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Reg. No. : .....

Name : .....

**Sixth Semester B.Sc. Degree Examination, March 2020**

**First Degree Programme under CBCSS**

**Chemistry**

**Core Course X**

**CH 1641 – PHYSICAL CHEMISTRY II**

**(2017 Admission)**

Time : 3 Hours

Max. Marks : 80

SECTION – A (One word)

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

1. State Third law of thermodynamics.
2. Define thermodynamic probability.
3. What is physical adsorption?
4. Define Brownian movement.
5. Define Photoelectric effect.
6. State the operator postulate of quantum mechanics.
7. Which radiation is used in nuclear magnetic resonance spectroscopy?
8. Write the selection rule for rotational spectroscopy.

P.T.O.

9. Molecules such as  $H_2$ ,  $N_2$  etc do not show IR spectra. Why?
10. Define dipole moment.

(10 × 1 = 10 Marks)

SECTION – B (Short Answers)

Answer **any eight** questions. Each question carries **2** marks

11. Define ensembles. Name the different types of ensembles?
12. What is meant by critical micelle concentration?
13. Write the Freundlich adsorption isotherm equation and explain the terms.
14. Write the Schrodinger wave equation.
15. What is meant by a well behaved function?
16. What are the relationship between the frequency of radiation and its  
(a) wavelength and (b) energy?
17. How is force constant related to bond length and bond order?
18. Calculate the reduced mass of CO. [C = 12; O = 16]
19. Name any two non spectroscopic methods to determine structure of molecules.
20. State Frank - Condon principle.
21. Give any two applications of ESR spectroscopy.
22. What are polar and nonpolar molecules? Give one example for each.

(8 × 2 = 16 Marks)

### SECTION – C (Short essay)

Answer **any six** questions. Each question carries **4** marks

23. Distinguish between physisorption and chemisorption.
24. How is partition function related to (a) internal energy (b) work function and (c) pressure.
25. Derive Langmuir adsorption isotherm.
26. Calculate the ground state energy of an electron confined in a one dimensional box of length  $5 \text{ \AA}$ . (Mass of electron =  $9.1 \times 10^{-31} \text{ kg}$ ).
27. State and explain Hardy - Schulze rule.
28. The force constant of HCl bond is  $482.08 \text{ Nm}^{-1}$ . Calculate the fundamental vibrational frequency in  $\text{s}^{-1}$ .
29. Explain the term chemical shift in NMR spectroscopy.
30. What are the factors which contribute to paramagnetism in a substance?
31. What are the functions of a protective colloids

**(6 × 4 = 24 Marks)**

### SECTION – D (Long Essay)

Answer **any 2** questions. Each question carries 15 marks.

32. Write note on
  - (a) gold number
  - (b) Electrodialysis and
  - (c) BET adsorption isotherm. (3 × 5)

33. (a) State and explain Nernst heat theorem.
- (b) Evaluate the absolute entropy of a gas using third law of thermodynamics.
- (c) Write the Schrodinger wave equation for hydrogen atom in Cartesian and spherical polar co-ordinates and explain the terms.
34. (a) Explain the term stokes and anti-stokes lines in Raman spectra.
- (b) In a rotational spectrum of  $HCl$  is  $21.18\text{cm}^{-1}$ . apart. Calculate the moment of inertia and bond length in  $HCl$ . [ $H = 1.008; Cl = 35.5$ ]
- (c) Draw and explain the schematic diagrams of the NMR spectra of
- (i) Ethanol and
- (ii) Diethyl ether.
35. (a) Explain the principle behind the electron spin resonance spectroscopy.
- (b) Explain the significance of Debye equation.
- (c) Differentiate between paramagnetic and diamagnetic substances.

**(2 × 15 = 30 Marks)**