവരണത്തിനും അനുയോജ്യമായ ലോക മേഖല തിരിച്ചറിയുകയും ചെയ്യുക:

*സമൃദ്ധമായ സസ്യങ്ങളും വൈവിധ്യമാർന്ന വന്യജീവികളും ഉള്ള ഈ പ്രദേശത്ത് വർഷം മുഴുവനും കനത്ത മഴ ലഭിക്കുന്നു.

☐ a) ആമസോൺ മഴക്കാടുകൾ ☐ b) സഹാറ മരുഭൂമി

☐ c) ഇന്ത്യൻ മൺസൂൺ മേഖല ☐ d) ആഫ്രിക്ക

31. പകലും രാത്രിയും ശരാശരി താപനിലകൾ തമ്മിലുള്ള വ്യത്യാസത്തെ ദൈനംദിന താപാന്തരം സൂചിപ്പിക്കുന്നു. അങ്ങനെയെങ്കിൽ ഇനിപ്പറയുന്ന ഘടകങ്ങളിൽ ഏതാണ് ഒരു വലിയ ദൈനംദിന താപാന്തരത്തിനു കാരണമാകുന്നത്?

☐ a) മേഘാവരണം ☐ b) നഗരവൽക്കരണം

☐ c) വലിയ ജലാശയങ്ങളുടെ സാമീപ്യം ☐ d) ഉയർന്ന ഈർപ്പം

32. ഒരു സ്ഥലത്ത് ഒരു ദിവസം പരമാവധി താപനില 30°C ഉം കുറഞ്ഞ താപനില 10°C ഉം ആണ്. ദൈനംദിന താപാന്തരം എത്രയാണ്?

☐ a) 15°C ☐ b) 20°C ☐ c) 25°C ☐ d) 30°C

33. ഒരു പ്രദേശത്തെ ദൈനംദിന താപാന്തരം കുറയ്ക്കാൻ സാധ്യതയുള്ള ഘടകം ഏതാണ്?

☐ a) തെളിഞ്ഞ ആകാശം ☐ b) ഉയരം

☐ c) സസ്യങ്ങളുടെ ആവരണം ☐ d) വരണ്ട വായു

34. ഒരു വർഷത്തിൽ രേഖപ്പെടുത്തിയ ഏറ്റവും ഉയർന്നതും താഴ്ന്നതുമായ താപ നിലകൾ തമ്മിലുള്ള വ്യത്യാസമായാണ് വാർഷിക താപാന്തരം കണക്കാക്കുന്നത്. അങ്ങനെയെങ്കിൽ ഇനിപ്പറയുന്നവയിൽ ഏതാണ് ഏറ്റവും വലിയ വാർഷിക താപാ ന്തരം ഉള്ളത്?

☐ a) തീരദേശ നഗരം ☐ b) ഉഷ്ണമേഖലാ മഴക്കാടുകൾ

☐ c) മരുഭൂമി പ്രദേശം ☐ d) പർവതശിഖരം

35. സൗരവികിരണവ ഭൗമ വികിരണവ തമ്മിലുള്ള സന്തുലിതാവസ്ഥയാണ് ഭൂമിയുടെ താപസന്തുലനംഅങ്ങനെയെങ്കിൽ ഹരിതഗൃഹ പ്രഭാവം ഭൂമിയുടെ താപ ബജറ്റിനെ എങ്ങനെ സ്വാധീനിക്കുന്നു?

☐ a) ഇത് ഉപരിതലത്തിൽ എത്തുന്ന സൗരവികിരണത്തിന്റെ അളവ് കുറയ്ക്കുന്നു.

☐ b) ഇത് സമുദ്രങ്ങൾ ആഗിരണം ചെയ്യുന്ന താപത്തിന്റെ അളവ് വർദ്ധിപ്പിക്കുന്നു.

☐ c) ഇത് അന്തരീക്ഷത്തിൽ ചൂട് കൂടുന്നു., ഗ്രഹത്തെ ചൂടാക്കുന്നു.

☐ d) ഇത് സൗരവികിരണത്തെ പ്രതിഫലിപ്പിക്കുന്ന ആൽബിഡോ പ്രഭാവം വർദ്ധി പ്പിക്കുന്നു.

Appendix D2

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

TEST OF PROBLEM SOLVING ABILITY IN GEOGRAPHY (PRETEST)

(FINAL ENGLISH)

RESHMA P T
Research Scholar
GCTE Kozhikode

Dr. K RAMAKRISHNAN
Rtd. Associate Professor
GCTE Kozhikode

Class: IX Subject: Geography Unit: Sun the Ultimate Source Max Mark: 35 Time:1.30hrs

General Instructions:

- This test paper consists of 35 questions
- Answer all the questions. Each question carry 1 score
- Draw a tick mark beside the correct answer
- No negative marks for wrong answers

1. Which location receives more solar radiation?
   a) Location A (coastal area): Solar radiation received = 800 W/m², Average temperature = 28°C
   b) Location B (inland area): Solar radiation received = 1000 W/m², Average temperature = 35°C
   ☐ a) Location A ☐ b) Location B
2. Which area experiences a higher heat absorption due to its lower albedo?
   a) Urban Area: Albedo = 0.15, Heat absorbed by surfaces = 4500 W/m²
   b) Rural Area: Albedo = 0.25, Heat absorbed by surfaces = 3500 W/m²
   ☐ a) Urban Area ☐ b) Rural Area
3. What is the temperature lapse rate per 1000 meters of altitude increase?
   Altitude 0 meters: Temperature = 30°C
   Altitude 1000 meters: Temperature = 20°C
   ☐ a) 1°C per 1000 meters ☐ b) 2°C per 1000 meters
   ☐ c) 5°C per 1000 meters ☐ d) 10°C per 1000 meters
4. Define aphelion and perihelion in relation to Earth's orbit. (Use the information below)
   Aphelion: distance between sun and earth = 152 million km
   Perihelion: distance between sun and earth = 147 million km
   ☐ a) Aphelion is when Earth is closest to the Sun, and perihelion is when Earth is farthest from the Sun.
   ☐ b) Aphelion is when Earth is farthest from the Sun, and perihelion is when Earth is closest to the Sun.
   ☐ c) Both aphelion and perihelion refer to the same point in Earth's orbit.

5. Explain the relationship between Earth's distance from the Sun and its temperature during aphelion and perihelion. (Use the information below)

   Aphelion: Earth experiences aphelion on July 4th.

   Perihelion: Earth experiences perihelion on January 3rd.

   ☐ a) Earth is hotter during aphelion due to its closer distance to the Sun.
   ☐ b) Earth is hotter during perihelion due to its closer distance to the Sun.
   ☐ c) Earth is cooler during aphelion due to its farther distance from the Sun.
   ☐ d) Earth's distance from the Sun has no impact on temperature.

6. Conduction and convection are associated with atmospheric temperature changes, then which is the most accurate definition?"

   ☐ a) Conduction is the transfer of heat through a fluid, and convection is the transfer of heat through solids.

   ☐ b) Conduction is the transfer of heat through solids, and convection is the transfer of heat through a fluid.

   ☐ c) Conduction and convection both refer to the same process of heat transfer.

7. What is the reason behind urban areas experiencing higher temperatures than rural areas during both daytime and nighttime? Here are some of the special characteristics of urban and rural areas. Taking them as a basis, please write the answer.

   * Urban areas have more concrete, asphalt, and buildings that absorb and retain heat.

   * Rural areas have more vegetation and open spaces that provide shade and coolness.

   ☐ a) Urban areas have more trees and vegetation that release heat.
   ☐ b) Urban areas have more concrete and buildings that reflect heat.
   ☐ c) Urban areas have more heat-absorbing surfaces and less vegetation.

8. The details given below as a basis; explain how altitude affects atmospheric temperature.

   *As altitude increases, the atmospheric pressure decreases.

   *Temperature decreases with increasing altitude in the troposphere.

   ☐ a) As altitude increases, atmospheric pressure and temperature both increase.

   ☐ b) As altitude increases, atmospheric pressure decreases and temperature increases.

   ☐ c) As altitude increases, atmospheric pressure decreases and temperature decreases.

9. Temperature inversions often occur on calm, clear nights. “During a temperature inversion, the normal temperature lapse rate is reversed”. Describe the typical temperature lapse rate in the atmosphere.

   ☐ a) Temperature increases with increasing altitude.
   ☐ b) Temperature decreases with increasing altitude.
   ☐ c) Temperature remains constant with increasing altitude.

10. Explain how atmospheric pressure changes with altitude.

    *Atmospheric pressure is the force exerted by the weight of the air above us.

    ☐ a) Atmospheric pressure increases with increasing altitude.
    ☐ b) Atmospheric pressure decreases with increasing altitude.
    ☐ c) Atmospheric pressure remains constant at all altitudes.

11. With provided details; describe the characteristics of a low-pressure system.

    *Low-pressure systems are associated with cloudy and rainy weather.

    *High-pressure systems typically bring clear skies and fair weather.

    ☐ a) It is associated with clear skies and fair weather.
    ☐ b) It usually brings strong winds and heavy rainfall.
    ☐ c) It has a downward movement of air.

12. Unequal heating of Earth's surface, which causes variations in air pressure and subsequently leads to the movement of air, impact the speed of wind due to temperature differences?

    ☐ a) Higher temperatures lead to slower wind speeds.
    ☐ b) Lower temperatures result in higher wind speeds.
    ☐ c) Temperature differences do not affect wind velocity.

13. The differences in temperature present in small areas influence the regional winds. If that's the case, what is the main factor that causes mountain and valley breezes?

    ☐ a) Gravity pulling air up the mountainsides.
    ☐ b) Temperature differences between mountains and valleys.
    ☐ c) The rotation of the Earth.

14. High humidity levels can lead to discomfort and impact weather patterns. How does high humidity affect human comfort?

    ☐ a) High humidity makes the air feel cooler and more comfortable.
    ☐ b) High humidity makes the air feel warmer and more comfortable.
    ☐ c) High humidity can make the air feel sticky and uncomfortable.

15. Evaporation from oceans, lakes, and rivers contributes to the formation of clouds and precipitation. Explain how evaporation contributes to the water cycle?

- ☐ a) Evaporation decreases the amount of water vapor in the atmosphere
- ☐ b) Evaporation adds moisture to the atmosphere as water molecules change from liquid to gas
- ☐ c) Evaporation has no impact on the water cycle

20. When irrigation is carried out for plants, the humidity in the atmosphere increases. In such a case, how does vaporization benefit farmers in agriculture?

- ☐ a) Evaporation decreases the humidity in the atmosphere, which benefits crops
- ☐ b) Evaporation increases the temperature of the soil, helping crops grow faster
- ☐ c) Evaporation from irrigation provides water to crops, supporting their growth

22. Clouds are formed when moist air rises, expands, and cools, causing water vapor to condense into tiny water droplets or ice crystals. Explain why this types of clouds form at higher altitudes?

- ☐ a) Clouds form at higher altitudes because the air is warmer there.
- ☐ b) Clouds form at higher altitudes due to increased air pressure.
- ☐ c) Clouds form at higher altitudes because the air is cooler there.

23. When altocumulus clouds appear along with drizzle or rain, cirrus clouds indicate pleasant weather conditions. In this case, if you were to stand at a coastal area when cirrus clouds are in the sky, what would be the uniqueness of the distant view?

- ☐ a) Due to Thunderstorms and heavy rain you can see more distant ships.
- ☐ b) Due to Clear and sunny conditions you can see more distant ships.
- ☐ c) Due to Steady rain and snow you can see more distant ships.
- ☐ d) Due to Fog and mist you can see more distant ships.

24. The precipitation falling from clouds, varying in shape according to their freezing process, is known by various names. Frozen precipitation consisting of ice crystals that fall in feathery flakes is identified by what term?

☐ a) Rain ☐ b) Sleet ☐ c) Snow ☐ d) Hail

25. When Sleet falls it goes through shallow layer of warm air then it melts partially and freeze before it reaching the ground.as per the information which type of precipitation is more likely to occur in cold weather condition?

☐ a) Rain ☐ b) Sleet ☐ c) Snow ☐ d) Hail

26. It is essential to understand the patterns of precipitation methods and analyze them for weather forecasting. What plays a crucial role in the meteorological prediction of precipitation is the contribution of a rain gauge for measuring rainfall.

- ☐ a) To measure atmospheric pressure
- ☐ b) To measure wind speed
- ☐ c) To measure temperature
- ☐ d) To measure the amount of rainfall over a specific period

27. Read the scenarios below and identify the type of rainfall that best fits each situation:

    *A hot summer day leads to the rapid heating of the ground, causing warm air to rise, then it cool and condense, resulting in rain. Which type of rainfall is this?

    ☐ a) Convectional Rainfall
    ☐ b) Orographic Rainfall
    ☐ c) Frontal Rainfall

28. In a coastal region, moist air from the ocean is lifted upward by a mountain range, causing it to cool and release moisture as rain. What type of rainfall is this?

    ☐ a) Convectional Rainfall
    ☐ b) Orographic Rainfall
    ☐ c) Frontal Rainfall

29. Understanding the different types of rainfall is important in predicting local weather patterns. In which type of rainfall does warm air rise due to its lower density compared to surrounding cooler air?

    ☐ a) Convectional Rainfall
    ☐ b) Orographic Rainfall
    ☐ c) Frontal Rainfall

30. Read the descriptions of different regions and identify the appropriate world region from the list above for each description:

    *This region experiences heavy rainfall throughout the year, with lush vegetation and diverse wildlife.

    ☐ a) Amazon Rainforest b) Sahara Desert
    ☐ c) Indian Monsoon Region d) Equatorial Africa

31. Diurnal temperature range refers to the difference between average temperatures during day and night. Which of the following factors can contribute to a larger diurnal temperature range?

    ☐ a) Cloud cover ☐ b) Urbanization
    ☐ c) Proximity to large bodies of water ☐ d) High humidity

32. A location has a maximum temperature of 30°C and a minimum temperature of 10°C during a day. What is the diurnal temperature range?

    ☐ a) 15°C ☐ b) 20°C ☐ c) 25°C ☐ d) 30°C

33. Which factor is likely to reduce the diurnal temperature range in a region?

    ☐ a) Clear skies ☐ b) Elevation
    ☐ c) Vegetation cover ☐ d) Dry air

34. Annual temperature range is calculated as the difference between highest and lowest temperatures recorded in a year. Which of the following would likely have the largest annual temperature range?

☐ a) Coastal city ☐ b) Tropical rainforest
☐ c) Desert region ☐ d) Mountain peak

35. Which involves the balance between incoming solar radiation and outgoing terrestrial radiation. How does the greenhouse effect influence Earth's heat budget?

☐ a) It decreases the amount of solar radiation reaching the surface.
☐ b) It increases the amount of heat absorbed by the oceans.
☐ c) It traps heat in the atmosphere, warming the planet.
☐ d) It enhances the albedo effect, reflecting solar radiation.

TEST OF PROBLEM SOLVING ABILITY IN GEOGRAPHY (PRETEST)

(FINAL MALAYALAM)

RESHMA P T
Research Scholar
GCTE Kozhikode

Dr. K RAMAKRISHNAN
Rtd. Associate Professor
GCTE Kozhikode

Class: IX Subject: Geography Unit: Sun the Ultimate Source Max Mark: 35 Time:1.30hrs

പൊതു നിർദ്ദേശങ്ങൾ:

- ഈ ടെസ്റ്റ് പേപ്പറിൽ 30 ചോദ്യങ്ങൾ അടങ്ങിയിരിക്കുന്നു
- എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം നൽകുക. ഓരോ ചോദ്യത്തിനും 1 സ്കോർ ഉണ്ടായിരിക്കും
- ശരിയുത്തരങ്ങൾക്ക് നേരെ ടിക്ക് മാർക്കിടുക.
- തെറ്റായ ഉത്തരങ്ങൾക്ക് നെഗറ്റീവ് മാർക്ക് ഇല്ല

1. ഏത് സ്ഥലത്താണ് കൂടുതൽ സൗരവികിരണം ലഭിക്കുന്നത്?

   a) പ്രദേശം A (തീരപ്രദേശം): സൗരവികിരണം സ്വീകരിച്ചത് = 800 W/m², ശരാശരി താപനില = 28°C

   b) പ്രദേശം B (ഉൾപ്രദേശം): സൗരവികിരണം സ്വീകരിച്ചത് = 1000 W/m², ശരാശരി താപനില = 35°C

   ☐ a) സ്ഥലം എ ☐ b) സ്ഥാനം ബി

2. താഴ്ന്ന ആൽബിഡോ കാരണം ഉയർന്ന താപം ആഗിരണം ചെയ്യുന്ന പ്രദേശം ഏതാണ്?

   a) നഗരപ്രദേശം: ആൽബിഡോ = 0.15, പ്രതലങ്ങളാൽ ആഗിരണം ചെയ്യപ്പെടുന്ന താപം = 4500 W/m²

   b) ഗ്രാമപ്രദേശം: ആൽബിഡോ = 0.25, പ്രതലങ്ങളാൽ ആഗിരണം ചെയ്യപ്പെടുന്ന താപം = 3500 W/m²

   ☐ a) നഗര പ്രദേശം ☐ b) ഗ്രാമപ്രദേശം

3. ഉയരം കൂടുന്നതിനനുസരിച്ച്1000 മീറ്ററിൽ താപനില കുറയുന്നതിന്റെ നിരക്ക് എത്ര യാണ്?

   ഉയരം 0 മീറ്റർ : താപനില = 30°C

   ഉയരം 1000 മീറ്റർ: താപനില = 20°C

   ☐ a) 1000 മീറ്ററിന് 1°C ☐ b) 1000 മീറ്ററിന് 2°C

   ☐ c) 1000 മീറ്ററിന് 5°C ☐ d) 1000 മീറ്ററിന് 10°C

4. ഭൂമിയുടെ ഭ്രമണപഥവുമായി ബന്ധപ്പെട്ട് അപ്ഹീലിയൻ, പെരിഹീലിയൻ എന്നിവ അനുബന്ധ വിവരങ്ങൾ ഉപയോഗിച്ച് നിർവ്വചിക്കുക

   അപ്ഹീലിയൻ: ഭൂമി സൂര്യനിൽ നിന്ന് ഏറ്റവും അകലെയാണ്, ദൂരം=152 ദശലക്ഷം കി.മീ.

   പെരിഹീലിയൻ: ഭൂമി സൂര്യനോട് ഏറ്റവും അടുത്താണ്, ദൂരം=147 ദശലക്ഷം കി.മീ

   ☐ a) ഭൂമി സൂര്യനോട് ഏറ്റവും അടുത്തായിരിക്കുമ്പോൾ അപ്ഹീലിയൻ, ഭൂമി സൂര്യനിൽ നിന്ന് ഏറ്റവും അകലെയായിരിക്കുമ്പോൾ പെരിഹീലിയൻ.

   ☐ b) ഭൂമി സൂര്യനിൽ നിന്ന് ഏറ്റവും അകലെയായിരിക്കുമ്പോൾ അപ്ഹീലിയൻ, ഭൂമി സൂര്യനോട് ഏറ്റവും അടുത്തായിരിക്കുമ്പോൾ പെരിഹീലിയൻ.

   ☐ c) അപ്ഹീലിയനും പെരിഹീലിയനും ഭൂമിയുടെ ഭ്രമണപഥത്തിലെ ഒരേ ബിന്ദുവിനെ സൂചിപ്പിക്കുന്നു.

5. സൂര്യനിൽ നിന്നുള്ള ഭൂമിയുടെ ദൂരവും അപ്ഹീലിയൻ, പെരിഹീലിയൻ സമയത്ത് ഭൂമിയുടെ താപനിലയും തമ്മിലുള്ള ബന്ധം അനുബന്ധ വിവരങ്ങൾ ഉപയോഗിച്ച് വിശദീകരിക്കുക.

   അപ്ഹീലിയൻ: ജൂലൈ 4 ന് ഭൂമിക്ക് അപ്ഹീലിയൻ അനുഭവപ്പെടുന്നു.
   പെരിഹീലിയൻ: ജനുവരി 3 ന് ഭൂമിക്ക് പെരിഹീലിയൻ അനുഭവപ്പെടുന്നു.

   ☐ a) സൂര്യനുമായി അടുത്ത അകലം ഉള്ളതിനാൽ അപ്ഹീലിയൻ സമയത്ത് ഭൂമി കൂടുതൽ ചൂടാകുന്നു.

   ☐ b) സൂര്യനിലേക്കുള്ള ദൂരം കാരണം പെരിഹീലിയൻ സമയത്ത് ഭൂമി കൂടുതൽ ചൂടാകുന്നു.

   ☐ c) സൂര്യനിൽ നിന്നുള്ള അകലം കാരണം അപ്ഹീലിയൻ സമയത്ത് ഭൂമി തണുപ്പാണ്.

   ☐ d) സൂര്യനിൽ നിന്നുള്ള ഭൂമിയുടെ ദൂരം താപനിലയെ ബാധിക്കുന്നില്ല.

6. ചാലകവും സംവഹനവും അന്തരീക്ഷത്തിലെ താപകൈമാറ്റവുമായി ബന്ധപ്പെട്ടിരിക്കുന്നു. അങ്ങനെയെങ്കിൽ ഏതു നിർവ്വചനമാണ് ഏറ്റവും കൃത്യമായത്?

   ☐ a) ചാലകം എന്നത് ഒരു ദ്രാവകത്തിലൂടെയുള്ള താപ കൈമാറ്റമാണ്, സംവഹനം എന്നത് ഖരവസ്തുക്കളിലൂടെയുള്ള താപ കൈമാറ്റമാണ്.

   ☐ b) ഖരവസ്തുക്കളിലൂടെയുള്ള താപം കൈമാറ്റം ചെയ്യുന്നതാണ് ചാലകം, ഒരു ദ്രാവകത്തിലൂടെയുള്ള താപ കൈമാറ്റമാണ് സംവഹനം.

   ☐ c) ചാലകവും സംവഹനവും താപ കൈമാറ്റത്തിന്റെ ഒരേ പ്രക്രിയയെ സൂചിപ്പിക്കുന്നു.

7. പകൽ സമയത്തും രാത്രി സമയത്തും ഗ്രാമപ്രദേശങ്ങളെ അപേക്ഷിച്ച് നഗരം പ്രദേശങ്ങളിൽ കൂടുതൽ ചൂട് അനുഭവപ്പെടാനുള്ള കാരണമെന്ത്? നഗര പ്രദേശങ്ങളുടെയും ഗ്രാമപ്രദേശങ്ങളുടെയും ചില പ്രത്യേകതകൾ താഴെ കൊടുത്തിരിക്കുന്നു അവയെ അടിസ്ഥാനമാക്കി ഉത്തരമെഴുതുക

   നഗരപ്രദേശങ്ങളിൽ കൂടുതൽ കോൺക്രീറ്റ്, അസ്ഫാൽറ്റ്, കെട്ടിടങ്ങൾ എന്നിവ ചൂട് ആഗിരണം ചെയ്യുകയും നിലനിർത്തുകയും ചെയ്യുന്നു.

   ഗ്രാമപ്രദേശങ്ങളിൽ തണലും തണുപ്പും നൽകുന്ന തുറസ്സായ സ്ഥലങ്ങളും കൂടുതൽ സസ്യജാലങ്ങളുമുണ്ട്.

   ☐ a) നഗരപ്രദേശങ്ങളിൽ ചൂട് പുറത്തുവിടുന്ന മരങ്ങളും സസ്യങ്ങളും കൂടുതലാണ്.

   ☐ b) നഗരപ്രദേശങ്ങളിൽ കൂടുതൽ കോൺക്രീറ്റും താപത്തെ പ്രതിഫലിപ്പിക്കുന്ന കെട്ടിടങ്ങളുമുണ്ട്.

   ☐ c) നഗരപ്രദേശങ്ങളിൽ കൂടുതൽ ചൂട് ആഗിരണം ചെയ്യുന്ന പ്രതലങ്ങളും കുറഞ്ഞ സസ്യജാലങ്ങളുമുണ്ട്.

8. താഴെ കൊടുത്തിരിക്കുന്ന വിവരങ്ങളെ അടിസ്ഥാനപ്പെടുത്തി ഉയരം അന്തരീക്ഷ താപനിലയെ എങ്ങനെ ബാധിക്കുന്നുവെന്ന് വ്യക്തമാക്കുക.

   ഉയരം കൂടുന്നതിനനുസരിച്ച് അന്തരീക്ഷമർദ്ദം കുറയുന്നു.

   ട്രോപോസ്ഫിയറിലെ ഉയരം കൂടുന്നതിനനുസരിച്ച് താപനില കുറയുന്നു.

   ☐ a) ഉയരം കൂടുന്നതിനനുസരിച്ച്, അന്തരീക്ഷമർദ്ദവും താപനിലയും വർദ്ധിക്കുന്നു.

   ☐ b) ഉയരം കൂടുന്നതിനനുസരിച്ച് അന്തരീക്ഷമർദ്ദം കുറയുകയും താപനില വർദ്ധിക്കുകയും ചെയ്യുന്നു.

   ☐ c) ഉയരം കൂടുന്നതിനനുസരിച്ച് അന്തരീക്ഷമർദ്ദം കുറയുകയും താപനില കുറയുകയും ചെയ്യുന്നു.

9. താപവൈപരീത്യങ്ങൾ, ശാന്തമായ, തെളിഞ്ഞ രാത്രികളിൽ സംഭവിക്കാറുണ്ട്. ''ഒരു താപവൈപരീത്യസമയത്ത്, സാധാരണ താപനില നിരക്ക് വിപരീതമാണ്.'' വസ്തുത അടിസ്ഥാനപ്പെടുത്തിഅന്തരീക്ഷത്തിലെ താപനില കുറയുന്ന നിരക്ക് താരതമ്യം ചെയ്യുക.

   ☐ a) ഉയരം കൂടുന്നതിനനുസരിച്ച് താപനില വർദ്ധിക്കുന്നു.

   ☐ b) ഉയരം കൂടുന്തോറും താപനില കുറയുന്നു.

   ☐ c) ഉയരം കൂടുന്തോറും താപനില സ്ഥിരമായി തുടരുന്നു.

10. നമുക്ക് മുകളിലുള്ള വായു ചെലുത്തുന്ന ഭാരമാണ് അന്തരീക്ഷമർദ്ദം. അങ്ങനെയെങ്കിൽ ഉയരത്തിനനുസരിച്ച് അന്തരീക്ഷമർദ്ദം എങ്ങനെ മാറുന്നുവെന്ന് വിശദീകരിക്കുക.

   ☐ a) ഉയരം കൂടുന്നതിനനുസരിച്ച് അന്തരീക്ഷമർദ്ദം വർദ്ധിക്കുന്നു.

   ☐ b) ഉയരം കൂടുന്നതിനനുസരിച്ച് അന്തരീക്ഷമർദ്ദം കുറയുന്നു.

   ☐ c) എല്ലാ ഉയരങ്ങളിലും അന്തരീക്ഷമർദ്ദം സ്ഥിരമായി നിലകൊള്ളുന്നു.

11. തന്നിരിക്കുന്ന വിവരങ്ങൾ അടിസ്ഥാനമാക്കി താഴ്ന്ന മർദ്ദ സംവിധാനത്തിന്റെ സവിശേഷതകൾ വിവരിക്കുക.

   * താഴ്ന്ന മർദ്ദ സംവിധാനങ്ങൾ മേഘാവൃതവും മഴയുള്ളതുമായ കാലാവസ്ഥയുമായി ബന്ധപ്പെട്ടിരിക്കുന്നു.
   * ഉയർന്ന മർദ്ദ സംവിധാനങ്ങൾ സാധാരണയായി തെളിഞ്ഞ ആകാശവും തെളിഞ്ഞ കാലാവസ്ഥയും നൽകുന്നു.

   ☐ a) ഇത് തെളിഞ്ഞ ആകാശവും ന്യായമായ കാലാവസ്ഥയുമായി ബന്ധപ്പെട്ടിരിക്കുന്നു.

   ☐ b) ഇത് സാധാരണയായി ശക്തമായ കാറ്റും കനത്ത മഴയും നൽകുന്നു.

   ☐ c) ഇതിന് വായുവിന്റെ താഴോട്ടുള്ള ചലനമുണ്ട്.

12. ഭൗമോപരിതലത്തിലെ അസന്തുലിതമായ താപവിതരണം വായു മണ്ഡലത്തിൽ മർദ്ദവ്യത്യാസം സൃഷ്ടിക്കുന്നു. ഇത് വായുവിന്റെ ചലനത്തിന് കാരണമാകുന്നു. മേൽപ്പറഞ്ഞിരിരിക്കുന്ന താപനിലാവ്യതിയാനം കാറ്റിന്റെ വേഗതയെ എങ്ങനെയാണ് സ്വാധീനിക്കുന്നത്?

   ☐ a) ഉയർന്ന താപനില കാറ്റിന്റെ വേഗത കുറയുന്നതിന് കാരണമാകുന്നു.

   ☐ b) കുറഞ്ഞ താപനില കാറ്റിന്റെ വേഗത വർദ്ധിപ്പിക്കുന്നു.

   ☐ c) താപനില വ്യത്യാസങ്ങൾ കാറ്റിന്റെ വേഗതയെ ബാധിക്കില്ല.

13. ചെറിയ തോതിലുള്ള താപനിലയിലും മർദ്ദത്തിലും ഉള്ള വ്യത്യാസങ്ങൾ പ്രാദേശിക കാറ്റുകളെ സ്വാധീനിക്കുന്നുണ്ട് അങ്ങനെയെങ്കിൽ പർവ്വതത്തിന്റെ മുകളിലും താഴ്വരകളിലും കാറ്റുവീശുന്നതിന്റെ കാരണമെന്ത്?

   ☐ a) ഗുരുത്വാകർഷണം പർവതനിരകളിലേക്ക് വായു വലിക്കുന്നു.

   ☐ b) പർവ്വതങ്ങങ്ങളുടെ മുകൾഭാഗവും താഴ് വരകളുംതമ്മിലുള്ള താപനില വ്യത്യാസം.

   ☐ c) ഭൂമിയുടെ ഭ്രമണം.

14. ഉയർന്ന അന്തരീക്ഷ ആർദ്രത കാലാവസ്ഥാ വ്യതിയാനത്തിനും ജീവജാലങ്ങൾക്ക് അസ്വാസ്ഥ്യത്തിനും ഇട വരുത്തുന്നു. മനുഷ്യനെ ഇതെങ്ങനെ സ്വാധീനിക്കുന്നു?

   ☐ a) ഉയർന്ന ഈർപ്പം വായുവിനെ തണുപ്പുള്ളതും കൂടുതൽ സുഖകരവുമാക്കുന്നു.

   ☐ b) ഉയർന്ന ഈർപ്പം വായുവിനെ കൂടുതൽ ഊഷ്മളവും കൂടുതൽ സുഖകരവുമാക്കുന്നു.

   ☐ c) ഉയർന്ന ഈർപ്പം വായുവിനെ ഒട്ടിപ്പിടിക്കുന്നതും അസ്വസ്ഥതയുമുള്ളതാക്കും.

15. സമുദ്രങ്ങൾ, തടാകങ്ങൾ, നദികൾ എന്നിവയിൽ നിന്നുള്ള ബാഷ്പീകരണം മേഘങ്ങളുടെ രൂപീകരണത്തിനും മഴയ്ക്കും കാരണമാകുന്നു. അങ്ങനെയെങ്കിൽ ബാഷ്പീകരണം ജലചക്രത്തിന് എങ്ങനെ സംഭാവന നൽകുന്നുവെന്ന് വിശദീകരിക്കുക.

☐ a) ബാഷ്പീകരണം അന്തരീക്ഷത്തിലെ ജലബാഷ്പത്തിന്റെ അളവ് കുറയ്ക്കുന്നു.

☐ b) ജല തന്മാത്രകൾ ദ്രാവകത്തിൽ നിന്ന് വാതകത്തിലേക്ക് മാറുമ്പോൾ ബാഷ്പീകരണം അന്തരീക്ഷത്തിലേക്ക് ഊർപ്പം ചേർക്കുന്നു.

☐ c) ബാഷ്പീകരണത്തിന് ജലചക്രത്തിൽ യാതൊരു സ്വാധീനവുമില്ല.

16. വിളകൾക്ക് ജലസേചനം നടത്തുമ്പോൾ അന്തരീക്ഷത്തിലെ ആർദ്രത ഉയരുന്നു. അങ്ങനെയെങ്കിൽ ബാഷ്പീകരണം കൃഷിക്കാർക്ക് ഏതു തരത്തിലാണ് പ്രയോജനകരമാകുന്നത്?

☐ a) ബാഷ്പീകരണം അന്തരീക്ഷത്തിലെ ഊർപ്പം കുറയ്ക്കുന്നു, ഇത് വിളകൾക്ക് ഗുണം ചെയ്യും.

☐ b) ബാഷ്പീകരണം മണ്ണിന്റെ താപനില വർദ്ധിപ്പിക്കുന്നു, വിളകൾ വേഗത്തിൽ വളരാൻ സഹായിക്കുന്നു.

☐ c) ജലസേചനത്തിൽ നിന്നുള്ള ബാഷ്പീകരണം വിളകൾക്ക് വെള്ളം നൽകുന്നു, അവയുടെ വളർച്ചയെ സഹായിക്കുന്നു.

17. ഊർപ്പമുള്ള വായു ഉയരുകയും വികസിക്കുകയും തണുക്കുകയും ചെയ്യുമ്പോൾ മേഘങ്ങൾ രൂപം കൊള്ളുന്നു, ഇത് ജലബാഷ്പം ചെറിയ ജലത്തുള്ളികളോ ഐസ് പരലുകളോ ആയി ഘനീഭവിക്കാൻ കാരണമാകുന്നു. ഉയരം കൂടുമ്പോൾ മേൽപ്പറഞ്ഞ തരത്തിലുള്ള മേഘങ്ങൾ രൂപപ്പെടുന്നത് എന്തുകൊണ്ടെന്ന് വിശദീകരിക്കുക?

☐ a) ഉയർന്ന ഉയരത്തിൽ വായു ചൂട് കൂടുതലാണ്.

☐ b) ഉയർന്ന അന്തരീക്ഷമർദ്ദം മൂലം ഉയർന്ന ഉയരത്തിൽ മേഘങ്ങൾ രൂപം കൊള്ളുന്നു.

☐ c) ഉയർന്ന ഉയരത്തിൽ വായു തണുത്തതാണ്.

18. ആൾട്രോസ് മേഘങ്ങളോടൊപ്പം മൂടൽമഞ്ഞ് അല്ലെങ്കിൽ മഴ കാണപ്പെടുന്നു. എന്നാൽ സിറസ് മേഘങ്ങൾ സുഖകരമായ കാലാവസ്ഥയെ സൂചിപ്പിക്കുന്നു. അങ്ങനെയെങ്കിൽ സിറസ് മേഖങ്ങൾ ആകാശത്തുള്ളപ്പോൾ നിങ്ങൾ കടൽത്തീരത്ത് നിൽക്കുകയാണെങ്കിൽ ദൂരക്കാഴ്ച്ചയുടെ പ്രത്യേകത എന്തായിരിക്കും?

☐ a) ഇടിമിന്നലും കനത്ത മഴയും കാരണം കൂടുതൽ ദൂരത്തിലുള കപ്പലുകൾ കാണാം

☐ b) തെളിഞ്ഞതും വെയിലും ഉള്ള അവസ്ഥ കാരണം കൂടുതൽ ദൂരത്തിലുള കപ്പലുകൾ കാണാം

☐ c) സ്ഥിരമായ മഴ അല്ലെങ്കിൽ മഞ്ഞ് കാരണം കൂടുതൽ ദൂരത്തിലുള കപ്പലുകൾ കാണാം

☐ d) മൂടൽമഞ്ഞ് കാരണം കൂടുതൽ ദൂരത്തിലുള കപ്പലുകൾ കാണാം

19. മേഘങ്ങളിൽ നിന്നും വീഴുന്ന വെള്ളത്തുള്ളികളുടെ വർഷണ രൂപത്തിനനുസരിച്ച് അവയെ വിവിധ പേരുകളിൽ അറിയപ്പെടുന്നു. തൂവൽ പോലെ കനം കുറഞ്ഞ അടരുകളായി ഐസ് പരലുകളായി ശൈത്യമേറിയ വർഷണ രൂപത്തെ ഏതു പേരിൽ അറിയപ്പെടുന്നു?

☐ a) മഴ ☐ b) മഴയുടെയും മഞ്ഞിന്റെയും മിശ്രിതം

☐ c) മഞ്ഞ് ☐ d) ആലിപ്പഴം

20. മഞ്ഞിന്റെയും മഴയുടെയും മിശ്രിതം കനം കുറഞ്ഞ ചൂട് വായു പാളികളിൽ കൂടി കടന്നു പോകുന്നോൾ പാതി ഉരുകുകയും ഭൂമിയിൽ എത്തുന്നതിന് മുൻപ് തന്നെ തണുത്തുറയുകയും ചെയ്യുന്നു. മേൽപ്പറഞ്ഞ വിവരങ്ങളുടെ അടിസ്ഥാനത്തിൽ തണുത്തുറഞ്ഞ കാലവസ്ഥയിൽ ഏതു തരത്തിലുള്ള വർഷണ രൂപത്തിനാണ് ഏറ്റവുമധികം സാധ്യതയുള്ളത്?

☐ a) മഴ ☐ b) മഴയുടെയും മഞ്ഞിന്റെയും മിശ്രിതം

☐ c) മഞ്ഞ് ☐ d) ആലിപ്പഴം

21. കാലാവസ്ഥാ രീതികൾ പ്രവചിക്കുന്നതിനും വിശകലനം ചെയ്യുന്നതിനും വർഷണ രീതികളുടെ തോത് അറിഞ്ഞിരിക്കേണ്ടത് അത്യാവശ്യമാണ്. കാലാവസ്ഥാ പ്രവച നത്തിന് മഴമാപിനി വഹിക്കുന്ന പങ്ക് എന്താണ്?

☐ a) അന്തരീക്ഷമർദ്ദം അളക്കാൻ

☐ b) കാറ്റിന്റെ വേഗത അളക്കാൻ

☐ c) താപനില അളക്കാൻ

☐ d) ഒരു നിശ്ചിത കാലയളവിൽ മഴയുടെ അളവ് അളക്കാൻ

22. താഴെയുള്ള സാഹചര്യങ്ങൾ വായിക്കുകയും സാഹചര്യത്തിന് ഏറ്റവും അനുയോ ജ്യമായ മഴയുടെ തരം തിരിച്ചറിയുകയും ചെയ്യുക:

*ചൂടുകൂടിയ പകൽ സമയത്ത് കര പെട്ടന്ന് ചൂടുപിടിക്കുന്നതു മൂലം അവിടെയുള്ള വായു വേഗത്തിൽ ചൂട് പിടിച്ച് മുകളിലേക്കുയർന്ന് തണുത്ത് മഴയായി പെയ്യുന്നു. ഇത്തരത്തിലുള്ള മഴ ഏതുതരം ഏതു തരം മഴയാണ്?

☐ a) സംവഹന വൃഷ്ടി ☐ b) പർവത വൃഷ്ടി ☐ c) ചക്രവാത വൃഷ്ടി

23. ഒരു തീരപ്രദേശത്ത്, സമുദ്രത്തിൽ നിന്നുള്ള ഈർപ്പമുള്ള വായു ഒരു പർവതനിര യിലൂടെ മുകളിലേക്ക് ഉയർത്തപ്പെടുന്നു, ഇത് തണുക്കുകയും ഈർപ്പം മഴയായി മഴയായി പെയ്യുന്നതിനും ഇടയാക്കുന്നു. ഇത് ഏത് തരത്തിലുള്ള മഴയാണ്?

☐ a) സംവഹന വൃഷ്ടി ☐ b) പർവത വൃഷ്ടി ☐ c) ചക്രവാത വൃഷ്ടി

24. പ്രാദേശിക കാലാവസ്ഥാ രീതികൾ പ്രവചിക്കുന്നതിൽ വ്യത്യസ്ത തരത്തിലുള്ള മഴയെ കുറിച്ച് മനസ്സിലാക്കുന്നത് പ്രധാനമാണ്. ഏത് തരത്തിലുള്ള മഴയിലാണ് ചുറ്റുമുള്ള തണുത്ത വായുവുമായി താരതമ്യപ്പെടുത്തുമ്പോൾ സാന്ദ്രത കുറവായ തിനാൽ ചൂട് വായു ഉയരുന്നത്?

☐ a) സംവഹന വൃഷ്ടി ☐ b) പർവത വൃഷ്ടി ☐ c) ചക്രവാത വൃഷ്ടി

25. വിവിധ പ്രദേശങ്ങളുടെ വിവരണങ്ങൾ വായിക്കുകയും ഓരോ വിവരണത്തിനും അനുയോജ്യമായ ലോക മേഖല തിരിച്ചറിയുകയും ചെയ്യുക:

*സമൃദ്ധമായ സസ്യങ്ങളും വൈവിധ്യമാർന്ന വന്യജീവികളും ഉള്ള ഈ പ്രദേശത്ത് വർഷം മുഴുവനും കനത്ത മഴ ലഭിക്കുന്നു.

☐ a) ആമസോൺ മഴക്കാടുകൾ ☐ b) സഹാറ മരുഭൂമി

☐ c) ഇന്ത്യൻ മൺസൂൺ മേഖല ☐ d) ആഫ്രിക്ക

26. പകലും രാത്രിയും ശരാശരി താപനിലകൾ തമ്മിലുള്ള വ്യത്യാസത്തെ ദൈനംദിന താപാന്തരം സൂചിപ്പിക്കുന്നു. അങ്ങനെയെങ്കിൽ ഇനിപ്പറയുന്ന ഘടകങ്ങളിൽ ഏതാണ് ഒരു വലിയ ദൈനംദിന താപാന്തരത്തിനു കാരണമാകുന്നത്?

☐ a) മേഘാവരണം ☐ b) നഗരവൽക്കരണം

☐ c) വലിയ ജലാശയങ്ങളുടെ സാമീപ്യം ☐ d) ഉയർന്ന ഈർപ്പം

27. ഒരു സ്ഥലത്ത് ഒരു ദിവസം പരമാവധി താപനില 30°C ഉം കുറഞ്ഞ താപനില 10°C ഉം ആണ്. ദൈനംദിന താപാന്തരം എത്രയാണ്?

☐ a) 15°C ☐ b) 20°C ☐ c) 25°C ☐ d) 30°C

28. ഒരു പ്രദേശത്തെ ദൈനംദിന താപാന്തരം കുറയ്ക്കാൻ സാധ്യതയുള്ള ഘടകം ഏതാണ്?

☐ a) തെളിഞ്ഞ ആകാശം ☐ b) ഉയരം

☐ c) സസ്യങ്ങളുടെ ആവരണം ☐ d) വരണ്ട വായു

29. ഒരു വർഷത്തിൽ രേഖപ്പെടുത്തിയ ഏറ്റവും ഉയർന്നതും താഴ്ന്നതുമായ താപ നിലകൾ തമ്മിലുള്ള വ്യത്യാസമായാണ് വാർഷിക താപാന്തരം കണക്കാക്കുന്നത്. അങ്ങനെയെങ്കിൽ ഇനിപ്പറയുന്നവയിൽ ഏതാണ് ഏറ്റവും വലിയ വാർഷിക താപാ ന്തരം ഉള്ളത്?

☐ a) തീരദേശ നഗരം ☐ b) ഉഷ്ണമേഖലാ മഴക്കാടുകൾ

☐ c) മരുഭൂമി പ്രദേശം ☐ d) പർവതശിഖരം

30. സൗരവികിരണവ ഭൗമ വികിരണവ തമ്മിലുള്ള സന്തുലിതാവസ്ഥയാണ് ഭൂമിയുടെ താപസന്തുലനംഅങ്ങനെയെങ്കിൽ ഹരിതഗൃഹ പ്രഭാവം ഭൂമിയുടെ താപ ബജറ്റിനെ എങ്ങനെ സ്വാധീനിക്കുന്നു?

☐ a) ഇത് ഉപരിതലത്തിൽ എത്തുന്ന സൗരവികിരണത്തിന്റെ അളവ് കുറയ്ക്കുന്നു.

☐ b) ഇത് സമുദ്രങ്ങൾ ആഗിരണം ചെയ്യുന്ന താപത്തിന്റെ അളവ് വർദ്ധിപ്പിക്കുന്നു.

☐ c) ഇത് അന്തരീക്ഷത്തിൽ ചൂട് കൂടുന്നു., ഗ്രഹത്തെ ചൂടാക്കുന്നു.

☐ d) ഇത് സൗരവികിരണത്തെ പ്രതിഫലിപ്പിക്കുന്ന ആൽബിഡോ പ്രഭാവം വർദ്ധി പ്പിക്കുന്നു.

Appendix D3

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

TEST OF PROBLEM SOLVING ABILITY IN GEOGRAPHY (PRETEST)

SCORING KEY
(English)

1. b) Location B
2. a) Urban Area
3. b) 2°C per 1000 meters
4. b) Aphelion is when Earth is farthest from the Sun, and perihelion is when Earth is closest to the Sun
5. c) Earth is cooler during aphelion due to its farther distance from the Sun
6. b) Conduction is the transfer of heat through solids, and convection is the transfer of heat through a fluid
7. c) Urban areas have more heat-absorbing surfaces and less vegetation
8. c) As altitude increases, atmospheric pressure decreases and temperature decreases
9. b) Temperature decreases with increasing altitude
10. b) Atmospheric pressure decreases with increasing altitude
11. b) It usually brings strong winds and heavy rainfall
12. b) Lower temperatures result in higher wind speeds
13. b) Temperature differences between mountains and valleys
14. c) High humidity can make the air feel sticky and uncomfortable
15. b) Evaporation adds moisture to the atmosphere as water molecules change from liquid to gas
16. c) Evaporation from irrigation provides water to crops, supporting their growth.
17. c) Clouds form at higher altitudes because the air is cooler there
18. b) Due to Clear and sunny conditions you can see more distant ships.
19. c) Snow
20. c) Snow
21. d) To measure the amount of rainfall over a specific period
22. a) Convectional Rainfall
23. b) Orographic Rainfall
24. a) Convectional Rainfall
25. a) Amazon Rainforest
26. a) Cloud cover
27. b) 20°C
28. c) Vegetation cover
29. c) Desert region
30. c) It traps heat in the atmosphere, warming the planet

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

TEST OF PROBLEM SOLVING ABILITY IN GEOGRAPHY (PRETEST)

SCORING KEY
(Malayalam)

1. b) സ്ഥാനം ബി
2. a) നഗര പ്രദേശം
3. b) 1000 മീറ്ററിന് 2°C
4. b) ഭൂമി സൂര്യനിൽ നിന്ന് ഏറ്റവും അകലെയായിരിക്കുമ്പോൾ അപ്ഹീലിയൻ, ഭൂമി സൂര്യനോട് ഏറ്റവും അടുത്തായിരിക്കുമ്പോൾ പെരിഹീലിയൻ.
5. c) സൂര്യനിൽ നിന്നുള്ള അകലം കാരണം അപ്ഹീലിയൻ സമയത്ത് ഭൂമി തണുപ്പാണ്.
6. b) ഖരവസ്തുക്കളിലൂടെയുള്ള താപം കൈമാറ്റം ചെയ്യുന്നതാണ് ചാലകം, ഒരു ദ്രാവകത്തിലൂടെയുള്ള താപ കൈമാറ്റമാണ് സംവഹനം.
7. c) നഗരപ്രദേശങ്ങളിൽ കൂടുതൽ ചൂട് ആഗിരണം ചെയ്യുന്ന പ്രതലങ്ങളും കുറഞ്ഞ സസ്യജാലങ്ങളുമുണ്ട്.
8. c) ഉയരം കൂടുന്നതിനനുസരിച്ച് അന്തരീക്ഷമർദ്ദം കുറയുകയും താപനില കുറയുകയും ചെയ്യുന്നു.
9. b) ഉയരം കൂടുന്തോറും താപനില കുറയുന്നു.
10. b) ഉയരം കൂടുന്നതിനനുസരിച്ച് അന്തരീക്ഷമർദ്ദം കുറയുന്നു.
11. b) ഇത് സാധാരണയായി ശക്തമായ കാറ്റും കനത്ത മഴയും നൽകുന്നു.
12. b) കുറഞ്ഞ താപനില കാറ്റിന്റെ വേഗത വർദ്ധിപ്പിക്കുന്നു.
13. b) പർവ്വതങ്ങങ്ങളുടെ മുകൾഭാഗവും താഴ് വരകളുംതമ്മിലുള്ള താപനില വ്യത്യാസം.
14. c) ഉയർന്ന ഈർപ്പം വായുവിനെ ഒട്ടിപ്പിടിക്കുന്നതും അസ്വസ്ഥതയുമുള്ളതാക്കും
15. b) ജല തന്മാത്രകൾ ദ്രാവകത്തിൽ നിന്ന് വാതകത്തിലേക്ക് മാറുമ്പോൾ ബാഷ്പീകരണം അന്തരീക്ഷത്തിലേക്ക് ഈർപ്പം ചേർക്കുന്നു.
16. c) ജലസേചനത്തിൽ നിന്നുള്ള ബാഷ്പീകരണം വിളകൾക്ക് വെള്ളം നൽകുന്നു, അവയുടെ വളർച്ചയെ സഹായിക്കുന്നു.
17. c) ഉയർന്ന ഉയരത്തിൽ വായു തണുത്തതാണ്
18. b) തെളിഞ്ഞതും വെയിലും ഉള്ള അവസ്ഥ കാരണം കൂടുതൽ ദൂരത്തിലുള കപ്പലുകൾ കാണാം
19. c) മഞ്ഞ്
20. c) മഞ്ഞ്
21. d) ഒരു നിശ്ചിത കാലയളവിൽ മഴയുടെ അളവ് അളക്കാൻ
22. a) സംവഹന വൃഷ്ടി
23. b) പർവത വൃഷ്ടി
24. a) സംവഹന വൃഷ്ടി
25. a) ആമസോൺ മഴക്കാടുകൾ
26. a) മേഘാവരണം
27. b) 20°C
28. c) സസ്യങ്ങളുടെ ആവരണം
29. c) മരുഭൂമി പ്രദേശം
30. c) ഇത് അന്തരീക്ഷത്തിൽ ചൂട് കൂടുന്നു., ഗ്രഹത്തെ ചൂടാക്കുന്നു.

Appendix E1

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

TEST OF PROBLEM SOLVING ABILITY IN GEOGRAPHY (POSTTEST)

(DRAFT ENGLISH)

RESHMA P T
Research Scholar
GCTE Kozhikode

Dr. K RAMAKRISHNAN
Rtd. Associate Professor
GCTE Kozhikode

Class: IX Subject: Geography Unit: Sun the Ultimate Source Max Mark: 35 Time:1.30hrs

General Instructions:

- This test paper consists of 35 questions
- Answer all the questions. Each question carry 1 score
- Draw a tick mark beside the correct answer
- No negative marks for wrong answers

1. By examining the measurements provided below, find how solar radiation affects the average temperature."

   Location A (coastal area): Solar radiation received = 800 W/m², Average temperature = 28°C

   Location B (inland area): Solar radiation received = 1000 W/m², Average temperature = 35°C

   ☐ a) Higher solar radiation leads to higher average temperature.

   ☐ b) Higher solar radiation leads to lower average temperature.

   ☐ c) Solar radiation has no effect on temperature.

2. By examining the measurements provided below, how does the difference in albedo between urban and rural areas contribute to their respective heat absorption levels?

   Urban Area: Albedo = 0.15, Heat absorbed by surfaces = 4500 W/m²

   Rural Area: Albedo = 0.25, Heat absorbed by surfaces = 3500 W/m²

   ☐ a) Higher albedo in urban areas leads to higher heat absorption.

   ☐ b) Higher albedo in rural areas leads to higher heat absorption.

   ☐ c) Lower albedo in urban areas leads to higher heat absorption.

   ☐ d) Lower albedo in rural areas leads to higher heat absorption.

3. If you descend to an elevation of 3000 meters based on the information provided below, what would be the approximate temperature at that location?

   Altitude 0 meters : Temperature = 30°C

   Altitude 1000 meters : Temperature = 20°C

   ☐ a) 10°C ☐ b) 15°C ☐ c) 20°C ☐ d) 0°C

4. Use the information provided to answer the question below: Calculate the difference in distance between aphelion and perihelion.

   Aphelion: Earth is farthest from the Sun, distance = 152 million km

   Perihelion: Earth is closest to the Sun, distance = 147 million km

   ☐ a) 5 million km ☐ b) 10 million km

   ☐ c) 15 million km ☐ d) 25 million km

5. Use the information below to answer the question

   Aphelion: Earth experiences aphelion on July 4th.

   Perihelion: Earth experiences perihelion on January 3rd.

   In which season will both hemispheres of the Earth be when it is at aphelion?

   ☐ a) Winter (Northern Hemisphere), Summer (Southern Hemisphere)

   ☐ b) Summer (Northern Hemisphere), Winter (Southern Hemisphere)

   ☐ c) Spring (Northern Hemisphere), Autumn (Southern Hemisphere)

   ☐ d) Autumn (Northern Hemisphere), Spring (Southern Hemisphere)

6. Explain how land and water absorb and release heat differently during the day and night.

   ☐ a) Land absorbs heat faster and releases it slower than water, causing temperature changes to be more gradual.

   ☐ b) Land absorbs heat slower and releases it faster than water, causing temperature changes to be more gradual.

   ☐ c) Both land and water absorb and release heat at the same rate.

7. (a) Urban areas have more concrete, asphalt, and buildings that absorb and retain heat.

   (b) Rural areas have more vegetation and open spaces that provide shade and coolness.

   To mitigate the urban heat island effect in cities under above mentioned scenarios (a) and (b), suggest two strategies.

   ☐ a) Remove all vegetation and trees from urban areas.

   ☐ b) Increase the amount of concrete and asphalt in cities.

   ☐ c) Plant more trees and create green spaces in urban areas.

8. Sunlight falls on the Earth at various angles and intensities throughout different times. Explain how the angle of sunlight influences temperature variation.

   ☐ a) Higher angles of sunlight result in more concentrated heat and higher temperatures.

   ☐ b) Lower angles of sunlight result in less concentrated heat and lower temperatures.

   ☐ c) The angle of sunlight does not affect temperature variation.

9. As altitude increases, atmospheric pressure decreases; as altitude in the troposphere increases, temperature decreases. With this information explain why mountains tend to have colder temperatures compared to lowland areas.
   - ☐ a) Mountains receive more direct sunlight, causing higher temperatures.
   - ☐ b) Mountains are closer to the Equator, resulting in higher temperatures.
   - ☐ c) The higher altitude of mountains leads to lower temperatures.
10. In the geographical map connecting places with the same temperature, the lines are known as isotherms. In the context of this, explain why isotherms are important for understanding temperature patterns.
   - ☐ a) Isotherms help us predict rainfall patterns.
   - ☐ b) Isotherms provide information about cloud cover.
   - ☐ c) Isotherms show how temperature varies across regions.
11. During a temperature inversion, the normal temperature lapse rate is reversed. Temperature inversions often occur on calm, clear nights. Considering these circumstances explain why temperature inversions are more likely to occur on clear nights.
   - ☐ a) Clouds trap warm air near the surface.
   - ☐ b) The absence of clouds allows heat to escape, causing cooling.
   - ☐ c) Windy conditions prevent temperature inversions.
12. Atmospheric pressure is the force exerted by the weight of the air above us. In such a scenario, when you are at an elevated mountainous area, what happens to the magnitude of the atmospheric pressure that is exerted on you from above?
   - ☐ a) It increases
   - ☐ b) It decreases
   - ☐ c) It remains the same
   - ☐ d) it becomes negative
13. Low-pressure systems are associated with cloudy and rainy weather; High-pressure systems typically bring clear skies and fair weather. In such a scenario, explain why high-pressure systems are associated with fair weather.
   - ☐ a) High-pressure systems trap warm air near the surface.
   - ☐ b) High-pressure systems encourage the formation of clouds.
   - ☐ c) High-pressure systems inhibit the upward movement of air.
14. The Coriolis Effect causes the deflection of wind to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. Then what role do pressure gradients play in wind direction?
   - ☐ a) Pressure gradients have no effect on wind direction.
   - ☐ b) Wind blows perpendicular to pressure gradients.
   - ☐ c) Wind flows from areas of high pressure to areas of low pressure, perpendicular to pressure gradients.

15. The uneven heating of the Earth's surface causes variations in air pressure, leading to the movement of air; this movement transforms into wind. However, how does the Earth's rotation affect the velocity of the wind?

    ☐ a) Earth's rotation has no impact on wind velocity.

    ☐ b) Earth's rotation causes wind to move at a constant speed.

    ☐ c) Earth's rotation influences wind speed due to the Coriolis Effect.

16. If the differences in temperature between small-scale regions, both on land and in the sea, influence local winds, then related to formation of sea breezes and land breezes which one is the incorrect statement below

    ☐ a) Sea breezes are formed at night when the land cools faster than the sea. Land breezes occur during the day when the sea is warmer than the land.

    ☐ b) Sea breezes are formed during the day when the land is warmer than the sea. Land breezes occur at night when the sea is warmer than the land.

    ☐ c) Sea breezes are formed by the Coriolis Effect. Land breezes are caused by the rotation of the Earth.

17. High humidity in the atmosphere can contribute to both health issues and variations in climate. In the more humid atmosphere, the process of condensation influences the formation of clouds and precipitation. Could you please explain how humidity influences the formation of clouds and precipitation?

    ☐ a) Humidity has no effect on cloud formation.

    ☐ b) High humidity levels can lead to the evaporation of water bodies.

    ☐ c) High humidity levels provide the necessary moisture for water vapor to condense and form clouds, which can later result in precipitation.

18. In the water cycle, evaporation and condensation are key processes. However, which factors impact the rate of evaporation which are explained below?

    ☐ a) High humidity and low temperature.

    ☐ b) Low humidity and high temperature.

    ☐ c) High humidity and high temperature.

19. The process of Evaporation from oceans, lakes, and rivers contributes to the formation of clouds and precipitation, which includes rain. However, explain how the process of condensation, is connected to cloud formation?

    ☐ a) Condensation decreases the amount of water vapor in the atmosphere.

    ☐ b) Condensation is a process that only occurs at ground level.

    ☐ c) Condensation leads to the cooling of air and the formation of tiny water droplets that gather to form clouds.

20. When irrigation is carried out for crops, increased humidity in the atmosphere benefits agricultural plants. However, explain how the process of condensation affecting road traffic and transportation?
    - ☐ a) Condensation has no effect on transportation.
    - ☐ b) Condensation can lead to slippery roads and reduced visibility, affecting transportation safety.
    - ☐ c) Condensation only occurs in urban areas and does not impact transportation.
21. Clouds take on different shapes and formations based on their altitude. These varying cloud formations serve as indicators of different weather conditions. However, describe the sequence of clouds in ascending order seen by a person standing 500 meters above sea level?
    - ☐ a) Cumulus, nimbus, stratus, cirrus
    - ☐ b) Cirrus, stratus, cumulus, nimbus
    - ☐ c) Stratus, cirrus, nimbus, cumulus
    - ☐ d) Nimbus, stratus, cumulus, cirrus
22. When moist air rises, expands, cools, and condenses, clouds take shape. This phenomenon involves the transformation of water vapor into either tiny water droplets or ice crystals within the air. Understanding the fundamental principles of cloud formation and their connection with atmospheric dynamics, cirrus clouds differ from cumulus clouds in terms of their general characteristics.
    - ☐ a) Cirrus clouds are fluffy and white, while cumulus clouds are thin and wispy.
    - ☐ b) Cirrus clouds are low-altitude clouds, while cumulus clouds are high-altitude clouds.
    - ☐ c) Cirrus clouds are thin and wispy, while cumulus clouds are puffy and white.
23. Condensed water droplets in the atmosphere are rapidly lifted upwards by thunder storm or up draft whether condition. As they rise into the super cold upper atmosphere, they freeze. This process leads to the formation of the solid ice structure of Condensed water droplets known as hailstones. Related to formation of hailstone and hailstone falling Find the incorrect statement below
    - ☐ a) Hailstones become denser as they rise in the atmosphere.
    - ☐ b) Hailstones form by condensing water vapor in the air.
    - ☐ c) Hailstones only fall to the ground after reaching a certain size.
    - ☐ d) Hailstone falls only in day time
24. Altocumulus clouds often bring steady rain or snow, while at the same time, cirrus clouds can indicate good weather. When cumulonimbus clouds are present in the sky, try to predict the weather.
    - ☐ a) Sunny and dry conditions
    - ☐ b) Light drizzle or mist
    - ☐ c) Thunderstorms with heavy rain, lightning, and thunder
    - ☐ d) Foggy conditions

25. When condensation occurs, various forms of precipitation can develop; it can take the form of raindrops, ice crystals like snowflakes, or other types of frozen particles. Identify the correct type of precipitation Tiny, frozen pellets of ice that bounce when they hit the ground.

☐ a) Rain ☐ b) Sleet ☐ c) Snow ☐ d) Hail

26. You are setting up a weather station to monitor local weather conditions. One of the instruments you have is a rain gauge. What is the main function of a rain gauge in a weather station setup?

☐ a) To indicate changes in atmospheric pressure

☐ b) To measure the speed of the wind

☐ c) To record temperature variations

☐ d) To quantify the quantity of rainfall received over a certain timeframe

27. This type of rainfall occurs when warm air rises due to its lower density, cools, and condenses, often leading to localized and intense rainfall, thunderstorms, and potential flooding. The type of rainfall described above belongs to which category shown below?

☐ a) Convectional Rainfall

☐ b) Orographic Rainfall

☐ c) Frontal Rainfall

28. A cold air mass meets a warm air mass, and the warm air is forced to rise over the colder air, leading to condensation and rain. What type of rainfall is this?

☐ a) Convectional Rainfall

☐ b) Orographic Rainfall

☐ c) Frontal Rainfall

29. The geographical features of the region, including mountains, valleys, and lowlands, play a significant role in influencing the local climate patterns that govern regional weather forecasts. Which type of rainfall is more likely to occur in regions near mountain ranges?

☐ a) Convectional Rainfall

☐ b) Orographic Rainfall

☐ c) Frontal Rainfall

30. The natural features and characteristics of each region are influenced by both the climate and the geography in accordance with them. In the region mentioned below, there is a place where there is extremely dry conditions and high temperatures, this region receives very little rainfall. Identify the region.

☐ a) Amazon Rainforest ☐ b) Sahara Desert

☐ c) Indian Monsoon Region ☐ d) Equatorial Africa

31. Diurnal temperature range refers to the difference between average temperatures during day and night. Then, in the regions mentioned below, which region the diurnal temperature range is typically larger?

☐ a) Coastal areas ☐ b) Urban areas
☐ c) Mountainous regions ☐ d) Tropical rainforests

32. In a desert, the temperature can rise to 40°C during the day and drop to 5°C at night. What is the diurnal temperature range?

☐ a) 10°C ☐ b) 20°C ☐ c) 25°C ☐ d) 35°C

33. A city experiences a temperature of 15°C in the morning and 10°C in the evening. What is its diurnal temperature range?

☐ a) 3°C ☐ b) 5°C ☐ c) 10°C ☐ d) 15°C

34. Annual temperature range is calculated as the difference between highest and lowest temperatures recorded in a year. Then, if a city has an average high temperature of 25°C in summer and an average low temperature of -5°C in winter, what is its annual temperature range?

☐ a) 10°C ☐ b) 15°C ☐ c) 20°C ☐ d) 30°C

35. The heat budget of the Earth, which involves the balance between incoming solar radiation and outgoing terrestrial radiation. Then, on a cloudy night, why is the temperature generally warmer compared to a clear night?

☐ a) Clouds emit heat, warming the atmosphere.
☐ b) Clouds prevent heat from escaping into space.
☐ c) Clouds block incoming solar radiation.
☐ d) Clouds increase atmospheric pressure.

TEST OF PROBLEM SOLVING ABILITY IN GEOGRAPHY (POSTTEST)

(DRAFT MALAYALAM)

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Class: IX Subject: Geography Unit: Sun the Ultimate Source Max Mark: 35 Time:1.30 hrs

പൊതു നിർദ്ദേശങ്ങൾ:

- ഈ ടെസ്റ്റ് പേപ്പറിൽ 35 ചോദ്യങ്ങൾ അടങ്ങിയിരിക്കുന്നു
- എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം നൽകുക. ഓരോ ചോദ്യത്തിനും 1 സ്കോർ ഉണ്ടായിരിക്കും
- ശരിയുത്തരങ്ങൾക്ക് നേരെ ടിക്ക് മാർക്കിടുക.
- തെറ്റായ ഉത്തരങ്ങൾക്ക് നെഗറ്റീവ് മാർക്ക് ഇല്ല

1. താഴെപ്പറയുന്ന അളവുകൾ പരിശോധിച്ച് സൗരവികിരണത്തിന്റെ അളവ്, ശരാശരി താപനിലയെ എങ്ങനെ ബാധിക്കുന്നു എന്ന് കണ്ടുപിടിക്കുക.

   പ്രദേശം A (തീരപ്രദേശം): സൗരവികിരണം സ്വീകരിച്ചത് = 800 W/m², ശരാശരി താപനില = 28°C

   പ്രദേശം B (ഉൾപ്രദേശം): സൗരവികിരണം സ്വീകരിച്ചത് = 1000 W/m², ശരാശരി താപനില = 35°C

   ☐ a) ഉയർന്ന സൗരവികിരണം ഉയർന്ന ശരാശരി താപനിലയിലേക്ക് നയിക്കുന്നു.

   ☐ b) ഉയർന്ന സൗരവികിരണം കുറഞ്ഞ ശരാശരി താപനിലയിലേക്ക് നയിക്കുന്നു.

   ☐ c) സൗരവികിരണത്തിന് താപനിലയിൽ യാതൊരു സ്വാധീനവുമില്ല.

2. താഴെപ്പറയുന്ന അളവുകൾ പരിശോധിച്ച് നഗരപ്രദേശങ്ങളും ഗ്രാമപ്രദേശങ്ങളും തമ്മിലുള്ള ആൽബിഡോയിലെ വ്യത്യാസം അവയുടെ താപം ആഗിരണം ചെയ്യുന്ന നിലയിലേക്ക് എങ്ങനെ സംഭാവന ചെയ്യുന്നു എന്ന് കണ്ടുപിടിക്കുക.

   നഗരപ്രദേശം: ആൽബിഡോ = 0.15, പ്രതലങ്ങളാൽ ആഗിരണം ചെയ്യപ്പെടുന്ന താപം = 4500 W/m²

   ഗ്രാമപ്രദേശം: ആൽബിഡോ = 0.25, പ്രതലങ്ങളാൽ ആഗിരണം ചെയ്യപ്പെടുന്ന താപം = 3500 W/m²

   ☐ a) നഗരപ്രദേശങ്ങളിലെ ഉയർന്ന ആൽബിഡോ ഉയർന്ന താപ ആഗിരണത്തിലേക്ക് നയിക്കുന്നു.

   ☐ b) ഗ്രാമപ്രദേശങ്ങളിലെ ഉയർന്ന ആൽബിഡോ ഉയർന്ന താപ ആഗിരണത്തിലേക്ക് നയിക്കുന്നു.

   ☐ c) നഗരപ്രദേശങ്ങളിലെ താഴ്ന്ന ആൽബിഡോ ഉയർന്ന താപ ആഗിരണത്തിലേക്ക് നയിക്കുന്നു.

   ☐ d) ഗ്രാമപ്രദേശങ്ങളിലെ താഴ്ന്ന ആൽബിഡോ ഉയർന്ന താപ ആഗിരണത്തിലേക്ക് നയിക്കുന്നു.

3. താഴെ കൊടുത്തിരിക്കുന്ന വിവരങ്ങൾ അടിസ്ഥാനമാക്കി നിങ്ങൾ 3000 മീറ്റർ ഉയരത്തിൽ കയറുകയാണെങ്കിൽ, അവിടെ ഏകദേശം എന്തായിരിക്കും താപനില എന്ന് കണ്ടെത്തുക.

   *ഉയരം 0 മീറ്റർ: താപനില = 30°C

   *ഉയരം 1000 മീറ്റർ: താപനില = 20°C

   ☐ a) 10°C ☐ b) 15°C ☐ c) 20°C ☐ d) 0°C

4. തന്നിരിക്കുന്ന വിവരങ്ങൾ വിലയിരുത്തി അപ്ഹീലിയനും പെരിഹീലിയനും തമ്മിലുള്ള അകലം കണക്കാക്കുക.

   *അപ്ഹീലിയൻ: ഭൂമി സൂര്യനിൽ നിന്ന് ഏറ്റവും അകലെയാണ്, ദൂരം=152 ദശലക്ഷം കി.മീ

   *പെരിഹീലിയൻ: ഭൂമി സൂര്യനോട് ഏറ്റവും അടുത്താണ്, ദൂരം=147 ദശലക്ഷം കി.മീ

   ☐ a) 5 ദശലക്ഷം കി.മീ. ☐ b) 10 ദശലക്ഷം കി.മീ.

   ☐ c) 15 ദശലക്ഷം കി.മീ. ☐ d) 25 ദശലക്ഷം കി.മീ

5. താഴെ കൊടുത്തിരിക്കുന്ന വിവരങ്ങൾ ഉപയോഗിച്ച് ചോദ്യത്തിന് ഉത്തരം നല്കുക.
   അപ്ഹീലിയൻ: ജൂലൈ 4 ന് ഭൂമിക്ക് അപ്ഹീലിയൻ അനുഭവപ്പെടുന്നു.
   പെരിഹീലിയൻ: ജനുവരി 3 ന് ഭൂമിക്ക് പെരിഹീലിയൻ അനുഭവപ്പെടുന്നു.
   ഭൂമി അപ് ഹീലിയനിൽ ആയിരിക്കുമ്പോൾ ഭൂമിയുടെ രണ്ട് അർദ്ധഗോളങ്ങളിലും എത് സീസൺ (ഋതു) ആണ് അനുഭവപ്പെടുക.

   ☐ a) ശീതകാലം (ഉത്തര അർദ്ധഗോളം), വേനൽക്കാലം (ദക്ഷിണാർദ്ധഗോളം)

   ☐ b) വേനൽക്കാലം (ഉത്തര അർദ്ധഗോളം), ശീതകാലം (ദക്ഷിണാർദ്ധഗോളം)

   ☐ c) സ്പ്രിംഗ് (ഉത്തര അർദ്ധഗോളം), ശരത്കാലം (ദക്ഷിണാർദ്ധഗോളം)

   ☐ d) ശരത്കാലം (ഉത്തര അർദ്ധഗോളം), വസന്തകാലം (ദക്ഷിണാർദ്ധഗോളം)

6. കരയും വെള്ളവും, പകലും രാത്രിയും വ്യത്യസ്തമായി ചൂട് ആഗിരണം ചെയ്യുന്നതും പുറത്തുവിടുന്നതും എങ്ങനെയെന്ന് വിശദീകരിക്കുക.

   ☐ a) ഭൂമി താപം വേഗത്തിൽ ആഗിരണം ചെയ്യുകയും വെള്ളത്തേക്കാൾ സാവധാനത്തിൽ പുറത്തുവിടുകയും ചെയ്യുന്നു, ഇത് താപനില മാറ്റങ്ങൾ കൂടുതൽ സാവധാനത്തിലാക്കുന്നു.

   ☐ b) ഭൂമി താപത്തെ സാവധാനത്തിൽ ആഗിരണം ചെയ്യുകയും വെള്ളത്തേക്കാൾ വേഗത്തിൽ പുറത്തുവിടുകയും ചെയ്യുന്നു, ഇത് താപനില മാറ്റങ്ങൾ കൂടുതൽ സാവധാനത്തിലാക്കുന്നു.

   ☐ c) കരയും വെള്ളവും ഒരേ നിരക്കിൽ ചൂട് ആഗിരണം ചെയ്യുകയും പുറത്തുവിടുകയും ചെയ്യുന്നു.

7. (എ) നഗരപ്രദേശങ്ങളിൽ കൂടുതൽ കോൺക്രീറ്റ്, അസ്ഫാൽറ്റ്, കെട്ടിടങ്ങൾ എന്നിവ ചൂട് ആഗിരണം ചെയ്യുകയും നിലനിർത്തുകയും ചെയ്യുന്നു;

   (ബി) ഗ്രാമപ്രദേശങ്ങളിൽ തണലും തണുപ്പും നൽകുന്ന തുറസ്സായ സ്ഥലങ്ങളും കൂടുതൽ സസ്യജാലങ്ങളുമുണ്ട്. എ,ബി എന്നീ സാഹചര്യങ്ങൾ വിലയിരുത്തി നഗരങ്ങളിലെ അർബൻ ഹീറ്റ് ഐലൻഡ് പ്രഭാവം ലഘൂകരിക്കാൻ രണ്ട് തന്ത്രങ്ങൾ നിർദ്ദേശിക്കുക.

   ☐ a) നഗരപ്രദേശങ്ങളിൽ നിന്ന് എല്ലാ സസ്യങ്ങളും മരങ്ങളും നീക്കം ചെയ്യുക.

   ☐ b) നഗരങ്ങളിൽ കോൺക്രീറ്റിന്റെയും അസ്ഫാൽറ്റിന്റെയും അളവ് വർദ്ധിപ്പിക്കുക.

   ☐ c) കൂടുതൽ മരങ്ങൾ നട്ടുപിടിപ്പിക്കുകയും നഗരപ്രദേശങ്ങളിൽ ഹരിത ഇടങ്ങൾ സൃഷ്ടിക്കുകയും ചെയ്യുക.

8. സൂര്യപ്രകാശം പല സമയത്തും പല അളവു കോണിലാണ് ഭൂമിയിൽ പതിക്കുന്നത്. സൂര്യപ്രകാശത്തിന്റെ കോൺ അളവു താപനില വ്യതിയാനത്തെ എങ്ങനെ സ്വാധീനിക്കുന്നുവെന്ന് വിശദീകരിക്കുക.

   ☐ a) സൂര്യപ്രകാശത്തിന്റെ ഉയർന്ന കോണുകൾ കൂടുതൽ സാന്ദ്രമായ താപത്തിനും ഉയർന്ന താപനിലയ്ക്കും കാരണമാകുന്നു.

   ☐ b) സൂര്യപ്രകാശത്തിന്റെ താഴ്ന്ന കോണുകൾ കുറഞ്ഞ സാന്ദ്രീകൃത താപത്തിനും താഴ്ന്ന താപനിലയ്ക്കും കാരണമാകുന്നു.

   ☐ c) സൂര്യപ്രകാശത്തിന്റെ കോൺ താപനില വ്യതിയാനത്തെ ബാധിക്കില്ല.

9. ഉയരം കൂടുന്നതിനനുസരിച്ച് അന്തരീക്ഷമർദ്ദം കുറയുന്നു; ട്രോപോസ്ഫിയറിലെ ഉയരം കൂടുന്നതിനനുസരിച്ച് താപനില കുറയുന്നു. അങ്ങനെയെങ്കിൽ താഴ്ന്ന പ്രദേശങ്ങളുമായി താരതമ്യപ്പെടുത്തുമ്പോൾ പർവതങ്ങളിൽ തണുത്ത താപനില ഉണ്ടാകുന്നത് എന്തുകൊണ്ടെന്ന് വിശദീകരിക്കുക

   ☐ a) പർവതങ്ങൾക്ക് കൂടുതൽ നേരിട്ട് സൂര്യപ്രകാശം ലഭിക്കുന്നു, ഇത് ഉയർന്ന താപനിലയ്ക്ക് കാരണമാകുന്നു.

   ☐ b) പർവതങ്ങൾ ഭൂമധ്യരേഖയോട് അടുത്താണ്, ഇത് ഉയർന്ന താപനിലയ്ക്ക് കാരണമാകുന്നു.

   ☐ c) പർവതങ്ങളുടെ ഉയർന്ന ഉയരം താഴ്ന്ന താപനിലയിലേക്ക് നയിക്കുന്നു.

10. ഒരേ താപനിലയുള്ള സ്ഥലങ്ങളെ ബന്ധിപ്പിക്കുന്ന ഭൂപടത്തിലെ വരകളാണ് സമതാപ രേഖകൾ. എന്നതിന്റെ അടിസ്ഥാനത്തിൽ താപനില പാറ്റേണുകൾ മനസ്സിലാക്കുന്നതിന് സമതാപ രേഖകൾ പ്രധാനമായിരിക്കുന്നത് എന്തുകൊണ്ടെന്ന് വിശദീകരിക്കുക.

   ☐ a) മഴയുടെ പാറ്റേൺ പ്രവചിക്കാൻ സഹായിക്കുന്നു.

   ☐ b) മേഘങ്ങളക്കുറിച്ചുള്ള വിവരങ്ങൾ നൽകുന്നു.

   ☐ c) പ്രദേശങ്ങളിലുടനീളം താപനില എങ്ങനെ വ്യത്യാസപ്പെടുന്നുവെന്ന് കാണിക്കുന്നു.

11. താപവൈപരീത്യസമയത്ത്, സാധാരണ താപനില നിരക്ക് വിപരീതമാണ്. ശാന്തവും തെളിഞ്ഞതുമായ രാത്രികളിൽ താപവൈപരീത്യംപലപ്പോഴും സംഭവിക്കാറുണ്ട്. ഈ സാഹചര്യങ്ങൾ കണക്കിലെടുത്ത് തെളിഞ്ഞ രാത്രികളിൽ താപവൈപരീത്യം ഉണ്ടാകാനുള്ള സാധ്യത എന്തുകൊണ്ടെന്ന് വിശദീകരിക്കുക.

   ☐ a) മേഘങ്ങൾ ഉപരിതലത്തിനടുത്തുള്ള ചൂടുള്ള വായുവിനെ കുടുക്കുന്നു.

   ☐ b) മേഘങ്ങളുടെ അഭാവം ചൂട് പുറത്തുവരാൻ അനുവദിക്കുന്നു, ഇത് തണുപ്പിന് കാരണമാകുന്നു.

   ☐ c) കാറ്റുള്ള സാഹചര്യങ്ങൾ താപവൈപരീത്യം തടയുന്നു.

12. നമുക്ക് മുകളിലുള്ള വായു ചെലുത്തുന്ന ഭാരമാണ് അന്തരീക്ഷമർദ്ദം. അങ്ങനെയെങ്കിൽ ഉയർന്ന പർവ്വത പ്രദേശത്ത് നിൽക്കുമ്പോൾ നിങ്ങളുടെ മേൽ പ്രയോഗിക്കപ്പെടുന്ന അന്തരീക്ഷമർദ്ദത്തിന്റെ അളവിന് എന്തു സംഭവിക്കുന്നു.

   ☐ a) ഇത് വർദ്ധിക്കുന്നു ☐ b) ഇത് കുറയുന്നു

   ☐ c) അത് അതേപടി തുടരുന്നു ☐ d) ഇത് നെഗറ്റീവ് ആയി മാറുന്നു

13. താഴ്ന്ന മർദ്ദ സംവിധാനങ്ങൾ മേഘാവൃതവും മഴയുള്ളതുമായ കാലാവസ്ഥയുമായി ബന്ധപ്പെട്ടിരിക്കുന്നു. ഉയർന്ന മർദ്ദ സംവിധാനങ്ങൾ സാധാരണയായി തെളിഞ്ഞ ആകാശവും തെളിഞ്ഞ കാലാവസ്ഥയും നൽകുന്നു. അങ്ങനെയെങ്കിൽ ഉയർന്ന മർദ്ദ സംവിധാനങ്ങൾ തെളിഞ്ഞ കാലാവസ്ഥയുമായി ബന്ധപ്പെട്ടിരിക്കുന്നത് എന്തുകൊണ്ടാണെന്ന് വിശദീകരിക്കുക.

- [ ] a) ഉയർന്ന മർദ്ദ സംവിധാനങ്ങൾ ഉപരിതലത്തിനടുത്തുള്ള ചൂട് വായുവിനെ കുടുക്കുന്നു.
- [ ] b) ഉയർന്ന മർദ്ദ സംവിധാനങ്ങൾ മേഘങ്ങളുടെ രൂപീകരണത്തെ പ്രോത്സാഹിപ്പിക്കുന്നു.
- [ ] c) ഉയർന്ന മർദ്ദ സംവിധാനങ്ങൾ വായുവിന്റെ മുകളിലേക്കുള്ള ചലനത്തെ തടയുന്നു.

14. കോറിയോലിസ് പ്രഭാവം ഉത്തരാർദ്ധഗോളത്തിൽ വലത്തോട്ടും ദക്ഷിണാർദ്ധഗോളത്തിൽ ഇടത്തോട്ടും കാറ്റിന്റെ വ്യതിചലനത്തിന് കാരണമാകുന്നു. എന്നാൽ കാറ്റിന്റെ ദിശയിൽ മർദ്ദചെരിവ് മാനബലം എന്ത് പങ്കാണ് വഹിക്കുന്നത്?

- [ ] a) കാറ്റിന്റെ ദിശയിൽ യാതൊരു സ്വാധീനവുമില്ല.
- [ ] b) മർദ്ദചെരിവിന് ലംബമായി കാറ്റ് വീശുന്നു.
- [ ] c) ഉയർന്ന മർദ്ദമുള്ള പ്രദേശങ്ങളിൽ നിന്ന് മർദ്ദചെരിവിന് ലംബമായി താഴ്ന്ന മർദ്ദമുള്ള പ്രദേശങ്ങളിലേക്ക് കാറ്റ് വീശുന്നു.

15. ഭൂമിയുടെ ഉപരിതലത്തിലെ അസമമായ താപനം വായു മർദ്ദത്തിലെ വ്യത്യാസങ്ങൾക്ക് കാരണമാകുന്നു, ഇത് വായുവിന്റെ ചലനത്തിന് കാരണമാകുന്നു അത് കാറ്റായി രൂപാന്തരപ്പെടുന്നു. എന്നാൽ ഭൂമിയുടെ ഭ്രമണം കാറ്റിന്റെ വേഗതയെ എങ്ങനെ ബാധിക്കുന്നു?

- [ ] a) ഭൂമിയുടെ ഭ്രമണം കാറ്റിന്റെ വേഗതയെ ബാധിക്കില്ല.
- [ ] b) ഭൂമിയുടെ ഭ്രമണം കാറ്റിനെ സ്ഥിരമായ വേഗതയിൽ ചലിപ്പിക്കുന്നു.
- [ ] c) കോറിയോലിസ് പ്രഭാവം മൂലം ഭൂമിയുടെ ഭ്രമണം കാറ്റിന്റെ വേഗതയെ സ്വാധീനിക്കുന്നു.

16. ചെറിയ തോതിലുള്ള താപനിലയിലും മർദ്ദത്തിലും ഉള്ള വ്യത്യാസങ്ങൾ പ്രാദേശിക കാറ്റുകളെ സ്വാധീനിക്കുന്നുവെങ്കിൽ കടൽക്കാറ്റും കരക്കാറ്റും രൂപപ്പെടുന്ന രീതിയെ അടിസ്ഥാനമാക്കി താഴെപ്പറയുന്നതിൽ ശരിയല്ലാത്ത പ്രസ്താവന ഏത്.

- [ ] a) കടലിനെക്കാൾ വേഗത്തിൽ കര തണുക്കുമ്പോഴാണ് രാത്രിയിൽ കടൽക്കാറ്റുകൾ ഉണ്ടാകുന്നത്. കടൽ കരയെക്കാൾ ചൂടുള്ള പകൽ സമയത്താണ് കരയിൽ കാറ്റ് വീശുന്നത്.
- [ ] b) കരയിൽ കടലിനെക്കാൾ ചൂട് കൂടുതലുള്ള പകൽ സമയത്താണ് കടൽക്കാറ്റുകൾ ഉണ്ടാകുന്നത്. കടലിന് കരയെക്കാൾ ചൂട് കൂടുതലുള്ള രാത്രിയിലാണ് കരക്കാറ്റ് ഉണ്ടാകുന്നത്.
- [ ] c) കോറിയോലിസ് പ്രഭാവം മൂലമാണ് കടൽക്കാറ്റുകൾ ഉണ്ടാകുന്നത്. ഭൂമിയുടെ ഭ്രമണം മൂലമാണ് കരക്കാറ്റ് ഉണ്ടാകുന്നത്.

17. അന്തരീക്ഷത്തിലെ ഉയർന്ന ആർദ്രത അസ്വാസ്ഥ്യത്തിനും കാലാവസ്ഥാ വ്യതിയാനത്തിനും ഇടയാക്കും. ആർദ്രത കൂടിയ അന്തരീക്ഷത്തിൽ ഘനീഭവിക്കൽ പ്രക്രിയ മേഘങ്ങളുടെ രൂപീകരണത്തെയും മഴയെയും എങ്ങനെ സ്വാധീനിക്കുന്നു എന്ന് വിശദീകരിക്കുക.

☐ a) ഘനീഭവിക്കൽ മേഘ രൂപീകരണത്തെ ബാധിക്കുന്നില്ല.

☐ b) ഉയർന്ന ആർദ്രതയുടെ അളവ് ജലാശയങ്ങളുടെ ബാഷ്പീകരണത്തിലേക്ക് നയിച്ചേക്കാം.

☐ c) ഉയർന്ന ആർദ്രത അളവ് ജലബാഷ്പത്തിന് ആവശ്യമായ ഈർപ്പം നൽകുന്നു, ഇത് പിന്നീട് മഴയ്ക്ക് കാരണമാകും.

18. ബാഷ്പീകരണവും ഘനീഭവിക്കലും ജലചക്രത്തിലെ പ്രധാന പ്രക്രിയകളാണ്. എന്നാൽ ബാഷ്പീകരണ നിരക്കിനെ ബാധിക്കുന്ന ഘടകങ്ങൾ താഴെപ്പറയുന്നതിൽ ഏതൊക്കെയാണ്?

☐ a) ഉയർന്ന ആർദ്രതയും കുറഞ്ഞ താപനിലയും.

☐ b) കുറഞ്ഞ ഈർപ്പവും ഉയർന്ന താപനിലയും.

☐ c) ഉയർന്ന ആർദ്രതയും ഉയർന്ന താപനിലയും.

19. സമുദ്രങ്ങൾ, തടാകങ്ങൾ, നദികൾ എന്നിവയിൽ നിന്നുള്ള ബാഷ്പീകരണം മേഘങ്ങളുടെ രൂപീകരണത്തിനും മഴയ്ക്കും കാരണമാകുന്നു. എന്നാൽ മേഘ രൂപീകരണവുമായി ഘനീഭവിക്കൽ പ്രക്രിയ എങ്ങനെ ബന്ധപ്പെട്ടിരിക്കുന്നുവെന്ന് വിവരിക്കുക.

☐ a) ഘനീഭവിക്കുന്നത് അന്തരീക്ഷത്തിലെ നീരാവിയുടെ അളവ് കുറയ്ക്കുന്നു.

☐ b) ഭൂനിരപ്പിൽ മാത്രം സംഭവിക്കുന്ന ഒരു പ്രക്രിയയാണ് ഘനീഭവിക്കൽ.

☐ c) ഘനീഭവിക്കുന്നത് വായു തണുപ്പിക്കുന്നതിലേക്കും ചെറിയ ജലകണങ്ങളുടെ രൂപീകരണത്തിലേക്കും നയിക്കുന്നു, അവ മേഘങ്ങളുണ്ടാക്കുന്നു.

20. വിളകൾക്ക് ജലസേചനം നടത്തുമ്പോൾ അന്തരീക്ഷത്തിലെ ആർദ്രത ഉയരുന്നു അത് കാർഷിക വിളകൾക്ക് ഗുണകരമാണ്. എന്നാൽ ഘനീഭവിക്കൽ പ്രകിയ റോഡ് ഗതാഗതത്തിന് വെല്ലുവിളിയാകുന്നത് എങ്ങനെ?

☐ a) ഘനീഭവിക്കുന്നത് ഗതാഗതത്തെ ബാധിക്കില്ല.

☐ b) ഘനീഭവിക്കുന്നത് റോഡുകൾ വഴുക്കുന്നതിനും ദൃശ്യപരത കുറയുന്നതിനും ഇടയാക്കും, ഇത് ഗതാഗത സുരക്ഷയെ ബാധിക്കും.

☐ c) നഗരപ്രദേശങ്ങളിൽ മാത്രമേ ഘനീഭവിക്കുന്നുള്ളൂ, ഗതാഗതത്തെ ബാധിക്കില്ല.

21. മേഘങ്ങൾ രൂപീകരിക്കപ്പെടുന്ന ഉയരത്തിനനുസരിച്ച് മേഘങ്ങളുടെ ആകൃതിയും വ്യത്യാസപ്പെട്ടിരിക്കുന്നു. ഇത്തരം മേഘങ്ങൾ ഓരോന്നും വ്യത്യസ്ത തരത്തിലുള്ള കാലാവസ്ഥാസൂചകങ്ങളായി വർത്തിക്കുന്നു. എന്നാൽ സമുദ്രനിരപ്പിൽ നിന്ന് 500 മീറ്റർ ഉയരത്തിൽ നിൽക്കുന്ന ഒരാൾ കാണുന്ന മേഘങ്ങളെ ആരോഹണ ക്രമത്തിൽ എഴുതുക?

☐ a) ക്യുമുലസ്, നിംബസ്, സ്ട്രാറ്റസ്, സിറസ്

☐ b) സിറസ്, സ്ട്രാറ്റസ്, ക്യുമുലസ്, നിംബസ്

☐ c) സ്ട്രാറ്റസ്, സിറസ്, നിംബസ്, ക്യുമുലസ്

☐ d) നിംബസ്, സ്ട്രാറ്റസ്, ക്യുമുലസ്, സിറസ്

22. ഈർപ്പമുള്ള വായു ഉയരുകയും വികസിക്കുകയും തണുക്കുകയും ചെയ്യുമ്പോൾ മേഘങ്ങൾ രൂപം കൊള്ളുന്നു, ഇത് ജലബാഷ്പം ചെറിയ ജലത്തുള്ളികളോ ഐസ് പരലുകളോ ആയി ഘനീഭവിക്കുന്നു.' മേഘ രൂപീകരണത്തിന്റെ പൊതു തത്വവുമായി ബന്ധപ്പെടുത്തി സിറസ് മേഘങ്ങൾ ക്യുമുലസ് മേഘങ്ങളിൽ നിന്ന് എങ്ങനെ വ്യത്യാസപ്പെട്ടിരിക്കുന്നു എന്ന് വ്യക്തമാക്കുക

☐ a) സിറസ് മേഘങ്ങൾ നനുത്തതും വെളുത്തതുമാണ്, അതേസമയം ക്യുമുലസ് മേഘങ്ങൾ കനം കുറഞ്ഞതും തൂവൽ പോലെയുള്ളതുമാണ്.

☐ b) സിറസ് മേഘങ്ങൾ താഴ്ന്ന ഉയരത്തിലുള്ള മേഘങ്ങളാണ്, അതേസമയം ക്യുമുലസ് മേഘങ്ങൾ ഉയർന്ന ഉയരത്തിലുള്ള മേഘങ്ങളാണ്.

☐ c) സിറസ് മേഘങ്ങൾ കനം കുറഞ്ഞതും ഞെരുക്കമുള്ളതുമാണ്, അതേസമയം ക്യുമുലസ് മേഘങ്ങൾ വീർത്തതും വെളുത്തതുമാണ്.

23. ചുഴലിക്കാറ്റും കനത്ത മഴയും രൂപപ്പെടുമ്പോൾ ജലകണങ്ങൾ വേഗത്തിൽ മുകളിലേക്കുയർന്ന് അന്തരീക്ഷത്തിന്റെ അത്യധികം തണുത്ത മുകൾത്തട്ടിലേക്ക് ജലത്തിന്റെ ഖരരൂപം പ്രാപിച്ച് ആലിപ്പഴം രൂപപ്പെടുന്നു. ആലിപ്പഴം രൂപപ്പെടുന്നതും അതിന്റെ വർഷണവുമായി ബന്ധമില്ലാത്ത പ്രസ്താവന ഏതാണ്?

☐ a) അന്തരീക്ഷത്തിന്റെ ഉയരം കൂടിയ ഭാഗത്ത് രൂപപ്പെടുന്ന ആലിപ്പഴ രൂപങ്ങൾക്ക് കട്ടി കൂടുതലായിരിക്കും

☐ b) ആലിപ്പഴം രൂപപ്പെടുന്നത് അന്തരീഷത്തിലെ ജലബാഷ്പം ഘനീഭവിച്ചാണ്

☐ c) ഒരു നിശ്ചിത വലിപ്പത്തിൽ എത്തിയാൽ മാത്രമെ ആലിപ്പഴം ഭൂമിയുടെ ഉപരിതലത്തിൽ പതിക്കുകയുള്ളു

☐ d) ആലിപ്പഴവർഷണം പകൽ സമയത്ത് മാത്രം കാണുന്ന ഒന്നാണ്.

24. ആൾട്ടോസ്ട്രാറ്റസ് മേഘങ്ങൾ പലപ്പോഴും സ്ഥിരമായ മഴയോ മഞ്ഞോ കൊണ്ടു വരുന്നു, അതേസമയം സിറസ് മേഘങ്ങൾ നല്ല കാലാവസ്ഥയെ സൂചിപ്പിക്കാം. ആകാശത്ത് കുമുലോനിംബസ് മേഘങ്ങളുടെ സാന്നിധ്യമുള്ളപ്പോൾ കാലാവസ്ഥ പ്രവചിക്കുക.

☐ a) വെയിൽ, വരണ്ട അവസ്ഥ

☐ b) നേരിയ ചാറ്റൽ മഴ അല്ലെങ്കിൽ മൂടൽമഞ്ഞ്

☐ c) കനത്ത മഴയ്ക്കൊപ്പം ഇടിമിന്നൽ

☐ d) മൂടൽമഞ്ഞുള്ള അവസ്ഥ

25. വർഷണ രൂപങ്ങൾ വിവിധ തരത്തിലുണ്ട്; വെള്ളത്തുള്ളികളായോ ഐസ് പരലുകളായോ അവ ഭൂമിയിൽ പെയ്യുന്നു. നിലത്തു പതിക്കുമ്പോൾ തണുത്തുറഞ്ഞ ചെറിയ ഐസ് ഉരുളകൾ പോലുള്ള വർഷണ രൂപം ഏതാണ്?

☐ a) മഴ ☐ b) മഴയുടെയും മഞ്ഞിന്റെയും മിശ്രിതം

☐ c) മഞ്ഞ് ☐ d) ആലിപ്പഴം

26. പ്രാദേശിക കാലാവസ്ഥ നിരീക്ഷിക്കാൻ നിങ്ങൾ ഒരു കാലാവസ്ഥാ സ്റ്റേഷൻ സജ്ജീകരിക്കുകയാണ്. നിങ്ങളുടെ പക്കലുള്ള ഉപകരണങ്ങളിലൊന്നാണ് മഴമാപിനി. കാലാവസ്ഥാ കേന്ദ്രം സജ്ജീകരിക്കുമ്പോൾ മഴമാപിനിയുടെ പ്രധാന ഉദ്ദേശ്യം എന്താണ്?

☐ a) അന്തരീക്ഷമർദ്ദത്തിലെ മാറ്റങ്ങൾ സൂചിപ്പിക്കാൻ

☐ b) കാറ്റിന്റെ വേഗത അളക്കാൻ

☐ c) താപനില വ്യതിയാനങ്ങൾ രേഖപ്പെടുത്താൻ

☐ d) ഒരു നിശ്ചിത സമയപരിധിക്കുള്ളിൽ ലഭിച്ച മഴയുടെ അളവ് കണക്കാക്കാൻ

27. താഴ്ന്ന സാന്ദ്രത കാരണം ചൂടുള്ള വായു ഉയരുകയും തണുക്കുകയും ഘനീഭവിക്കുകയും ചെയ്യുമ്പോൾ ഇത് പലപ്പോഴും പ്രാദേശികവും തീവ്രവുമായ മഴ, ഇടിമിന്നൽ, വെള്ളപ്പൊക്കം എന്നിവയിലേക്ക് നയിക്കുന്നു. മുകളിൽ പ്രതിപാദിച്ചിരിക്കുന്ന തരത്തിലുള്ള മഴ താഴെക്കൊടുത്തിരിക്കുന്നതിൽ ഏതു വിഭാഗത്തിൽപ്പെടുന്നു?

☐ a) സംവഹന വൃഷ്ടി ☐ b) പർവത വൃഷ്ടി ☐ c) ചക്രവാത വൃഷ്ടി

28. ഒരു തണുത്ത വായു പിണ്ഡം ഒരു ചൂടുള്ള വായു പിണ്ഡത്തെ കണ്ടുമുട്ടുന്നു, ചൂടുള്ള വായു തണുത്ത വായുവിന് മുകളിൽ ഉയരാൻ നിർബന്ധിതമാകുന്നു, ഇത് ഘനീഭവിക്കുന്നതിനും മഴയ്ക്കും കാരണമാകുന്നു. ഇത് ഏത് തരത്തിലുള്ള മഴയാണ്?

☐ a) സംവഹന മഴ ☐ b) പർവത വൃഷ്ടി ☐ c) ചക്രവാത വൃഷ്ടി

29. പർവ്വതങ്ങൾ താഴ് വരകൾ താഴ്ന്ന പ്രദേശങ്ങൾ എന്നിവയുൾപ്പെടെയുള്ള പ്രദേശത്തിന്റെ ഭൂമിശാസ്ത്രപരമായ സവിശേഷകൾ കാലാവസ്ഥാ പ്രവചനങ്ങളെ നിയന്ത്രിക്കുന്ന പ്രാദേശിക കാലാവസ്ഥാ മതൃകകളെ സ്വാധീനിക്കുന്നതിൽ ഒരു പ്രധാന പങ്കുവഹിക്കുന്നു.പർവതനിരകൾക്ക് സമീപമുള്ള പ്രദേശങ്ങളിൽ ഏത് തരത്തിലുള്ള മഴയാണ് കൂടുതൽ ഉണ്ടാകാൻ സാധ്യത?

☐ a) സംവഹന മഴ ☐ b) പർവത വൃഷ്ടി ☐ c) ചക്രവാത വൃഷ്ടി

30. ഒരോ പ്രദേശത്തിന്റെയും കാലാവസ്ഥക്കനുസരിച്ച് ഭൂപ്രകൃതിക്കും സവിശേഷതകൾ കാണപ്പെടുന്നു. താഴെ ക്കൊടുത്തിരിക്കുന്നതിൽ വളരെ വരണ്ട കാലാവസ്ഥയും ഉയർന്ന താപനിലയും വളരെ കുറഞ്ഞ അളവിൽ മാത്രം മഴ മഴ ലഭിക്കുകയും ചെയ്യുന്ന പ്രദേശംഏതാണെന്ന് തിരിച്ചറിയുക.

☐ a) ആമസോൺ മഴക്കാടുകൾ ☐ b) സഹാറ മരുഭൂമി

☐ c) ഇന്ത്യൻ മൺസൂൺ മേഖല ☐ d) ആഫ്രിക്ക

31. പകലും രാത്രിയും ശരാശരി താപനിലകൾ തമ്മിലുള്ള വ്യത്യാസത്തെ ദൈനംദിന താപാന്തരം സൂചിപ്പിക്കുന്നെങ്കിൽ, താഴെപ്പറയുന്ന പ്രദേശങ്ങളിൽ ഏത് പ്രദേശത്താണ് സാധാരണയായി ദൈനം ദിന താപാന്തരണം കൂടുതലായി കണ്ടുവരുന്നത്?

☐ a) തീരപ്രദേശങ്ങൾ ☐ b) നഗരപ്രദേശങ്ങൾ

☐ c) പർവതപ്രദേശങ്ങൾ ☐ d) ഉഷ്ണമേഖലാ മഴക്കാടുകൾ

32. ഒരു മരുഭൂമിയിൽ, പകൽ സമയത്ത് താപനില 40 ഡിഗ്രി സെൽഷ്യസായി ഉയരുകയും രാത്രിയിൽ 5 ഡിഗ്രി സെൽഷ്യസായി കുറയുകയും ചെയ്യുന്നു. ദൈനംദിന താപാന്തരം എത്രയാണ്?

☐ a) 10°C ☐ b) 20°C ☐ c) 25°C ☐ d) 35°C

33. ഒരു നഗരത്തിൽ രാവിലെ 15 ഡിഗ്രി സെൽഷ്യസും വൈകുന്നേരം 10 ഡിഗ്രി സെൽഷ്യസും താപനില അനുഭവപ്പെടുന്നു. നഗരത്തിലെ ദൈനംദിന താപാന്തരം എത്രയാണ്?

☐ a) 3°C ☐ b) 5°C ☐ c) 10°C ☐ d) 15°C

34. ഒരു വർഷത്തിൽ രേഖപ്പെടുത്തിയ ഏറ്റവും ഉയർന്നതും താഴ്ന്നതുമായ താപനിലകൾ തമ്മിലുള്ള വ്യത്യാസമായാണ് വാർഷിക താപാന്തരം കണക്കാക്കുന്നതെങ്കിൽ, ഒരു നഗരത്തിൽ വേനൽക്കാലത്ത് ശരാശരി ഉയർന്ന താപനില 25 ഡിഗ്രി സെൽഷ്യസും ശൈത്യകാലത്ത് -5 ഡിഗ്രി സെൽഷ്യസും ആയിരുന്നു. നഗരത്തിലെ വാർഷിക താപാന്തരം എത്രയാണ്

☐ a) 10°C ☐ b) 15°C ☐ c) 20°C ☐ d) 30°C

35. സൗരവികിരണവ ഭൗമ വികിരണവ തമ്മിലുള്ള സന്തുലിതാവസ്ഥയാണ് ഭൂമിയുടെ താപസന്തുലനം എങ്കിൽ മേഘാവൃതമായ രാത്രിയിൽ, തെളിഞ്ഞ രാത്രിയെ അപേക്ഷിച്ച് താപനില പൊതുവെ ഉയർന്നിരിക്കുന്നതിന്റെ കാരണം കണ്ടുപിടിക്കുക.

- [ ] a) മേഘങ്ങൾ ചൂട് പുറപ്പെടുവിക്കുകയും അന്തരീക്ഷത്തെ ചൂടാക്കുകയും ചെയ്യുന്നു.
- [ ] b) ബഹിരാകാശത്തേക്ക് താപം പോകുന്നത് മേഘങ്ങൾ തടയുന്നു.
- [ ] c) മേഘങ്ങൾ സൗരവികിരണത്തെ തടയുന്നു.
- [ ] d) മേഘങ്ങൾ അന്തരീക്ഷമർദ്ദം വർദ്ധിപ്പിക്കുന്നു.

Appendix E2

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

TEST OF PROBLEM SOLVING ABILITY IN GEOGRAPHY (POSTTEST)

(FINAL ENGLISH)

RESHMA P T
Research Scholar
GCTE Kozhikode

Dr. K RAMAKRISHNAN
Rtd. Associate Professor
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Class: IX Subject: Geography Unit: Sun the Ultimate Source Max Mark: 30 Time:1 hr

General Instructions:

- This test paper consists of 30 questions
- Answer all the questions. Each question carry 1 score
- Draw a tick mark beside the correct answer
- No negative marks for wrong answers

1. By examining the measurements provided below, find how solar radiation affects the average temperature."

   Location A (coastal area): Solar radiation received = 800 W/m², Average temperature = 28°C

   Location B (inland area): Solar radiation received = 1000 W/m², Average temperature = 35°C

   ☐ a) Higher solar radiation leads to higher average temperature.

   ☐ b) Higher solar radiation leads to lower average temperature.

   ☐ c) Solar radiation has no effect on temperature.

2. By examining the measurements provided below, how does the difference in albedo between urban and rural areas contribute to their respective heat absorption levels?

   Urban Area: Albedo = 0.15, Heat absorbed by surfaces = 4500 W/m²

   Rural Area: Albedo = 0.25, Heat absorbed by surfaces = 3500 W/m²

   ☐ a) Higher albedo in urban areas leads to higher heat absorption.

   ☐ b) Higher albedo in rural areas leads to higher heat absorption.

   ☐ c) Lower albedo in urban areas leads to higher heat absorption.

   ☐ d) Lower albedo in rural areas leads to higher heat absorption.

3. If you descend to an elevation of 3000 meters based on the information provided below, what would be the approximate temperature at that location?

   Altitude 0 meters : Temperature = 30°C

   Altitude 1000 meters : Temperature = 20°C

   ☐ a) 10°C ☐ b) 15°C ☐ c) 20°C ☐ d) 0°C

4. Use the information provided to answer the question below: Calculate the difference in distance between aphelion and perihelion.

   Aphelion: Earth is farthest from the Sun, distance = 152 million km

   Perihelion: Earth is closest to the Sun, distance = 147 million km

   ☐ a) 5 million km ☐ b) 10 million km
   ☐ c) 15 million km ☐ d) 25 million km

5. Explain how land and water absorb and release heat differently during the day and night.

   ☐ a) Land absorbs heat faster and releases it slower than water, causing temperature changes to be more gradual.

   ☐ b) Land absorbs heat slower and releases it faster than water, causing temperature changes to be more gradual.

   ☐ c) Both land and water absorb and release heat at the same rate.

6. (a) Urban areas have more concrete, asphalt, and buildings that absorb and retain heat.

   (b) Rural areas have more vegetation and open spaces that provide shade and coolness.

   To mitigate the urban heat island effect in cities under above mentioned scenarios (a) and (b), suggest two strategies.

   ☐ a) Remove all vegetation and trees from urban areas.
   ☐ b) Increase the amount of concrete and asphalt in cities.
   ☐ c) Plant more trees and create green spaces in urban areas.

7. As altitude increases, atmospheric pressure decreases; as altitude in the troposphere increases, temperature decreases. With this information explain why mountains tend to have colder temperatures compared to lowland areas.

   ☐ a) Mountains receive more direct sunlight, causing higher temperatures.
   ☐ b) Mountains are closer to the Equator, resulting in higher temperatures.
   ☐ c) The higher altitude of mountains leads to lower temperatures.

8. In the geographical map connecting places with the same temperature, the lines are known as isotherms. In the context of this, explain why isotherms are important for understanding temperature patterns.

   ☐ a) Isotherms help us predict rainfall patterns.
   ☐ b) Isotherms provide information about cloud cover.
   ☐ c) Isotherms show how temperature varies across regions.

9. During a temperature inversion, the normal temperature lapse rate is reversed. Temperature inversions often occur on calm, clear nights. Considering these circumstances explain why temperature inversions are more likely to occur on clear nights.
   - ☐ a) Clouds trap warm air near the surface.
   - ☐ b) The absence of clouds allows heat to escape, causing cooling.
   - ☐ c) Windy conditions prevent temperature inversions.
10. Atmospheric pressure is the force exerted by the weight of the air above us. In such a scenario, when you are at an elevated mountainous area, what happens to the magnitude of the atmospheric pressure that is exerted on you from above?
    - ☐ a) It increases
    - ☐ b) It decreases
    - ☐ c) It remains the same
    - ☐ d) it becomes negative
11. Low-pressure systems are associated with cloudy and rainy weather; High-pressure systems typically bring clear skies and fair weather. In such a scenario, explain why high-pressure systems are associated with fair weather.
    - ☐ a) High-pressure systems trap warm air near the surface.
    - ☐ b) High-pressure systems encourage the formation of clouds.
    - ☐ c) High-pressure systems inhibit the upward movement of air.
12. The uneven heating of the Earth's surface causes variations in air pressure, leading to the movement of air; this movement transforms into wind. However, how does the Earth's rotation affect the velocity of the wind?
    - ☐ a) Earth's rotation has no impact on wind velocity.
    - ☐ b) Earth's rotation causes wind to move at a constant speed.
    - ☐ c) Earth's rotation influences wind speed due to the Coriolis Effect.
13. If the differences in temperature between small-scale regions, both on land and in the sea, influence local winds, then related to formation of sea breezes and land breezes which one is the incorrect statement below
    - ☐ a) Sea breezes are formed at night when the land cools faster than the sea. Land breezes occur during the day when the sea is warmer than the land.
    - ☐ b) Sea breezes are formed during the day when the land is warmer than the sea. Land breezes occur at night when the sea is warmer than the land.
    - ☐ c) Sea breezes are formed by the Coriolis Effect. Land breezes are caused by the rotation of the Earth.
14. High humidity in the atmosphere can contribute to both health issues and variations in climate. In the more humid atmosphere, the process of condensation influences the formation of clouds and precipitation. Could you please explain how humidity influences the formation of clouds and precipitation?
    - ☐ a) Humidity has no effect on cloud formation.
    - ☐ b) High humidity levels can lead to the evaporation of water bodies.
    - ☐ c) High humidity levels provide the necessary moisture for water vapor to condense and form clouds, which can later result in precipitation.

15. The process of Evaporation from oceans, lakes, and rivers contributes to the formation of clouds and precipitation, which includes rain. However, explain how the process of condensation, is connected to cloud formation?

    ☐ a) Condensation decreases the amount of water vapor in the atmosphere.

    ☐ b) Condensation is a process that only occurs at ground level.

    ☐ c) Condensation leads to the cooling of air and the formation of tiny water droplets that gather to form clouds.

16. When irrigation is carried out for crops, increased humidity in the atmosphere benefits agricultural plants. However, explain how the process of condensation affecting road traffic and transportation?

    ☐ a) Condensation has no effect on transportation.

    ☐ b) Condensation can lead to slippery roads and reduced visibility, affecting transportation safety.

    ☐ c) Condensation only occurs in urban areas and does not impact transportation.

17. Clouds take on different shapes and formations based on their altitude. These varying cloud formations serve as indicators of different weather conditions. However, describe the sequence of clouds in ascending order seen by a person standing 500 meters above sea level?

    ☐ a) Cumulus, nimbus, stratus, cirrus ☐ b) Cirrus, stratus, cumulus, nimbus

    ☐ c) Stratus, cirrus, nimbus, cumulus ☐ d) Nimbus, stratus, cumulus, cirrus

18. When moist air rises, expands, cools, and condenses, clouds take shape. This phenomenon involves the transformation of water vapor into either tiny water droplets or ice crystals within the air. Understanding the fundamental principles of cloud formation and their connection with atmospheric dynamics, cirrus clouds differ from cumulus clouds in terms of their general characteristics.

    ☐ a) Cirrus clouds are fluffy and white, while cumulus clouds are thin and wispy.

    ☐ b) Cirrus clouds are low-altitude clouds, while cumulus clouds are high-altitude clouds.

    ☐ c) Cirrus clouds are thin and wispy, while cumulus clouds are puffy and white.

19. Altocumulus clouds often bring steady rain or snow, while at the same time, cirrus clouds can indicate good weather. When cumulonimbus clouds are present in the sky, try to predict the weather.

    ☐ a) Sunny and dry conditions

    ☐ b) Light drizzle or mist

    ☐ c) Thunderstorms with heavy rain, lightning, and thunder

    ☐ d) Foggy conditions

20. When condensation occurs, various forms of precipitation can develop; it can take the form of raindrops, ice crystals like snowflakes, or other types of frozen particles. Identify the correct type of precipitation Tiny, frozen pellets of ice that bounce when they hit the ground.

☐ a) Rain ☐ b) Sleet ☐ c) Snow ☐ d) Hail

21. You are setting up a weather station to monitor local weather conditions. One of the instruments you have is a rain gauge. What is the main function of a rain gauge in a weather station setup?

☐ a) To indicate changes in atmospheric pressure

☐ b) To measure the speed of the wind

☐ c) To record temperature variations

☐ d) To quantify the quantity of rainfall received over a certain timeframe

22. This type of rainfall occurs when warm air rises due to its lower density, cools, and condenses, often leading to localized and intense rainfall, thunderstorms, and potential flooding. The type of rainfall described above belongs to which category shown below?

☐ a) Convectional Rainfall

☐ b) Orographic Rainfall

☐ c) Frontal Rainfall

23. A cold air mass meets a warm air mass, and the warm air is forced to rise over the colder air, leading to condensation and rain. What type of rainfall is this?

☐ a) Convectional Rainfall

☐ b) Orographic Rainfall

☐ c) Frontal Rainfall

24. The geographical features of the region, including mountains, valleys, and lowlands, play a significant role in influencing the local climate patterns that govern regional weather forecasts. Which type of rainfall is more likely to occur in regions near mountain ranges?

☐ a) Convectional Rainfall

☐ b) Orographic Rainfall

☐ c) Frontal Rainfall

25. The natural features and characteristics of each region are influenced by both the climate and the geography in accordance with them. In the region mentioned below, there is a place where there is extremely dry conditions and high temperatures, this region receives very little rainfall. Identify the region.

☐ a) Amazon Rainforest ☐ b) Sahara Desert

☐ c) Indian Monsoon Region ☐ d) Equatorial Africa

26. Diurnal temperature range refers to the difference between average temperatures during day and night. Then, in the regions mentioned below, which region the diurnal temperature range is typically larger?

☐ a) Coastal areas ☐ b) Urban areas
☐ c) Mountainous regions ☐ d) Tropical rainforests

27. In a desert, the temperature can rise to 40°C during the day and drop to 5°C at night. What is the diurnal temperature range?

☐ a) 10°C ☐ b) 20°C ☐ c) 25°C ☐ d) 35°C

28. A city experiences a temperature of 15°C in the morning and 10°C in the evening. What is its diurnal temperature range?

☐ a) 3°C ☐ b) 5°C ☐ c) 10°C ☐ d) 15°C

29. Annual temperature range is calculated as the difference between highest and lowest temperatures recorded in a year. Then, if a city has an average high temperature of 25°C in summer and an average low temperature of -5°C in winter, what is its annual temperature range?

☐ a) 10°C ☐ b) 15°C ☐ c) 20°C ☐ d) 30°C

30. The heat budget of the Earth, which involves the balance between incoming solar radiation and outgoing terrestrial radiation. Then, on a cloudy night, why is the temperature generally warmer compared to a clear night?

☐ a) Clouds emit heat, warming the atmosphere.
☐ b) Clouds prevent heat from escaping into space.
☐ c) Clouds block incoming solar radiation.
☐ d) Clouds increase atmospheric pressure.

TEST OF PROBLEM SOLVING ABILITY IN GEOGRAPHY (POSTTEST)

(FINAL MALAYALAM)

RESHMA P T
Research Scholar
GCTE Kozhikode

Dr. K RAMAKRISHNAN
Rtd. Associate Professor
GCTE Kozhikode

Class: IX Subject: Geography Unit: Sun the Ultimate Source Max Mark: 30 Time: 1 hr

പൊതു നിർദ്ദേശങ്ങൾ:

- ഈ ടെസ്റ്റ് പേപ്പറിൽ 30 ചോദ്യങ്ങൾ അടങ്ങിയിരിക്കുന്നു
- എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം നൽകുക. ഓരോ ചോദ്യത്തിനും 1 സ്കോർ ഉണ്ടായിരിക്കും
- ശരിയുത്തരങ്ങൾക്ക് നേരെ ടിക്ക് മാർക്കിടുക.
- തെറ്റായ ഉത്തരങ്ങൾക്ക് നെഗറ്റീവ് മാർക്ക് ഇല്ല

1. താഴെപ്പറയുന്ന അളവുകൾ പരിശോധിച്ച് സൗരവികിരണത്തിന്റെ അളവ്, ശരാശരി താപനിലയെ എങ്ങനെ ബാധിക്കുന്നു എന്ന് കണ്ടുപിടിക്കുക.

   പ്രദേശം A (തീരപ്രദേശം): സൗരവികിരണം സ്വീകരിച്ചത് = 800 W/m², ശരാശരി താപനില = 28°C

   പ്രദേശം B (ഉൾപ്രദേശം): സൗരവികിരണം സ്വീകരിച്ചത് = 1000 W/m², ശരാശരി താപനില = 35°C

   ☐ a) ഉയർന്ന സൗരവികിരണം ഉയർന്ന ശരാശരി താപനിലയിലേക്ക് നയിക്കുന്നു.

   ☐ b) ഉയർന്ന സൗരവികിരണം കുറഞ്ഞ ശരാശരി താപനിലയിലേക്ക് നയിക്കുന്നു.

   ☐ c) സൗരവികിരണത്തിന് താപനിലയിൽ യാതൊരു സ്വാധീനവുമില്ല.

2. താഴെപ്പറയുന്ന അളവുകൾ പരിശോധിച്ച് നഗരപ്രദേശങ്ങളും ഗ്രാമപ്രദേശങ്ങളും തമ്മിലുള്ള ആൽബിഡോയിലെ വ്യത്യാസം അവയുടെ താപം ആഗിരണം ചെയ്യുന്ന നിലയിലേക്ക് എങ്ങനെ സംഭാവന ചെയ്യുന്നു എന്ന് കണ്ടുപിടിക്കുക.

   നഗരപ്രദേശം: ആൽബിഡോ = 0.15, പ്രതലങ്ങളാൽ ആഗിരണം ചെയ്യപ്പെടുന്ന താപം = 4500 W/m²

   ഗ്രാമപ്രദേശം: ആൽബിഡോ = 0.25, പ്രതലങ്ങളാൽ ആഗിരണം ചെയ്യപ്പെടുന്ന താപം = 3500 W/m²

   ☐ a) നഗരപ്രദേശങ്ങളിലെ ഉയർന്ന ആൽബിഡോ ഉയർന്ന താപ ആഗിരണത്തിലേക്ക് നയിക്കുന്നു.

   ☐ b) ഗ്രാമപ്രദേശങ്ങളിലെ ഉയർന്ന ആൽബിഡോ ഉയർന്ന താപ ആഗിരണത്തിലേക്ക് നയിക്കുന്നു.

   ☐ c) നഗരപ്രദേശങ്ങളിലെ താഴ്ന്ന ആൽബിഡോ ഉയർന്ന താപ ആഗിരണത്തിലേക്ക് നയിക്കുന്നു.

   ☐ d) ഗ്രാമപ്രദേശങ്ങളിലെ താഴ്ന്ന ആൽബിഡോ ഉയർന്ന താപ ആഗിരണത്തിലേക്ക് നയിക്കുന്നു.

3. താഴെ കൊടുത്തിരിക്കുന്ന വിവരങ്ങൾ അടിസ്ഥാനമാക്കി നിങ്ങൾ 3000 മീറ്റർ ഉയരത്തിൽ കയറുകയാണെങ്കിൽ, അവിടെ ഏകദേശം എന്തായിരിക്കും താപനില എന്ന് കണ്ടെത്തുക.

   *ഉയരം 0 മീറ്റർ: താപനില = 30°C

   *ഉയരം 1000 മീറ്റർ: താപനില = 20°C

   ☐ a) 10°C ☐ b) 15°C ☐ c) 20°C ☐ d) 0°C

4. തന്നിരിക്കുന്ന വിവരങ്ങൾ വിലയിരുത്തി അപ്ഹീലിയനും പെരിഹീലിയനും തമ്മിലുള്ള അകലം കണക്കാക്കുക.

   *അപ്ഹീലിയൻ: ഭൂമി സൂര്യനിൽ നിന്ന് ഏറ്റവും അകലെയാണ്, ദൂരം=152 ദശലക്ഷം കി.മീ

   *പെരിഹീലിയൻ: ഭൂമി സൂര്യനോട് ഏറ്റവും അടുത്താണ്, ദൂരം=147 ദശലക്ഷം കി.മീ

   ☐ a) 5 ദശലക്ഷം കി.മീ. ☐ b) 10 ദശലക്ഷം കി.മീ.

   ☐ c) 15 ദശലക്ഷം കി.മീ. ☐ d) 25 ദശലക്ഷം കി.മീ

5. കരയും വെള്ളവും, പകലും രാത്രിയും വ്യത്യസ്തമായി ചൂട് ആഗിരണം ചെയ്യുന്നതും പുറത്തുവിടുന്നതും എങ്ങനെയെന്ന് വിശദീകരിക്കുക.

   ☐ a) ഭൂമി താപം വേഗത്തിൽ ആഗിരണം ചെയ്യുകയും വെള്ളത്തേക്കാൾ സാവധാനത്തിൽ പുറത്തുവിടുകയും ചെയ്യുന്നു, ഇത് താപനില മാറ്റങ്ങൾ കൂടുതൽ സാവധാനത്തിലാക്കുന്നു.

   ☐ b) ഭൂമി താപത്തെ സാവധാനത്തിൽ ആഗിരണം ചെയ്യുകയും വെള്ളത്തേക്കാൾ വേഗത്തിൽ പുറത്തുവിടുകയും ചെയ്യുന്നു, ഇത് താപനില മാറ്റങ്ങൾ കൂടുതൽ സാവധാനത്തിലാക്കുന്നു.

   ☐ c) കരയും വെള്ളവും ഒരേ നിരക്കിൽ ചൂട് ആഗിരണം ചെയ്യുകയും പുറത്തുവിടുകയും ചെയ്യുന്നു.

6. (എ) നഗരപ്രദേശങ്ങളിൽ കൂടുതൽ കോൺക്രീറ്റ്, അസ്ഫാൽറ്റ്, കെട്ടിടങ്ങൾ എന്നിവ ചൂട് ആഗിരണം ചെയ്യുകയും നിലനിർത്തുകയും ചെയ്യുന്നു;

   (ബി) ഗ്രാമപ്രദേശങ്ങളിൽ തണലും തണുപ്പും നൽകുന്ന തുറസ്സായ സ്ഥലങ്ങളും കൂടുതൽ സസ്യജാലങ്ങളുമുണ്ട്. എ,ബി എന്നീ സാഹചര്യങ്ങൾ വിലയിരുത്തി നഗരങ്ങളിലെ അർബൻ ഹീറ്റ് ഐലൻഡ് പ്രഭാവം ലഘൂകരിക്കാൻ രണ്ട് തന്ത്രങ്ങൾ നിർദ്ദേശിക്കുക.

   ☐ a) നഗരപ്രദേശങ്ങളിൽ നിന്ന് എല്ലാ സസ്യങ്ങളും മരങ്ങളും നീക്കം ചെയ്യുക.

   ☐ b) നഗരങ്ങളിൽ കോൺക്രീറ്റിന്റെയും അസ്ഫാൽറ്റിന്റെയും അളവ് വർദ്ധിപ്പിക്കുക.

   ☐ c) കൂടുതൽ മരങ്ങൾ നട്ടുപിടിപ്പിക്കുകയും നഗരപ്രദേശങ്ങളിൽ ഹരിത ഇടങ്ങൾ സൃഷ്ടിക്കുകയും ചെയ്യുക.

7. ഉയരം കൂടുന്നതിനനുസരിച്ച് അന്തരീക്ഷമർദ്ദം കുറയുന്നു; ട്രോപോസ്ഫിയറിലെ ഉയരം കൂടുന്നതിനനുസരിച്ച് താപനില കുറയുന്നു. അങ്ങനെയെങ്കിൽ താഴ്ന്ന പ്രദേശങ്ങളുമായി താരതമ്യപ്പെടുത്തുമ്പോൾ പർവതങ്ങളിൽ തണുത്ത താപനില ഉണ്ടാകുന്നത് എന്തുകൊണ്ടെന്ന് വിശദീകരിക്കുക

   ☐ a) പർവതങ്ങൾക്ക് കൂടുതൽ നേരിട്ട് സൂര്യപ്രകാശം ലഭിക്കുന്നു, ഇത് ഉയർന്ന താപനിലയ്ക്ക് കാരണമാകുന്നു.

   ☐ b) പർവതങ്ങൾ ഭൂമധ്യരേഖയോട് അടുത്താണ്, ഇത് ഉയർന്ന താപനിലയ്ക്ക് കാരണമാകുന്നു.

   ☐ c) പർവതങ്ങളുടെ ഉയർന്ന ഉയരം താഴ്ന്ന താപനിലയിലേക്ക് നയിക്കുന്നു.

8. ഒരേ താപനിലയുള്ള സ്ഥലങ്ങളെ ബന്ധിപ്പിക്കുന്ന ഭൂപടത്തിലെ വരകളാണ് സമതാപ രേഖകൾ. എന്നതിന്റെ അടിസ്ഥാനത്തിൽ താപനില പാറ്റേണുകൾ മനസ്സിലാക്കുന്നതിന് സമതാപ രേഖകൾ പ്രധാനമായിരിക്കുന്നത് എന്തുകൊണ്ടെന്ന് വിശദീകരിക്കുക.

☐ a) മഴയുടെ പാറ്റേൺ പ്രവചിക്കാൻ സഹായിക്കുന്നു.

☐ b) മേഘങ്ങളക്കുറിച്ചുള്ള വിവരങ്ങൾ നൽകുന്നു.

☐ c) പ്രദേശങ്ങളിലുടനീളം താപനില എങ്ങനെ വ്യത്യാസപ്പെടുന്നുവെന്ന് കാണിക്കുന്നു.

9. താപവൈപരീത്യസമയത്ത്, സാധാരണ താപനില നിരക്ക് വിപരീതമാണ്. ശാന്തവും തെളിഞ്ഞതുമായ രാത്രികളിൽ താപവൈപരീത്യംപലപ്പോഴും സംഭവിക്കാറുണ്ട്. ഈ സാഹചര്യങ്ങൾ കണക്കിലെടുത്ത് തെളിഞ്ഞ രാത്രികളിൽ താപവൈപരീത്യം ഉണ്ടാകാനുള്ള സാധ്യത എന്തുകൊണ്ടെന്ന് വിശദീകരിക്കുക.

☐ a) മേഘങ്ങൾ ഉപരിതലത്തിനടുത്തുള്ള ചൂടുള്ള വായുവിനെ കുടുക്കുന്നു.

☐ b) മേഘങ്ങളുടെ അഭാവം ചൂട് പുറത്തുവരാൻ അനുവദിക്കുന്നു, ഇത് തണുപ്പിന് കാരണമാകുന്നു.

☐ c) കാറ്റുള്ള സാഹചര്യങ്ങൾ താപവൈപരീത്യം തടയുന്നു.

10. നമുക്ക് മുകളിലുള്ള വായു ചെലുത്തുന്ന ഭാരമാണ് അന്തരീക്ഷമർദ്ദം. അങ്ങനെയെങ്കിൽ ഉയർന്ന പർവ്വത പ്രദേശത്ത് നിൽക്കുമ്പോൾ നിങ്ങളുടെ മേൽ പ്രയോഗിക്കപ്പെടുന്ന അന്തരീക്ഷമർദ്ദത്തിന്റെ അളവിന് എന്തു സംഭവിക്കുന്നു.

☐ a) ഇത് വർദ്ധിക്കുന്നു ☐ b) ഇത് കുറയുന്നു

☐ c) അത് അതേപടി തുടരുന്നു ☐ d) ഇത് നെഗറ്റീവ് ആയി മാറുന്നു

11. താഴ്ന്ന മർദ്ദ സംവിധാനങ്ങൾ മേഘാവൃതവും മഴയുള്ളതുമായ കാലാവസ്ഥയുമായി ബന്ധപ്പെട്ടിരിക്കുന്നു. ഉയർന്ന മർദ്ദ സംവിധാനങ്ങൾ സാധാരണയായി തെളിഞ്ഞ ആകാശവും തെളിഞ്ഞ കാലാവസ്ഥയും നൽകുന്നു. അങ്ങനെയെങ്കിൽ ഉയർന്ന മർദ്ദ സംവിധാനങ്ങൾ തെളിഞ്ഞ കാലാവസ്ഥയുമായി ബന്ധപ്പെട്ടിരിക്കുന്നത് എന്തുകൊണ്ടാണെന്ന് വിശദീകരിക്കുക.

☐ a) ഉയർന്ന മർദ്ദ സംവിധാനങ്ങൾ ഉപരിതലത്തിനടുത്തുള്ള ചൂട് വായുവിനെ കുടുക്കുന്നു.

☐ b) ഉയർന്ന മർദ്ദ സംവിധാനങ്ങൾ മേഘങ്ങളുടെ രൂപീകരണത്തെ പ്രോത്സാഹിപ്പിക്കുന്നു.

☐ c) ഉയർന്ന മർദ്ദ സംവിധാനങ്ങൾ വായുവിന്റെ മുകളിലേക്കുള്ള ചലനത്തെ തടയുന്നു.

12. ഭൂമിയുടെ ഉപരിതലത്തിലെ അസമമായ താപനം വായു മർദ്ദത്തിലെ വ്യത്യാസങ്ങൾക്ക് കാരണമാകുന്നു, ഇത് വായുവിന്റെ ചലനത്തിന് കാരണമാകുന്നു അത് കാറ്റായി രൂപാന്തരപ്പെടുന്നു. എന്നാൽ ഭൂമിയുടെ ഭ്രമണം കാറ്റിന്റെ വേഗതയെ എങ്ങനെ ബാധിക്കുന്നു?

☐ a) ഭൂമിയുടെ ഭ്രമണം കാറ്റിന്റെ വേഗതയെ ബാധിക്കില്ല.

☐ b) ഭൂമിയുടെ ഭ്രമണം കാറ്റിനെ സ്ഥിരമായ വേഗതയിൽ ചലിപ്പിക്കുന്നു.

☐ c) കോറിയോലിസ് പ്രഭാവം മൂലം ഭൂമിയുടെ ഭ്രമണം കാറ്റിന്റെ വേഗതയെ സ്വാധീനിക്കുന്നു.

13. ചെറിയ തോതിലുള്ള താപനിലയിലും മർദ്ദത്തിലും ഉള്ള വ്യത്യാസങ്ങൾ പ്രാദേശിക കാറ്റുകളെ സ്വാധീനിക്കുന്നുവെങ്കിൽ കടൽക്കാറ്റും കരക്കാറ്റും രൂപപ്പെടുന്ന രീതിയെ അടിസ്ഥാനമാക്കി താഴെപ്പറയുന്നതിൽ ശരിയല്ലാത്ത പ്രസ്താവന ഏത്.

    ☐ a) കടലിനെക്കാൾ വേഗത്തിൽ കര തണുക്കുമ്പോഴാണ് രാത്രിയിൽ കടൽക്കാറ്റുകൾ ഉണ്ടാകുന്നത്. കടൽ കരയെക്കാൾ ചൂടുള്ള പകൽ സമയത്താണ് കരയിൽ കാറ്റ് വീശുന്നത്.

    ☐ b) കരയിൽ കടലിനെക്കാൾ ചൂട് കൂടുതലുള്ള പകൽ സമയത്താണ് കടൽക്കാറ്റുകൾ ഉണ്ടാകുന്നത്. കടലിന് കരയെക്കാൾ ചൂട് കൂടുതലുള്ള രാത്രിയിലാണ് കരക്കാറ്റ് ഉണ്ടാകുന്നത്.

    ☐ c) കോറിയോലിസ് പ്രഭാവം മൂലമാണ് കടൽക്കാറ്റുകൾ ഉണ്ടാകുന്നത്. ഭൂമിയുടെ ഭ്രമണം മൂലമാണ് കരക്കാറ്റ് ഉണ്ടാകുന്നത്.

14. അന്തരീക്ഷത്തിലെ ഉയർന്ന ആർദ്രത അസ്വാസ്ഥ്യത്തിനും കാലാവസ്ഥാ വ്യതിയാനത്തിനും ഇടയാക്കും. ആർദ്രത കൂടിയ അന്തരീക്ഷത്തിൽ ഘനീഭവിക്കൽ പ്രക്രിയ മേഘങ്ങളുടെ രൂപീകരണത്തെയും മഴയെയും എങ്ങനെ സ്വാധീനിക്കുന്നു എന്ന് വിശദീകരിക്കുക.

    ☐ a) ഘനീഭവിക്കൽ മേഘ രൂപീകരണത്തെ ബാധിക്കുന്നില്ല.

    ☐ b) ഉയർന്ന ആർദ്രതയുടെ അളവ് ജലാശയങ്ങളുടെ ബാഷ്പീകരണത്തിലേക്ക് നയിച്ചേക്കാം.

    ☐ c) ഉയർന്ന ആർദ്രത അളവ് ജലബാഷ്പത്തിന് ആവശ്യമായ ഈർപ്പം നൽകുന്നു, ഇത് പിന്നീട് മഴയ്ക്ക് കാരണമാകും.

15. സമുദ്രങ്ങൾ, തടാകങ്ങൾ, നദികൾ എന്നിവയിൽ നിന്നുള്ള ബാഷ്പീകരണം മേഘങ്ങളുടെ രൂപീകരണത്തിനും മഴയ്ക്കും കാരണമാകുന്നു. എന്നാൽ മേഘ രൂപീകരണവുമായി ഘനീഭവിക്കൽ പ്രക്രിയ എങ്ങനെ ബന്ധപ്പെട്ടിരിക്കുന്നുവെന്ന് വിവരിക്കുക.

    ☐ a) ഘനീഭവിക്കുന്നത് അന്തരീക്ഷത്തിലെ നീരാവിയുടെ അളവ് കുറയ്ക്കുന്നു.

    ☐ b) ഭൂനിരപ്പിൽ മാത്രം സംഭവിക്കുന്ന ഒരു പ്രക്രിയയാണ് ഘനീഭവിക്കൽ.

    ☐ c) ഘനീഭവിക്കുന്നത് വായു തണുപ്പിക്കുന്നതിലേക്കും ചെറിയ ജലകണങ്ങളുടെ രൂപീകരണത്തിലേക്കും നയിക്കുന്നു, അവ മേഘങ്ങളുണ്ടാക്കുന്നു.

16. വിളകൾക്ക് ജലസേചനം നടത്തുമ്പോൾ അന്തരീക്ഷത്തിലെ ആർദ്രത ഉയരുന്നു അത് കാർഷിക വിളകൾക്ക് ഗുണകരമാണ്. എന്നാൽ ഘനീഭവിക്കൽ പ്രകിയ റോഡ് ഗതാഗതത്തിന് വെല്ലുവിളിയാകുന്നത് എങ്ങനെ?

    ☐ a) ഘനീഭവിക്കുന്നത് ഗതാഗതത്തെ ബാധിക്കില്ല.

    ☐ b) ഘനീഭവിക്കുന്നത് റോഡുകൾ വഴുക്കുന്നതിനും ദൃശ്യപരത കുറയുന്നതിനും ഇടയാക്കും, ഇത് ഗതാഗത സുരക്ഷയെ ബാധിക്കും.

    ☐ c) നഗരപ്രദേശങ്ങളിൽ മാത്രമേ ഘനീഭവിക്കുന്നുള്ളൂ, ഗതാഗതത്തെ ബാധിക്കില്ല.

17. മേഘങ്ങൾ രൂപീകരിക്കപ്പെടുന്ന ഉയരത്തിനനുസരിച്ച് മേഘങ്ങളുടെ ആകൃതിയും വ്യത്യാസപ്പെട്ടിരിക്കുന്നു. ഇത്തരം മേഘങ്ങൾ ഓരോന്നും വ്യത്യസ്ത തരത്തിലുള്ള കാലാവസ്ഥാസൂചകങ്ങളായി വർത്തിക്കുന്നു. എന്നാൽ സമുദ്രനിരപ്പിൽ നിന്ന് 500 മീറ്റർ ഉയരത്തിൽ നിൽക്കുന്ന ഒരാൾ കാണുന്ന മേഘങ്ങളെ ആരോഹണ ക്രമത്തിൽ എഴുതുക?

☐ a) ക്യുമുലസ്, നിംബസ്, സ്ട്രാറ്റസ്, സിറസ്

☐ b) സിറസ്, സ്ട്രാറ്റസ്, ക്യുമുലസ്, നിംബസ്

☐ c) സ്ട്രാറ്റസ്, സിറസ്, നിംബസ്, ക്യുമുലസ്

☐ d) നിംബസ്, സ്ട്രാറ്റസ്, ക്യുമുലസ്, സിറസ്

18. ഈർപ്പമുള്ള വായു ഉയരുകയും വികസിക്കുകയും തണുക്കുകയും ചെയ്യുമ്പോൾ മേഘങ്ങൾ രൂപം കൊള്ളുന്നു, ഇത് ജലബാഷ്പം ചെറിയ ജലത്തുള്ളികളോ ഐസ് പരലുകളോ ആയി ഘനീഭവിക്കുന്നു.' മേഘ രൂപീകരണത്തിന്റെ പൊതു തത്വവുമായി ബന്ധപ്പെടുത്തി സിറസ് മേഘങ്ങൾ ക്യുമുലസ് മേഘങ്ങളിൽ നിന്ന് എങ്ങനെ വ്യത്യാസപ്പെട്ടിരിക്കുന്നു എന്ന് വ്യക്തമാക്കുക

☐ a) സിറസ് മേഘങ്ങൾ നനുത്തതും വെളുത്തതുമാണ്, അതേസമയം ക്യുമുലസ് മേഘങ്ങൾ കനം കുറഞ്ഞതും തൂവൽ പോലെയുള്ളതുമാണ്.

☐ b) സിറസ് മേഘങ്ങൾ താഴ്ന്ന ഉയരത്തിലുള്ള മേഘങ്ങളാണ്, അതേസമയം ക്യുമുലസ് മേഘങ്ങൾ ഉയർന്ന ഉയരത്തിലുള്ള മേഘങ്ങളാണ്.

☐ c) സിറസ് മേഘങ്ങൾ കനം കുറഞ്ഞതും ഞെരുക്കമുള്ളതുമാണ്, അതേസമയം ക്യുമുലസ് മേഘങ്ങൾ വീർത്തതും വെളുത്തതുമാണ്.

☐ d) ആലിപ്പഴവർഷണം പകൽ സമയത്ത് മാത്രം കാണുന്ന ഒന്നാണ്.

19. ആൾട്ടോസ്ട്രാറ്റസ് മേഘങ്ങൾ പലപ്പോഴും സ്ഥിരമായ മഴയോ മഞ്ഞോ കൊണ്ടു വരുന്നു, അതേസമയം സിറസ് മേഘങ്ങൾ നല്ല കാലാവസ്ഥയെ സൂചിപ്പിക്കാം. ആകാശത്ത് കുമുലോനിംബസ് മേഘങ്ങളുടെ സാന്നിധ്യമുള്ളപ്പോൾ കാലാവസ്ഥ പ്രവചിക്കുക.

☐ a) വെയിൽ, വരണ്ട അവസ്ഥ

☐ b) നേരിയ ചാറ്റൽ മഴ അല്ലെങ്കിൽ മൂടൽമഞ്ഞ്

☐ c) കനത്ത മഴയ്ക്കൊപ്പം ഇടിമിന്നൽ

☐ d) മൂടൽമഞ്ഞുള്ള അവസ്ഥ

20. വർഷണ രൂപങ്ങൾ വിവിധ തരത്തിലുണ്ട്; വെള്ളത്തുള്ളികളായോ ഐസ് പരലുകളായോ അവ ഭൂമിയിൽ പെയ്യുന്നു. നിലത്തു പതിക്കുമ്പോൾ തണുത്തുറഞ്ഞ ചെറിയ ഐസ് ഉരുളകൾ പോലുള്ള വർഷണ രൂപം ഏതാണ്?

☐ a) മഴ ☐ b) മഴയുടെയും മഞ്ഞിന്റെയും മിശ്രിതം

☐ c) മഞ്ഞ് ☐ d) ആലിപ്പഴം

21. പ്രാദേശിക കാലാവസ്ഥ നിരീക്ഷിക്കാൻ നിങ്ങൾ ഒരു കാലാവസ്ഥാ സ്റ്റേഷൻ സജ്ജീകരിക്കുകയാണ്. നിങ്ങളുടെ പക്കലുള്ള ഉപകരണങ്ങളിലൊന്നാണ് മഴമാപിനി. കാലാവസ്ഥാ കേന്ദ്രം സജ്ജീകരിക്കുമ്പോൾ മഴമാപിനിയുടെ പ്രധാന ഉദ്ദേശ്യം എന്താണ്?

☐ a) അന്തരീക്ഷമർദ്ദത്തിലെ മാറ്റങ്ങൾ സൂചിപ്പിക്കാൻ

☐ b) കാറ്റിന്റെ വേഗത അളക്കാൻ

☐ c) താപനില വ്യതിയാനങ്ങൾ രേഖപ്പെടുത്താൻ

☐ d) ഒരു നിശ്ചിത സമയപരിധിക്കുള്ളിൽ ലഭിച്ച മഴയുടെ അളവ് കണക്കാക്കാൻ

22. താഴ്ന്ന സാന്ദ്രത കാരണം ചൂടുള്ള വായു ഉയരുകയും തണുക്കുകയും ഘനീഭവിക്കുകയും ചെയ്യുമ്പോൾ ഇത് പലപ്പോഴും പ്രാദേശികവും തീവ്രവുമായ മഴ, ഇടിമിന്നൽ, വെള്ളപ്പൊക്കം എന്നിവയിലേക്ക് നയിക്കുന്നു. മുകളിൽ പ്രതിപാദിച്ചിരിക്കുന്ന തരത്തിലുള്ള മഴ താഴെക്കൊടുത്തിരിക്കുന്നതിൽ ഏതു വിഭാഗത്തിൽപ്പെടുന്നു?

☐ a) സംവഹന വൃഷ്ടി ☐ b) പർവത വൃഷ്ടി ☐ c) ചക്രവാത വൃഷ്ടി

23. ഒരു തണുത്ത വായു പിണ്ഡം ഒരു ചൂടുള്ള വായു പിണ്ഡത്തെ കണ്ടുമുട്ടുന്നു, ചൂടുള്ള വായു തണുത്ത വായുവിന് മുകളിൽ ഉയരാൻ നിർബന്ധിതമാകുന്നു, ഇത് ഘനീഭവിക്കുന്നതിനും മഴയ്ക്കും കാരണമാകുന്നു. ഇത് ഏത് തരത്തിലുള്ള മഴയാണ്?

☐ a) സംവഹന മഴ ☐ b) പർവത വൃഷ്ടി ☐ c) ചക്രവാത വൃഷ്ടി

24. പർവ്വതങ്ങൾ താഴ് വരകൾ താഴ്ന്ന പ്രദേശങ്ങൾ എന്നിവയുൾപ്പെടെയുള്ള പ്രദേശത്തിന്റെ ഭൂമിശാസ്ത്രപരമായ സവിശേഷതകൾ കാലാവസ്ഥാ പ്രവചനങ്ങളെ നിയന്ത്രിക്കുന്ന പ്രാദേശിക കാലാവസ്ഥാ മതൃകകളെ സ്വാധീനിക്കുന്നതിൽ ഒരു പ്രധാന പങ്കുവഹിക്കുന്നു.പർവതനിരകൾക്ക് സമീപമുള്ള പ്രദേശങ്ങളിൽ ഏത് തരത്തിലുള്ള മഴയാണ് കൂടുതൽ ഉണ്ടാകാൻ സാധ്യത?

☐ a) സംവഹന മഴ ☐ b) പർവത വൃഷ്ടി ☐ c) ചക്രവാത വൃഷ്ടി

25. ഒരോ പ്രദേശത്തിന്റെയും കാലാവസ്ഥക്കനുസരിച്ച് ഭൂപ്രകൃതിക്കും സവിശേഷതകൾ കാണപ്പെടുന്നു. താഴെ ക്കൊടുത്തിരിക്കുന്നതിൽ വളരെ വരണ്ട കാലാവസ്ഥയും ഉയർന്ന താപനിലയും വളരെ കുറഞ്ഞ അളവിൽ മാത്രം മഴ മഴ ലഭിക്കുകയും ചെയ്യുന്ന പ്രദേശംഏതാണെന്ന് തിരിച്ചറിയുക.

☐ a) ആമസോൺ മഴക്കാടുകൾ ☐ b) സഹാറ മരുഭൂമി

☐ c) ഇന്ത്യൻ മൺസൂൺ മേഖല ☐ d) ആഫ്രിക്ക

26. പകലും രാത്രിയും ശരാശരി താപനിലകൾ തമ്മിലുള്ള വ്യത്യാസത്തെ ദൈനംദിന താപാന്തരം സൂചിപ്പിക്കുന്നെങ്കിൽ, താഴെപ്പറയുന്ന പ്രദേശങ്ങളിൽ ഏത് പ്രദേശത്താണ് സാധാരണയായി ദൈനം ദിന താപാന്തരണം കൂടുതലായി കണ്ടുവരുന്നത്?

☐ a) തീരപ്രദേശങ്ങൾ ☐ b) നഗരപ്രദേശങ്ങൾ

☐ c) പർവതപ്രദേശങ്ങൾ ☐ d) ഉഷ്ണമേഖലാ മഴക്കാടുകൾ

27. ഒരു മരുഭൂമിയിൽ, പകൽ സമയത്ത് താപനില 40 ഡിഗ്രി സെൽഷ്യസായി ഉയരുകയും രാത്രിയിൽ 5 ഡിഗ്രി സെൽഷ്യസായി കുറയുകയും ചെയ്യുന്നു. ദൈനംദിന താപാന്തരം എത്രയാണ്?

☐ a) 10°C ☐ b) 20°C ☐ c) 25°C ☐ d) 35°C

28. ഒരു നഗരത്തിൽ രാവിലെ 15 ഡിഗ്രി സെൽഷ്യസും വൈകുന്നേരം 10 ഡിഗ്രി സെൽഷ്യസും താപനില അനുഭവപ്പെടുന്നു. നഗരത്തിലെ ദൈനംദിന താപാന്തരം എത്രയാണ്?

☐ a) 3°C ☐ b) 5°C ☐ c) 10°C ☐ d) 15°C

29. ഒരു വർഷത്തിൽ രേഖപ്പെടുത്തിയ ഏറ്റവും ഉയർന്നതും താഴ്ന്നതുമായ താപനിലകൾ തമ്മിലുള്ള വ്യത്യാസമായാണ് വാർഷിക താപാന്തരം കണക്കാക്കുന്നതെങ്കിൽ, ഒരു നഗരത്തിൽ വേനൽക്കാലത്ത് ശരാശരി ഉയർന്ന താപനില 25 ഡിഗ്രി സെൽഷ്യസും ശൈത്യകാലത്ത് -5 ഡിഗ്രി സെൽഷ്യസും ആയിരുന്നു. നഗരത്തിലെ വാർഷിക താപാന്തരം എത്രയാണ്

☐ a) 10°C ☐ b) 15°C ☐ c) 20°C ☐ d) 30°C

30. സൗരവികിരണവ ഭൗമ വികിരണവ തമ്മിലുള്ള സന്തുലിതാവസ്ഥയാണ് ഭൂമിയുടെ താപസന്തുലനം എങ്കിൽ മേഘാവൃതമായ രാത്രിയിൽ, തെളിഞ്ഞ രാത്രിയെ അപേക്ഷിച്ച് താപനില പൊതുവെ ഉയർന്നിരിക്കുന്നതിന്റെ കാരണം കണ്ടുപിടിക്കുക.

- ☐ a) മേഘങ്ങൾ ചൂട് പുറപ്പെടുവിക്കുകയും അന്തരീക്ഷത്തെ ചൂടാക്കുകയും ചെയ്യുന്നു.
- ☐ b) ബഹിരാകാശത്തേക്ക് താപം പോകുന്നത് മേഘങ്ങൾ തടയുന്നു.
- ☐ c) മേഘങ്ങൾ സൗരവികിരണത്തെ തടയുന്നു.
- ☐ d) മേഘങ്ങൾ അന്തരീക്ഷമർദ്ദം വർദ്ധിപ്പിക്കുന്നു.

Efficacy of Certain Graphic Organizers

Appendix E3

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

TEST OF PROBLEM SOLVING ABILITY IN GEOGRAPHY (POSTTEST)

SCORING KEY

1. Higher solar radiation leads to higher average temperature.
2. c) Lower albedo in urban areas leads to higher heat absorption.
3. a) 0°C
4. a) 5 million km
5. a) Land absorbs heat faster and releases it slower than water, causing temperature changes to be more gradual.
6. c) Plant more trees and create green spaces in urban areas.
7. c) The higher altitude of mountains leads to lower temperatures.
8. c) Isotherms show how temperature varies across regions.
9. b) The absence of clouds allows heat to escape, causing cooling.
10. *b*) It decreases
11. c) High-pressure systems inhibit the upward movement of air.
12. c) Earth's rotation influences wind speed due to the Coriolis Effect.
13. b) Sea breezes are formed during the day when the land is warmer than the sea. Land breezes occur at night when the sea is warmer than the land.
14. c) High humidity levels provide the necessary moisture for water vapor to condense and form clouds, which can later result in precipitation.
15. c) Condensation leads to the cooling of air and the formation of tiny water droplets that gather to form clouds.
16. b) Condensation can lead to slippery roads and reduced visibility, affecting transportation safety.
17. d) Nimbus, stratus, cumulus, cirrus
18. c) Cirrus clouds are thin and wispy, while cumulus clouds are puffy and white.
19. c) Thunderstorms with heavy rain, lightning, and thunder.
20. b) Sleet
21. d) To quantify the quantity of rainfall received over a certain timeframe
22. a) Convectional Rainfall
23. c) Frontal Rainfall
24. a) Convectional Rainfall
25. b) Sahara Desert
26. c) Mountainous regions
27. b) 20°C
28. b) 5°C
29. d) 30°C
30. b) Clouds prevent heat from escaping into space.

GOVT. COLLEGE OF TEACHER EDUCATION, KOZHIKODE
Research Centre in Education (University of Calicut)

TEST OF PROBLEM SOLVING ABILITY IN GEOGRAPHY (POSTTEST)

SCORING KEY
(Malayalam)

1. a) ഉയർന്ന സൗരവികിരണം ഉയർന്ന ശരാശരി താപനിലയിലേക്ക് നയിക്കുന്നു.
2. c) നഗരപ്രദേശങ്ങളിലെ താഴ്ന്ന ആൽബിഡോ ഉയർന്ന താപ ആഗിരണത്തിലേക്ക് നയിക്കുന്നു.
3. a) 0°C
4. a) 5 ദശലക്ഷം കി.മീ.
5. a) ഭൂമി താപം വേഗത്തിൽ ആഗിരണം ചെയ്യുകയും വെള്ളത്തേക്കാൾ സാവധാനത്തിൽ പുറത്തുവിടുകയും ചെയ്യുന്നു, ഇത് താപനില മാറ്റങ്ങൾ കൂടുതൽ സാവധാനത്തിലാക്കുന്നു
6. c) കൂടുതൽ മരങ്ങൾ നട്ടുപിടിപ്പിക്കുകയും നഗരപ്രദേശങ്ങളിൽ ഹരിത ഇടങ്ങൾ സൃഷ്ടിക്കുകയും ചെയ്യുക.
7. c) പർവതങ്ങളുടെ ഉയർന്ന ഉയരം താഴ്ന്ന താപനിലയിലേക്ക് നയിക്കുന്നു.
8. c) പ്രദേശങ്ങളിലുടനീളം താപനില എങ്ങനെ വ്യത്യാസപ്പെടുന്നുവെന്ന് കാണിക്കുന്നു.
9. b) മേഘങ്ങളുടെ അഭാവം ചൂട് പുറത്തുവരാൻ അനുവദിക്കുന്നു, ഇത് തണുപ്പിന് കാരണമാകുന്നു.
10. b) ഇത് കുറയുന്നു
11. c) ഉയർന്ന മർദ്ദ സംവിധാനങ്ങൾ വായുവിന്റെ മുകളിലേക്കുള്ള ചലനത്തെ തടയുന്നു.
12. c) കോറിയോലിസ് പ്രഭാവം മൂലം ഭൂമിയുടെ ഭ്രമണം കാറ്റിന്റെ വേഗതയെ സ്വാധീനിക്കുന്നു.
13. b) കരയിൽ കടലിനെക്കാൾ ചൂട് കൂടുതലുള്ള പകൽ സമയത്താണ് കടൽക്കാറ്റുകൾ ഉണ്ടാകുന്നത്. കടലിന് കരയെക്കാൾ ചൂട് കൂടുതലുള്ള രാത്രിയിലാണ് കരക്കാറ്റ് ഉണ്ടാകുന്നത്.
14. c) ഉയർന്ന ആർദ്രത അളവ് ജലബാഷ്പത്തിന് ആവശ്യമായ ഈർപ്പം നൽകുന്നു, ഇത് പിന്നീട് മഴയ്ക്ക് കാരണമാകും.
15. c) ഘനീഭവിക്കുന്നത് വായു തണുപ്പിക്കുന്നതിലേക്കും ചെറിയ ജലകണങ്ങളുടെ രൂപീകരണത്തിലേക്കും നയിക്കുന്നു, അവ മേഘങ്ങളുണ്ടാക്കുന്നു.
16. b) ഘനീഭവിക്കുന്നത് റോഡുകൾ വഴുക്കുന്നതിനും ദൃശ്യപരത കുറയുന്നതിനും ഇടയാക്കും, ഇത് ഗതാഗത സുരക്ഷയെ ബാധിക്കും.
17. d) നിംബസ്, സ്ട്രാറ്റസ്, ക്യുമുലസ്, സിറസ്
18. c) സിറസ് മേഘങ്ങൾ കനം കുറഞ്ഞതും ഞെരുക്കമുള്ളതുമാണ്, അതേസമയം ക്യുമുലസ് മേഘങ്ങൾ വീർത്തതും വെളുത്തതുമാണ്.
19. c) കനത്ത മഴയ്ക്കൊപ്പം ഇടിമിന്നൽ
20. b) മഴയുടെയും മഞ്ഞിന്റെയും മിശ്രിതം
21. d) ഒരു നിശ്ചിത സമയപരിധിക്കുള്ളിൽ ലഭിച്ച മഴയുടെ അളവ് കണക്കാക്കാൻ

22. a) സംവഹന വൃഷ്ടി
23. c) ചക്രവാത വൃഷ്ടി
24. b) പർവത വൃഷ്ടി
25. b) സഹാറ മരുഭൂമി
26. c) പർവതപ്രദേശങ്ങൾ
27. b) 20°C
28. b) 5°C
29. d) 30°C
30. b) ബഹിരാകാശത്തേക്ക് താപം പോകുന്നത് മേഘങ്ങൾ തടയുന്നു.