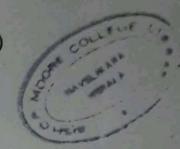
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Sixth Semester B.Sc. Degree Examination, March 2021

First Degree Programme Under CBCSS

Chemistry

Core Course X

CH 1641 - PHYSICAL CHEMISTRY II

(2018 Admission, Regular)

Time: 3 Hours Max. Marks: 80

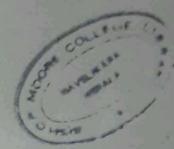
SECTION - A

Answer all the questions. Each question carries 1 mark.

- 1. What is Parachor?
- 2. State third law of thermodynamics.
- 3. Explain the term adsorbent and adsorbate.
- 4. What is Zeta potential?
- 5. What are quantum numbers?
- 6. Pick out, from among the following, those which would give microwave spectrum:

N₂, HCI, CCI₄, CH₃CI

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- 7. What is the selection rule for anharmonic oscillator?
- 8. Define dipole moment.
- Arrange the following electromagnetic waves in increasing order of their energy?
 U.V, IR, microwave, visible.
- 10. Write the expression for work function A, in terms of partition function.

 $(10 \times 1 = 10 \text{ Marks})$

SECTION - B

Each question carries 2 marks. Answer any eight questions.

- 11. What is meant by residual entropy, Give one example?
- 12. State Heisenberg uncertainty Principle, and write its mathematical representation.
- 13. Calculate the wave number in meter for a radiation of wavelength 200nm.
- 14. State Hardy-Schulze rule.
- 15. State rule of mutual exclusion.
- 16. What is referred to as a fundamental band in vibrational spectrum of a molecule?
- 17. What is partition function?
- 18. What is chromophore? Give two examples.
- 19. Explain the term distortion polarization?

- 20. What is Lande splitting factor?
- 21. Write Clausius-Mosotti equation.
- 22. What is meant by optical exaltation? Explain with one example.
- 23. Define Molar refraction, Write the equation.
- 24. What is streaming potential?
- 25. What is meant by an operator in quantum mechanics?
- 26. What is black body radiation?

 $(8 \times 2 = 16 \text{ Marks})$

SECTION - C

Each question carries 4 marks (short essay). Answer any six questions.

- 27. What is thermodynamic probability?
- 28. What are ensembles? Discuss the different types of ensembles?
- 29. Distinguish between physisorption and chemisorption?
- 30. Explain Nernst Heat theorem.
- 31. Explain the terms micelles and critical micelle concentration.
- 32. Discuss Compton effect.
- 33. Derive an expression for moment of inertia of a rigid diatomic molecule.

- 34. Explain the terms bathochromic and hypsochromic shifts with suitable examples Shifts in absorption maximum and peak intensity.
- 35. Dipole moment of ammonia is 1.47D, whereas dipole moment of BF₃ is zero. Explain.
- 36. A compound shows a proton NMR peak at 240 Hz downfield from the TMS peak in a spectrometer operating at 60MHz. Calculate the values of the chemical shifts δ or τ to in ppm relative to TMS?
- 37. Differentiate between Stoke's and Antistoke's lines.
- 38. The fundamental frequency of HCl is 2890cm⁻¹. Calculate the force constant of this molecule. The atomic masses are

 $^{1}H = 1.673 \times 10^{-27} \text{ kg}$ $^{35} \text{ CI} = 58.06 \times 10^{-27} \text{ kg}.$

 $(6 \times 4 = 24 \text{ Marks})$

SECTION - D

Each question carries 15 marks (essay). Answer any two questions.

- 39. (a) How are dipole moment used to distinguish between cis and trans isomers in dichloroethylene?
 - (b) What are quantum numbers? Discuss the significance of each quantum numbers.
 - (c) Discuss the BET equation and its utility in determination of surface area of an adsorbent.

 $(3 \times 5 = 15 \text{ Marks})$

- 40. (a) Derive the expression for internal energy in terms of partition function.
 - (b) Derive Langmuir adsorption isotherm.
 - (c) What is spin-spin coupling? Illustrate it by using NMR spectrum of CH₃-CH₂-Br.

 $(3 \times 5 = 15 \text{ Marks})$

- 41. (a) How will you determine absolute entropy of gases?
 - (b) How are colloidal solutions purified? Discuss two methods.
 - (c) Explain Photoelectric effect.

 $(3 \times 5 = 15 \text{ Marks})$

- 42. (a) Explain the term shielding and desheilding in NMR.
 - (b) Solve Schrodinger wave equation for particle in one dimensional box.
 - (c) How can measure magnetic susceptibility by Gouy's method.

 $(3 \times 5 = 15 \text{ Marks})$

- 43. (a) Discuss the postulates of quantum mechanics.
 - (b) Discuss the difference between lyophilic and lyophobic colloids.
 - (c) State and derive de Broglie relation.

 $(3 \times 5 = 15 \text{ Marks})$

- 44. (a) The IR and Raman spectroscopies are complementary Explain.
 - (b) Discuss what is meant by Tyndall effect and Brownian movement.
 - (c) Discuss the hyperfine splitting of methyl radical.

 $(3 \times 5 = 15 \text{ Marks})$

 $(2 \times 15 = 30 \text{ Marks})$