(Pages : 3) D – 2524

Reg. No. : .....

Name : .....

Fifth Semester B.Sc. Degree Examination, December 2017
(First Degree Programme under CBCSS)
CHEMISTRY
Core Course – VII
CH 1543 : PHYSICAL CHEMISTRY – II
(2013 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

Answer **all** questions. **Each** question carries **one** mark.

1. The third law of thermodynamics helps us in the calculation of _____
2. The expression for translational partition function in one dimension is _____
3. The condition for normalized wave function is _____
4. The operator for momentum in the x direction is _____
5. The process of converting a suspension into colloidal solution on addition of an electrolyte is known as _____
6. The number of vibrational modes of C_6H_6 is _____
7. Condition for molecule to show Raman spectrum is _____
8. In the IR spectrum the $\Delta V = \pm 2$ transitions are called _____
9. For a molecule with formula AX_n (spin of X = I). The number of signals observed in NMR spectrum for A nucleus is _____
10. The observed molar refraction of an aliphatic conjugated polyene is found to be greater than the calculated value. This phenomenon is called _____

(10×1=10 Marks)

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SECTION – B

Answer **any eight** questions. **Each** question carries **two** marks.

11. What is partition function ?

12. What is Lewis Randall statement of third law of thermodynamics?

13. What is critical micelle concentration ?

14. Define Hardy-Schulz rule.

15. What is an adsorption isotherm ?

16. Define the concept of degeneracy.

17. Write down the expression for rotational energy and selection rule of a diatomic molecule.

18. What is Born-Oppenheimer approximation ?

19. Write down the Morse equation and explain the terms.

20. Predict the ESR spectrum of benzene radical.

21. Explain the Clausius-Mosotti equation for dipole moment.

22. Derive the relationship between free energy and partition function.

(8×2=16 Marks)

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SECTION – C

Answer **any six** questions. **Each** question carries **four** marks.

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

24. Explain any two applications of colloids.

25. Derive the expression, for energy operator, for a particle in 3D box. Also write down the expression for energy.

26. Explain why ESR spectra are recorded in derivative mode.

27. Explain the classical theory of Raman effect.

28. Explain the energy level splitting and the NMR spectrum of deuterium nucleus (I =1).

29. Calculate the parachor value for acetone.

30. Stocks lines are more intense than antistocks lines in Raman spectrum. Why ?

31. Explain the temperature method for measurement of dipole moment.

(6×4=24 Marks)

SECTION – D

Answer **any two** questions. **Each** question carries **15** marks.

32. a) Derive Langmuir adsorption isotherm.

    b) Explain the determination of surface area of adsorbents by the above theorem.

33. Explain :

    a) The origin of chemical shift in NMR spectroscopy.

    b) Spin-spin coupling in NMR spectroscopy.

    c) Explain the significance of doing NMR spectroscopy at high magnetic field.

34. Explain the different methods of purification of colloids. Also explain the kinetic, optical and electrical properties of colloids.

35. a) Explain how rotational spectrum can be used for calculating the bond length of linear di atomic molecules.

    b) The fundamental vibrational frequency of HCl is 2890 cm^{-1}. Calculate the force constant of this molecule. (The atomic masses of H and Cl are 1.008 and 35.5 g/mol).

(2×15=30 Marks)

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