THIRD SEMESTER M.A./M.Sc./M.Com. DEGREE (REGULAR) EXAMINATION, NOVEMBER 2020

(CBCSS)

Polymer Chemistry

PCH 3C 11—INSTRUMENTAL METHODS AND COMPUTATIONAL CHEMISTRY

(2019 Admissions)

Time : Three Hours   Maximum : 30 Weightage

Section A

Answer at least **six** *questions.*
Each question carries 1 *weightage.*
All questions can be attended.
Overall Ceiling 6.

1. Differentiate between accuracy and precision.

2. What is the main advantage of potentiometric titration ?

3. How is the end point indicated in biamperometic titrations ?

4. Why water can't be used as a solvent in IR ?

5. What is meant by thermometric titration ?

6. Define detection limit of an AAS.

7. What is the principle of Atomic Emission Spectroscopy ?

8. Write any one difference between compiler and interpreter.

9. What is the symbol for the terminal box and processing box in flow chart ?

10. Write the GTO for 1s orbital.

11. Write the Z matrix for water molecule.

12. State Born Oppenheimer approximation.

(6 × 1 = 6 weightage)

Turn over

Section B

Answer at least **three** *questions.*
Each question carries 4 weightage.
All questions can be attended.
Overall Ceiling 12.

13. Discuss the theory of redox indicators.

14. Discuss the principle involved in polarography. How this technique can be used in quantitative analysis ?

15. What is the principle of nephelometry ? How a choice of measurement is made between nephelometry and turbidimetry ?

16. How does the TGA curve of $CaCO_3$ look like ? Explain.

17. Write the structure for a C program.

18. Write a note on the nomenclature of basis sets.

19. Briefly explain basic principles of HF method.

$(3 \times 4 = 12$ weightage)

Section C

Answer at least **two** *questions.*
Each question carries 6 weightage.
All questions can be attended.
Overall Ceiling 12.

20. What are students F test and T test ? What are their uses ? Explain.

21. What is the principle of solvent extraction ? How are metal ions separated as chelates ? Explain with examples.

22. Discuss the principle and instrumentation involved in FTIR. Write a short note on the factors influencing vibrational frequencies.

23. Discuss briefly the principle and instrumentation of cyclic voltammetry.

$(2 \times 6 = 12$ weightage)

THIRD SEMESTER M.A./M.Sc./M.Com. DEGREE (REGULAR) EXAMINATION NOVEMBER 2020

(CBCSS)

Polymer Chemistry

PCH 3C 10—PHYSICAL CHEMISTRY—II

(2019 Admissions)

Time : Three Hours

Maximum : 30 Weightage

Section A

Answer at least **six** *questions.*
Each question carries 1 *weightage.*
All questions can be attended.
Overall Ceiling 6.

1. Using Stirlings approximation calculate ln N! where $N = 6.023 \times 10^{23}$.

2. Discuss the effect of temperature on Maxwell Boltzmann distribution curve ?

3. What is Langevins function ? Explain its significance.

4. Explain the term superfluidity with reference to liquid He II.

5. What is meant by relaxation time ?

6. Unimolecular gas phase reaction follows first order kinetics at high pressure and second order kinetics at low pressure. Why ?

7. Define thermodynamic probability. How is it related to entropy ? Explain.

8. How effective a catalyst towards the strength of an acid or a base.

9. What is the influence of pH on enzyme catalysis ?

10. Derive equation for Cv from $E = NkT^2 (\ )_v$.

11. Comment on the role of surfaces in heterogeneous catalysis.

12. What are the assumption in absolute rate theory ?

(6 × 1 = 6 weightage)

Turn over

Section B

Answer at least **three** *questions.*
Each question carries 4 weightage.
All questions can be attended.
Overall Ceiling 12.

13. Derive the expression for the translational partition function for an ideal gas.

14. Derive Fermi - Dirac distribution function.

15. Explain Einstein's theory of specific heat of solids.

16. Calculate the enthalpy of activation at 300 K for a 1st order decomposition of N_2O_5 with pre-exponential factor $4.3 \times 10^{13} \, s^{-1}$ rate constant, $k = 4.329 \times 10^{-5} \, s^{-1}$.

17. Discuss the kinetics of fast reaction by Stopped flow method. What is the disadvantage of conventional flow techniques ?

18. Give steady state treatment to the decomposition of acetaldehyde.

19. Explain the role of solvent on reaction rate.

(3 × 4 = 12 weightage)

Section C

Answer at least **two** *questions.*
Each question carries 6 weightage.
All questions can be attended.
Overall Ceiling 12.

20. Discuss Bose-Einstein condensation. How does it differ from ordinary condensation ?

21. Derive Debye T^3 relation.

22. Write the mechanism for the photochemical reaction between H_2 and Cl_2. Derive rate law.

23. (a) Derive an equation for relaxation time in terms of K_1 and K_{-1} for the reaction A C.

    (b) Derive an equation to show primary salt effect.

(2 × 6 = 12 weightage)

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THIRD SEMESTER M.A./M.Sc./M.Com. DEGREE (REGULAR) EXAMINATION NOVEMBER 2020

(CBCSS)

Polymer Chemistry

PCH 3C 09—INORGANIC CHEMISTRY—II

(2019 Admissions)

Time : Three Hours

Maximum : 30 Weightage

Section A

*Answer at least **six** questions.*
Each question carries 1 weightage.
All questions can be attended.
Overall Ceiling 6.

1. What are the advantages of Tanabe -Sugano diagrams over Orgel diagram ?

2. State Curie law.

3. Find out the ground state term of Cr^{3+} complex.

4. Write down the Fuoss-Eigen equation ? What is its significance ?

5. $[Mn(CO)_5]$ doesn't exist but its dimer exists. Why ?

6. What is cis effect ?

7. Compare the infrared spectra of NH_3 as a free ligand and coordinated form.

8. Write a short note on metal-acetylene complexes.

9. What is reductive elimination ?

10. What is Bohr effect ?

11. Differentiate Nuclear fission and fusion.

12. What is Q value ?

(6 × 1 = 6 weightage)

Turn over

Section B

Answer at least **three** *questions.*
Each question carries 4 weightage.
All questions can be attended.
Overall Ceiling 12.

13. What are orgel diagrams. Discuss the orgel diagram of d^1 and d^9 tetrahedral and octahedral complexes ?

14. Explain the Eigen-Wilkins mechanism for the nucleophilic substitution of an octahedral complex. Discuss the structure and bonding in allyl complexes.

15. Explain outer sphere mechanism with eg.

16. Briefly describe the structure of Vitamin B_{12}.

17. What is hydroformylation reaction ? Discuss it with mechanism.

18. Write a short note on neutron activation analysis.

$(3 \times 4 = 12$ weightage)

Section C

Answer at least **two** *questions.*
Each question carries 6 weightage.
All questions can be attended.
Overall Ceiling 12.

19. Illustrate the ligational behaviour of cyclopentadiene using ferrocene as an example. Discuss its structure and bonding.

20. Explain the mechanism of ligand substitution in octahedral complexes.

21. What are ferritin and transferrin ? Discuss their structure and functions

22. Discuss the principle and working of ionisation counters.

$(2 \times 6 = 12$ weightage)

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THIRD SEMESTER M.Sc. DEGREE (SUPPLEMENTARY) EXAMINATION, NOVEMBER 2020

(CUCSS)

Polymer Chemistry

PC 3C 08—PHYSICAL CHEMISTRY—II

(2010 Admissions)

Time : Three Hours

Maximum : 36 Weightage

Section A

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

1. Expalin the significance of thermodynamic probability.

2. Write down London equation.

3. What is the effect of pH and temperature in enzyme catalyzed reactions ?

4. Explain the significance of Arrhenius parameters.

5. Explain Basic sets.

6. What is virial equation of states ? Explain.

7. Construct a z-matrix for water.

8. What is meant by algorithm ? Explain.

9. With two examples explain fermions.

10. Explain the term string variable.

11. What are partition functions ? Give an account of rotational partition function.

12. Explain Debye temperature.

13. What is characteristic about Fermi - Dirac Statistics ?

14. Explain the term relaxation time in fast reactions.

(14 × 1 = 14 weightage)

Section B

Answer any **seven** *questions.*
Each question carries 2 weightage.

15. Explain the lower and upper explosion limits in $H_2 - O_2$ reaction.

16. State the relation between partition function and enthalpy and entropy.

Turn over

17. Explain briefly about system softwares and application softwares.

18. Explain primary and secondary salt effect.

19. Illustrate mechanism of reaction between H_2 and Br_2.

20. For an enzyme catalyzed reaction, conversion of substance at 28°C has Michealis constant of 0.042 mol/L. The rate of reaction is 2.45 mol/L/s when the substrate concentration is 0.90 mol/L. What is the maximum velocity ?

21. Differentiate and compare ab initio calculations and semi-emperical methods.

22. Discuss Bose-Einstein condensation.

23. Give an account of the kinetics of heterogenous catalysis.

24. Application of Fermi-Dirac statics to explain thermionic emission.

<div align="right">(7 × 2 = 14 weightage)</div>

Section C

*Answer any **two** questions.*
Each question carries 4 weightage.

25. What are chain reactions ? Differentiate between chain reactions and branching chain reactions.

26. Explain Einstein theory of heat capacities of atomic crystals and modification given by Debye to Einstein theory .

27. Discuss the relaxation method for the study of fast reactions.

28. Obtain expression for the transition state theory.

<div align="right">(2 × 4 = 8 weightage)</div>