(Pages : 4) **K – 3167**

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TRIVANDRUM

Fifth Semester B.Sc. Degree Examination, February 2021

First Degree Programme Under CBCSS

Chemistry

Core Course VII

CH 1543 : PHYSICAL CHEMISTRY II

(2013, 2015-16 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – A

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

1. State Third law of thermodynamics.
2. Define ensemble.
3. What is meant by critical micelle concentration?
4. What is photoelectric effect?
5. What is the energy expression of a particle in a ID box?
6. How is the energy of radiation related to its wavelength?
7. In which region are the vibrational spectra of molecules obtained?
8. Write the equation. relating magnetic susceptibility and magnetic field strength.

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9. How many signals do the protons of TMS exhibit in its NMR spectrum?

10. Define dipole moment.

(10 × 1 = 10 Marks)

SECTION – B

Short answer type (Answer **any eight** questions, Each question carries **2** marks)

11. CO is an exception to III law of thermodynamics. Explain.

12. Write the expression for internal energy in terms of partition function.

13. Explain Hardy-Schulz rule.

14. Distinguish between a true solution and colloid.

15. Write Schrodinger equation and explain the terms.

16. Write the expression for energy and wave function of a particle in a 3D box.

17. What is the energy of radiation with wavelength 800 nm.

18. Calculate the reduced mass of HCl, [H = 1.008; Cl = 35.45]

19. Explain the term Stoke's and antistoke's lines in Raman spectroscopy.

20. Define molar extinction coefficient.

21. Distinguish between diamagnetic substance and paramagnetic substance.

22. Para dichlorobeozene molecule have zero dipolemoment. Why?

(8 × 2 = 16 Marks)

SECTION – C

Short essay type (Answer **any six** questions, Each question carries **4** marks)

23. Derive the expression for internal energy in term of partition function.

24. Define ensembles and explain the different types of ensembles.

25. Diagramatically represent different vibrational modes of CO2.Classify them as 1R active and IR inactive modes.

26. Write down the Schrodinger Wave equation for hydrogen atom in Cartesian and spherical polar co-ordinates and explain the terms.

27. Given that the force constant for the H - Cl bond is 482.08 N m^{-1}. Calculate the fundamental vibrational frequency in s^{-1}.

28. Explain the term spin –spin coupling in NMR spectroscopy.

29. What is spin only magnetic moments? Calculate the spin only magnetic moment of Chromium atom.

30. Explain the application of colloids.

31. Write the Clausius -Mosotti equation and explain the terms.

(6 × 4 = 24 Marks)

SECTION – D

Essay type (Answer **any two** questions. Each Question carries **15** marks)

32. (a) Evaluate absolute entropy of a gas using third law of Thermodynamics.

    (b) Explain the kinetic and optical properties of colloids.

33. Describe briefly the principle of Vibrational spectroscopy. What are its applications?

34. (a) Derive the expression for energy and wave function of a particle in a one dimensional box.

(b) Calculate the energy of an electron confined in a box of 10 nm length.

35. Write notes on (a) Parachor (b) Chemical shift (c) Dipolemoment and molecular structure.

(2 × 15 = 30 Marks)
