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Reg. No. : .....

Name : .....

**Fifth Semester B.Sc.Degree Examination, December 2019**

**First Degree Programme under CBCSS**

**Core Course VII**

**CH 1543 : PHYSICAL CHEMISTRY – II**

**(2014–2016 Admissions)**

Time : 3 Hours

Max. Marks : 80

PART – A

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

1. State Nernst heat theorem.
2. Write the relationship between entropy and probability.
3. What is meant by citical micelle concentration?
4. What is Compton effect?
5. Antistoke's lines are less intense than stoke's lines. Give reason.
6. Sketch the stretching modes of $CO_2$ molecule.
7. How is the energy of radiation related to its wave number?
8. How many allowed spin states are there for a nucleus with spin quantum number.

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9. How many normal modes of vibrations may a diatomic molecule have?

10. Define Parachor.

**(10 × 1 = 10 Marks)**

## PART – B

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

11. What is meant by residual entropy? Give example of a substance posses residual entropy.

12. Define partition function. How is it related to temperature?

13. Explain Hardy – Schulz rule.

14. Distinguish between Chemical and Physical adsorption.

15. What is meant by a well behaved function?

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

17. What is the essential condition for a molecule to absorb microwave radiation?

18. Calculate the reduced mass of carbon monoxide, [C = 12; O = 16].

19. What is all auxochrome?

20. Define molar extinction coefficient.

21. How is the magnetic moment of a paramagnetic substance varies with the number of unpaired electrons?

22. $CO_2$ molecule have zero dipole moment. Why?

**(8 × 2 = 16 Marks)**

## PART – 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. Write the statement of third law of Thermodynamics and explain.

25. The rotational spectrum of gaseous HBr has a series of equispaced lines separated by 16.94 $cm^{-1}$. Calculate the moment of inertia for HBr.

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

27. Given that the force constant for the carbon – oxygen bond in CO is 1850.60 N $m^{-1}$. Calculate the fundamental vibrational frequency in $s^{-1}$.

28. Explain the term chemical shift in NMR spectroscopy.

29. How is the magnetic moment of a paramagnetic substance varies with the number of unpaired electrons? Calculate the magnetic moment of Chromium atom.

30. Explain the application of colloids.

31. What is electron spin resonance spectroscopy? Write the important uses of this technique.

**(6 × 4 = 24 Marks)**

## PART – 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) Derive the expression for Langmuir adsorption isotherm.

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

34. (a) Discuss the postulates of Quantum mechanics.

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

35. Write notes on

    (a) Chromophore

    (b) spin — spin Splitting

    (c) Dipolemoment and molecular structure.

**(2 × 15 = 30 Marks)**

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