THIRD SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2021

(CBCSS)

Polymer Chemistry

PCH 3E 01—POLYMER MATERIALS

(2019 Admission onwards)

Time : Three Hours   Maximum : 30 Weightage

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*

2. *The minimum number of questions to be attended from the Section/Part shall remain the same.*

3. *The instruction if any, to attend a minimum number of questions from each sub section/sub part/ sub division may be ignored.*

4. *There will be an overall ceiling for each Section/Part that is equivalent to the maximum weightage of the Section/Part.*

Part A

Answer any **eight** *questions.*
Each question carries a weightage of 1.

1. What is butyl rubber ? Write its uses.

2. What is gun cotton ?

3. Write two uses of poly urethanes.

4. Give the preparation of nylon 6.

5. What is neoprene ?

6. What is gutta-percha ?

7. What is SBR ?

8. Write any two uses of Teflon.

9. What is novolac ?

10. Differentiate nucleotide and nucleoside.

11. Write two applications of polycarbonates.

12. Write two thermally resistant polymers.

(8 × 1 = 8 weightage)

Turn over

Part B

Answer any **four** *questions.*
Each question carries a weightage of 3.

13. Write short note on polyethylenes.

14. Compare the structure of RNA and DNA.

15. Briefly explain the structure of proteins.

16. Write short note on silicon oils.

17. Explain the synthesis and uses of PVC and polystyrene.

18. Write short notes on phenol formaldehyde resins and melamine formaldehyde resins.

19. How will you prepare PET and PTFE ?

(4 × 3 = 12 weightage)

Part C

Answer any **two** *questions.*
Each question carries a weightage of 5.

20. Write preparation, properties and uses of a) PMMA b) Polyacrylonitrate.

21. What is cellulose ? Discuss its properties and industrial applications.

22. Explain briefly the synthesis, properties and uses of polyamides.

23. Write short notes on : a) photoresists b) ionic polymers c) polymers in nonlinear optics.

(2 × 5 = 10 weightage)

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(CBCSS)

Polymer Chemistry

PCH 3C 11—INSTRUMENTAL METHODS AND COMPUTATIONAL CHEMISTRY

(2019 Admission onwards)

Time : Three Hours   Maximum : 30 Weightage

General Instructions

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Part A

Answer any **eight** *questions.*
Each question carries a weightage of 1.

1. What is meant by standard deviation ?

2. Which electrode is used as a reference electrode in potentiometric titration ?

3. Which selection rule is used in IR ?

4. What is the basic difference between nephelometry and flourimetry ?

5. Name the reference material used in TGA.

6. What is Retention factor ?

7. What is a Polarogram ?

8. Differentiate between RAM and ROM.

Turn over

9. How many types of constants are supported by BASIC ? What are they ?

10. Write the STO for 1s orbital.

11. Write the Z matrix for H_2O molecule.

12. What is meant by a voltammogram ?

(8 × 1 = 8 weightage)

Part B

Answer any **four** *questions.*
Each question carries a weightage of 3.

13. Describe the method of least squares for the treatment of analytical data.

14. What are the advantages of potentiometric titration ?

15. What are the advantages and disadvantages of amperometric titrations over other methods ?

16. Calculate the of λ_{max} of
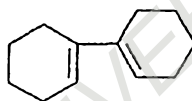
17. Do polar substances travel farther on a TLC plate ? Give reason.

18. Write the differences between system and application software.

19. Briefly discuss the abinitio methods of computational chemistry.

(4 × 3 = 12 weightage)

Part C

Answer any **two** *questions.*
Each question carries a weightage of 5.

20. Write an account of complexometric titrations bringing about the theory and methodology.

21. Describe the principle of AAS. What are its important applications ? Mention its merits and demerits ?

22. What are the main differences between high performance liquid chromatography and gas chromatography ? Write a note on different type of detectors used in GC.

23. What are basis functions ? Differentiate between popularly used basis functions in computational chemistry.

(2 × 5 = 10 weightage)

THIRD SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2021

(CBCSS)

Polymer Chemistry

PCH 3C 10—PHYSICAL CHEMISTRY—II

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

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Part A

Answer any **eight** *questions.*
Each question carries a weightage of 1.

1. Comment on the electronic specific heat of solids.

2. Calculate the transitional partition function for H_2 molecule confined in a 100 ml vessel at 25°C.

3. What is Bose - Einstein distribution function?

4. Explain equation of state of imperfect gases and terms involved in it.

5. Near to absolute zero atomic heat capacity vanishes. Justify the statement.

6. What is the effect of temperature on the molecular partition function ?

7. The fundamental vibrational frequency of HCl is 3000 cm^{-1}. Find the characteristics temperature of HCl.

8. What is secondary salt effect ?

9. Derive Arrhenius equation and what is its significance ?

Turn over

10. How cohesive energy density influences the reaction rate.

11. Explain the terms branching chain and explosion limit.

12. Explain the term potential energy surfaces.

<div align="right">(8 × 1 = 8 weightage)</div>

Part B

Answer any **four** *questions.*
Each question carries a weightage of 3.

13. Explain the transition of liquid He to superfluid liquid at 2.18 K.

14. How is partition function related to (1) Internal energy ; and (2) Heat capacity at constant volume.

15. Show that all particles follow Maxwell - Boltzmann statistics under dilute system conditions.

16. For the reaction $C_2 H_5 I + OH^- \rightarrow C_2 H_5 OH + I^-$, rate constant at 289K is 5.03×10^{-2}. Find the rate constant at 305K. Given Ea = 89 KJ/mole.

17. Explain the kinetics of fast reaction based temperature and pressure jump method.

18. Compare collision theory and transition state theory.

<div align="right">(4 × 3 = 12 weightage)</div>

Part C

Answer any **two** *questions.*
Each question carries a weightage of 5

19. Briefly explain the Rice-Herzfeld mechanism for the organic decomposition reaction taking a specific example.

20. Define partition function. Derive equation for ;

    a) Translational partition for a delocalized system.

    b) Rotational partition function for a diatomic molecule.

21. a) Derive Fermi-Dirac distribution law.

    b) Explain Bose-Einstein condensation.

22. Briefly explain the characteristic properties to identify chain reactions from other reactions. Explain the mechanism of the reaction between H_2 and Cl_2.

23. Derive the equation for enzyme catalysis. Briefly explain the influence of pH and temperature on enzyme catalyzed reaction.

<div align="right">(2 × 5 = 10 weightage)</div>

THIRD SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2021

(CBCSS)

Polymer Chemistry

PCH 3C 09—INORGANIC CHEMISTRY – II

(2019 Admission onwards)

Time : Three Hours

Maximum : 30 Weightage

General Instructions

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Part A

Answer any **eight** *questions.*
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1. Calculate the ground state term of Ni^{2+}.

2. What is vibronic coupling ?

3. What is base hydrolysis ? Discuss with eg.

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

5. How can you distinguish Water molecule in the coordinated or lattice form using IR spectroscopy ?

6. What is Curie's point ? What is its importance ?

7. What is Ziese's salt ? Give its structure.

8. Draw the structures of $Fe_2(CO)_9$ and $Fe_3(CO)_{12}$.

9. Calculate the total no. of ESR lines shown by $[CuCl_6]4^-$.

10. What are peroxidases ?

11. Discuss the role of Mg in Photosynthesis.

12. Compare secular and transient equilibria.

(8 × 1 = 8 weightage)

Part B

Answer any four *questions.*
Each question carries a weightage of 3.

13. What are charge transfer transitions ? Discuss.

14. What are fluxional molecules ? Explain the fluxional behaviour shown by cyclopentadienyl complexes.

15. What are ORD and CD curves ? Sketch the ORD and CD curves of $\pm[Co(en)_3]^{3+}$.

16. Explain trans effect. Discuss the theories of trans effect.

17. Explain the mechanism of hydrogenation.

18. Briefly explain the role of PS-I and PS-II in photosynthetic activity.

19. Explain the working of GM counter.

(4 × 3 = 12 weightage)

Part C

Answer any **two** *questions.*
Each question carries a weightage of 5.

20. What are orgel diagrams ? With specific examples, explain its advantages in interpreting the electronic spectra of coordination compounds.

21. What is ferrocene ? How is it Prepared ? Discuss the structure and bonding in ferrocene.

22. Describe the mechanisms of substitution reactions take place in octahedral complexes.

23. What is the origin of ESR spectrum ? Predict the ESR spectrum of bis (salicylaldimine) copper (II) complexes and explain.

24. (a) Give the structure of chlorophyll.

    (b) Write note on neutron activation analysis.

(2 × 5 = 10 weightage)