C 2604 (Pages : 4) Name.....

Reg. No.....

FOURTH SEMESTER P.G. DEGREE EXAMINATION, APRIL 2021

(CCSS)

M.Sc. Applied Chemistry

ACH 4E 09—CHEMISTRY OF POLYMERS

(2019 Admissions)

Time : Three Hours Maximum : 80 Marks

Section A

Answer **all** *questions.*

Each question carries 1 *mark.*

1. For radical polymerization the polydispersity index is defined as :

   (A) Mw/Mn. (B) Mw/Mv.

   (C) Mn/Mw. (D) Mv/Mz.

2. Resol resin has ————————.

   (A) Excess methylol group. (B) Excess hydroxyl group.

   (C) Excess ether groups. (D) Excess phenolic group.

3. Natural rubber can be crosslinked by :

   (A) Sulphur. (B) PF Resin.

   (C) Radiation. (D) All of these.

4. Acid can be used as a catalyst in the polymerization of ————————.

   (A) PE. (B) PET.

   (C) PU. (D) All of these.

5. Interfacial polymerization requires ————————.

   (A) Two immiscible solvents. (B) Two miscible solvents.

   (C) One water phase. (D) Two non polar solvents.

6. Molecular weight distribution is quantified by ————————.

   (A) Reactivity ratio. (B) Polydispersity Index.

   (C) Extent of reaction. (D) None of these.

7. In the suspension polymerization the initiator is soluble in ————————.

(A) Monomer. (B) Solvent.

(C) Surfactant. (D) None of these.

8. Trommsdorff's effects is observed in bulk polymerization due to ————————.

(A) Non availability of solvent. (B) Increase in viscosity.

(C) Reduction in termination. (D) All of these.

9. Which of the following is used to determine Tg precisely ?

(A) DSC. (B) TMA.

(C) DMA. (D) TEM.

10. Number average molecular weight is determined by :

(A) Light scattering. (B) Viscosity measurements.

(C) End group analysis. (D) GPC.

11. Which of the following has longer branches ?

(A) UHMWPE. (B) HDPE.

(C) LLDE. (D) LDPE.

12. For preparing block co polymer which of the following can be used :

(A) ATRP. (B) Anionic polymerization.

(C) RAFT. (D) All of these.

(12 × 1 = 12 marks)

Section B

Answer **all** *questions.*

Each question carries 2 *marks.*

13. Name one initiator for cationic polymerization and show a typical initiation step.

14. What are major advantages of Interfacial polymerization ?

15. Define reactivity ratio of monomers in a copolymerization. What is the significance of r1.r2 = 1 ?

16. Why is Tg determined DMA higher than that from DSC ?

17. How is Teflon prepared ? Mention two major attributes of Teflon.

18. Show that polymers with specific end groups can be prepared by living polymerization.

(6 × 2 = 12 marks)

Section C

Answer any **six** *questions.*
Each question carries 6 *marks.*

19. What are metallocenes ? Explain the formation of isotactic PP using metallocene catalyst.

20. Make a comparative study of solution and emulsion polymerization, taking appropriate examples.

21. Define Tg. Explain experimental set up to determine Tg using DSC. What are the other parameters that can be determined from the DSC output ?

22. Explain in detail the determination of molecular weight of a given polystyrene sample by viscosity measurements.

23. Describe in detail the preparation and properties of different types of PF resin. Comment on the applications.

24. What Gelation ? How is gel point determined ?

25. What is RAFT polymerization ? Explain the mechanism using appropriate example. What are the advantages ?

26. Define Fractionation. Explain one method of fractionation. Comment on the applications of fractionation.

27. What are chain transfer agents ? Explain their role taking one example. How do they differ form short stops ?

(6 × 6 = 36 marks)

Section D

Answer any **two** *questions.*
Each question carries 10 *marks.*

28. Write notes on :

(i) Ring opening polymerization.

(ii) Kinetic chain length.

(iii) Nylon 6.

(iv) Carother's Equation.

29. (i) Discuss the nitroxide mediated polymerization. Explain how this method provides much control on the polymerization. (5 marks)

(ii) Discuss the preparation and properties of PMMA and PVC. (5 marks)

30. (i) Discuss the monometallic and bimetallic mechanism of formation of stereospecific polymer using Ziegler-Natta catalyst. (7 marks)

(ii) Explain tacticity taking PP as an example. (3 marks)

31. (i) Discuss the various chemical modifications done industrially on cellulose. (5 marks)

(ii) Explain 'Persistent Radical Effect'. (5 marks)

[2 × 10 = 20 marks]

C 2600 (Pages : 4) Name.....

Reg. No.....

FOURTH SEMESTER P.G. DEGREE EXAMINATION, APRIL 2021

(CCSS)

M.Sc. Applied Chemistry

ACH 4E 05—BIOINORGANIC CHEMISTRY

(2019 Admissions)

Time : Three Hours Maximum : 80 Marks

Section A

Answer **all** *questions.*
Each question carries 1 *mark.*

1. Which is the most abundant metal present in human body ?

   a) Ca. b) Fe.

   c) Na. d) K.

2. Which of the following complex ion is expected to be labile to ligand substitution ?

   a) $[Ir(NH_3)_6]^{3+}$. b) $[Mo(NH_3)_6]^{3+}$.

   c) $[Ni(en)_3]^{2+}$. d) $[Co(NO_2)_6]^{3-}$.

3. Which ion inhibits the action of Na^+ -K^+ pump ?

   a) Chloride. b) Nitrate.

   c) Sulphate. d) Vanadate.

4. Nature has selected Zn(II) ion at the active site of many hydrolytic enzymes, because ———.

   a) Zn(II) is a poor Lewis acid.

   b) Zn(II) does not have chemically accessible redox states.

   c) Zn(II) forms both four and higher co-ordination complexes.

   d) Zn(II) forms weak complexes with oxygen donor ligands.

5. Hemerythrin belongs to the group of ———.

   a) Non-heme iron protein. b) Heme-iron protein.

   c) Binuclear copper protein. d) Non-heme non-iron protein.

Turn over

6. Choose the suitable species for the following reaction :

$$R\text{-}H + \tfrac{1}{2}O_2 \rightarrow R\text{-}O\text{-}H$$

a) Cytochrome C-oxidase.
b) Catalse.
c) Cytochrome P_{450}.
d) Ferredoxin.

7. Hemocyanin belongs to the group of ————————.

a) Non-heme iron protein.
b) Heme-iron protein.
c) Non-heme copper protein.
d) Heme copper protein.

8. Which protein has got highest Hill co-efficient value ?

a) Hemoglobin.
b) Hemocyanin.
c) Hemerythrin.
d) Myoglobin.

9. When compared to Pt(II) complexes, gold(III) complexes are not active as anticancer drug because ————————.

a) Gold(III) is highly oxidising.
b) Aqua complexes are highly acidic.
c) Lipophilicity of gold (III) complex is less.
d) All the above factors.

10. The chelating drug used for detoxification of Pb is ————————.

a) D-Pencillamine.
b) Ethylenediamine.
c) Deferrioxamine.
d) EDTA.

11. The catalyst involved in the photolysis of water in PS-II contain ————————.

a) Mg.
b) Mn.
c) Zn.
d) Fe.

12. Metal ions present in nitrogenase are ————————.

a) Fe and Zn.
b) Zn and Mn.
c) Fe and Mo.
d) Cu and Mg.

(12 × 1 = 12 marks)

Section B

Answer **all** *questions.*
Each question carries 2 *marks.*

13. Discuss the constitution of cell membrane. What is the role of metal ions in stabilizing the cell membrane.

14. An ionophore having two carboxylic acid groups at the periphery can transport both K^+ and Ca^{2+} depending upon the pH value. Explain.

15. How does nature protect iron(II) in hemoglogin from its irreversible oxidation in presence of oxygen ?

16. Electron transfer in plastocyanin is highly favoured ; why ?

17. Comment on the toxicity produced by lead.

18. Explain the role of indicator plants in assessing soil pollusion.

(6 × 2 = 12 marks)

Section C

Answer any **six** *questions.*
Each question carries 6 *marks.*

19. Differentiate between chelate effect and macrocyclic effect, giving examples.

20. Bring out the difference between metalloenzymes and metal activated enzyme, giving examples.

21. Give an account of the structure and functions of cytochrome P_{450}.

22. Classify the different types of copper proteins present in biological systems, giving examples.

23. Give an account of the inorganic pollutants in natural water. How they can be removed ?

24. Selection of ATP as a carrier of phosphate group is quite unique. Justify this statement.

25. What is DNA replication ? Explain.

26. Discuss the role of calcium in blood clotting.

27. Describe the role of superoxide dismutase in biological system.

(6 × 6 = 36 marks)

Section D

Answer any **two** *questions.*
Each question carries 10 *marks.*

28. What are the factors that affect the stability of metal complexes ? Derive the relationship between step-wise stability constants and overall stability constant of a metal complex.

29. Discuss the photosynthetic process bringing out the role of PS-I and PS-II. Suggest a suitable synthetic model for photosynthesis.

30. Bring out the important structural features of the active site of metal centre of Vitamin B_{12} and its biochemical importance. How does it differ from other vitamins ?

31. Write notes on :

    a) Biomineralisation.

    b) Plastocyanin.

    c) Hill coefficient.

(2 × 10 = 20 marks)