B.Sc. - III (CBCS Pattern) Semester-VI

CHT14 - Chemistry Paper-II: DSE Chemistry VI : Physical Chemistry

P. Pages : 2 **GUG/S/25/13342**

Time : Three Hours * 1 7 0 7 * Max. Marks : 50

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1. a) Draw Jablonski diagram and explain radiative and non-radiative transition. **5**

b) Explain the term dipole moment. Discuss its application in determination of shape of the molecule. The bond length between H and Cl is 1.27 Aº and observed dipole moment value for HCl is 1.07D. Calculate the percentage of ionic character of bond if charge on electron = 4.8×10^{-10} e.s.u. **5**

OR

c) Calculate the energy of one Einstein of radiation of wavelength 2537 Aº. **2½**

d) Write a short note on photosensitization reaction. **2½**

e) Explain the polarization of non-polar molecule in an electric field. **2½**

f) Explain the term Bond moment and Group moments. **2½**

2. a) Derive the expression for the energy level of rigid rotor and discuss the selection rule for transition. **5**

b) What do you understand by the degree of freedom of motion of molecule? Briefly explain the different types of degree of freedom possessed by linear and non-linear molecules. **5**

OR

c) Explain why molecule behave as non-rigid rotors. Write expression for the wave number of rotational level of non-rigid rotors. **2½**

d) Explain the relative intensities of spectral lines obtained in pure rotational spectra. **2½**

e) What type of vibrational spectrum is expected from a diatomic molecule taking it as a simple harmonic oscillator. **2½**

f) The force constant of CO is 1840 N/m. Calculate the vibrational frequency in cm^{-1} (Given : mass $C_{12} = 19.9\times10^{-27}$ kg $O_{16} = 26.6\times10^{-27}$ kg) **2½**

3. a) What do you understand by the term adsorption? Discuss Langmuir theory of adsorption and derive expression for Langmuir monolayer adsorption isotherm. **5**

b) What are colloids? How are they classified? Write characteristics of lyophilic and lyophobic sol. **5**

OR

c) Distinguish between physical adsorption and chemical adsorption. **2½**

d) Describe the application of adsorption chromatography. **2½**

e) Explain electrophoresis and electro Osmosis. **2½**

f) What is mean by CMC? Explain the effect of temperature on CMC. **2½**

4. a) Write note on Discovery of radioactivity and Briefly Explain types of radioactivity. **5**

b) Explain the applications of Radioisotopes in **5**
i) To find out reaction mechanism.
ii) Medical applications to assess the volume of blood in patient's body.

OR

c) Explain nuclear stability on the Basis of Nuclear Binding energy curve. **2½**

d) Write about G.M. counter method for detecting radioactivity. **2½**

e) Explain the use of Carbon-14 dating in the determination of age. **2½**

f) The half-life period of a certain radioactive element is 100 sec. Calculate time during which 2 gm substance reduces to 0.05 gm. **2½**

5. Attempt **any ten.** **10**

a) State Grotthus-Draper law of photochemistry.

b) What is mean by Chemiluminescence?

c) Write Clausius-Mossotti equation and meaning of term involve in it.

d) Which of the following molecule from $HCl_{(s)}, N_{2(g)}, HCl_{(g)}$ show rotational spectra? Why?

e) Explain the term 'isotope effect'?

f) What do you mean by zero point energy?

g) Define gold number.

h) Write the mathematical form of Freundlich adsorption isotherm?

i) Give two applications of adsorption.

j) What is mean by Nuclear Binding Energy?

k) What is radioactive decay?

l) How radioactivity is used in the treatment of goiter?

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