Reg. No. : ....

Name : ....

Fifth Semester B.Sc. Degree Examination, November 2014
First Degree Programme Under CBCSS
Core Course
CH1543 : PHYSICAL CHEMISTRY – II

Time : 3 Hours

Max. Weightage : 30

SECTION – A

Answer in **one** word/sentence. Answer **all** questions. (Weightage : 1).

I. 1) The third law of thermodynamics helps in the calculation of _____

2) The residual entropy of CO molecule is _____

3) When a die is tossed once, the probability of getting an even number is _____

4) The particles which obey Fermi-Dirac statistics are called _____

II. 5) The movement of colloidal particles under the influence of an electric field is called _____

6) Freundlich adsorption isotherm is _____

7) The visibility of the path of the beam from the projector in a cinema hall is an example for _____

8) The de Broglie wavelength of a particle in motion having a momentum 3.3×10^{-24} Kg ms^{-1} is _____

III. 9) The minimum frequency required for a light to cause ejection of electrons from the surface of the metal is called _____

10) A linear n-atom molecule has _____ normal modes of vibration.

11) In the NMR spectrum of pure anhydrous ethanol, the peak for the CH_2 protons will split into _____

12) Electromagnetic radiation in the _____ region is used to study electron paramagnetic resonance.

IV. 13) The minimum concentration required for the formation of micelle is known as _____

14) The number of signals exhibited by the protons of TMS in its NMR spectrum is _____

15) A colloidal solution in which the dispersed phase is a solid and dispersion medium is a liquid is known as _____

16) SEM is _____

SECTION – B
(Short answer type)

Answer **any 8** from the following. (Weightage : **1**).

17. Mention the important application of the third law.

18. Distinguish between statistical probability and thermodynamic probability.

19. What is meant by ultra filtration ?

20. Give the BET adsorption isotherm and specify the terms.

21. What is photo electric effect ?

22. Calculate the uncertainty in the momentum of a particle whose uncertainty in position is of the order of $1\overset{\circ}{A}$.

23. When is a wave function set to be normalized ?

24. State the selection rule for rotational transitions of a rigid rotator.

25. What is meant by the fingerprint region in an IR spectrum of an organic compound ?

26. Give the Clausius – Mosotti equation and explain the terms.

27. State the rule of mutual exclusion.

28. Sketch the ESR spectrum of methyl radical.

SECTION – C
(Short essay type)

Answer **any 5** from the following. (Weightage : **2**).

29. Discuss the term residual entropy with suitable examples.

30. Differentiate between physical adsorption and chemical adsorption.

31. Briefly explain the optical and kinetic properties of colloids.

32. Sketch the different vibrational modes of water molecules. Classify them as IR active and IR inactive modes and explain your answer.

33. State Franck-Condon principle and explain it with regard to electronic transitions in a diatomic molecule.

34. Explain the terms Stokes and antistokes lines with regard to Raman Spectra.

35. Explain briefly how STM is used for the examination of surface properties.

36. What information regarding the structure of the molecules can be obtained from the knowledge of their dipole moments ? Explain with examples.

SECTION – D
(Long essay type)

Answer **any 2** from the following. (Weightage : **4**).

37. Deduce relation between partition function and the following thermodynamic properties.
    a) Internal energy
    b) Work function
    c) Enthalpy
    d) Free energy function

38. Discuss the postulates of Langmuir's theory and derive the Langmuir adsorption isotherm.

39. a) The microwave spectrum of gaseous CO consists of a series of equally spaced lines separated by 3. 844 cm $^{-1}$. Calculate the moment of inertia and the C—O bond length.

    b) How can the NMR method be used to distinguish between the structures of 1-propanol and 2-propanol ?

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