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

CHT14 - Chemistry Paper-II: Discipline Specific Elective Chemistry VI (Physical Chemistry)

P. Pages : 2 **GUG/S/23/13342**

Time : Three Hours Max. Marks : 50

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

b) Explain polarization of polar molecule in an electric field. **5**

In a sodium chloride molecule, the bond length between Na & Cl atom is 1.36×10^{-10} m and its dipole moment is 6.0D. calculate the percentage of ionic character of Na-Cl bond.

OR

c) Explain the reason for high quantum yield. **2½**

d) State and explain second law of photochemistry. **2½**

e) Explain the term dipole moment. Discuss its application in determination of shape of molecules. **2½**

f) State Beer's law and derive its mathematical equation. **2½**

2. a) The far infrared spectrum of HI consists of series of equally spaced $12.4\,cm^{-1}$ apart. **5**

Calculate

i) Moment of inertia

ii) Bond length of H- I bond

Given $m_H = 1.6739\times10^{-27}$ kg h $= 6.62\times10^{-34}$ Js

$m_I = 2.1089\times10^{-25}$ kg.

b) Explain the vibrational energy level of a diatomic molecule as a simple harmonic oscillator using energy level diagram. **5**

OR

c) Explain normal modes of vibration in CO_2 molecule. **2½**

d) Show that each two spectral line in rotational spectrum are separated by 2B. **2½**

e) Calculate force constant of HCl bond if fundamental vibrational frequency is 8.667×10^{-13}. **2½**

Reduced mass of HCl is 1.63×10^{-27} kg .

f) State the selection rule for vibrational spectrum in simple harmonic oscillator. Show that only one absorption line will be obtained in vibrational spectrum of simple harmonic oscillator. **2½**

3. a) Discuss Langmuir theory of adsorption? Deduce an expression for Langmuir unimolecular adsorption isotherm. **5**

b) Explain method of preparation of colloidal solution using condensation method. **5**

OR

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

d) What is Freundlich adsorption isotherm? What are its limitation? **2½**

e) Explain term electrophoresis. **2½**

f) Define miscelle concentration. What is effect of temperature on CMC? **2½**

4. a) Discuss nuclear stability on the basis of binding energy curve. **5**

b) Explain application of radioisotopes in - **5**
i) Reaction Mechanism. ii) Medicinal application.

OR

c) Write a short notes on G. M. counter method for radioactivity measurement. **2½**

d) What are general characteristics of radioactive decay. **2½**

e) The isotopic mass of $^{84}_{36}Kr$ is 83.9115. Calculate mass defect and binding energy if masses of electron, proton neutron are 0.00055 amu, 1.007277 amu & 1.008665 respectively. **2½**

f) Give classification of nuclides. **2½**

5. Solve **any ten**. **10**

i) What is quantum yield?

ii) State Grotthus - Draper law.

iii) Define Group moment.

iv) Which of the following molecule show rotational spectra HCl, N_2, CH_4

v) Give the selection rule for pure rotational spectrum.

vi) Define fundamental vibrational frequency

vii) What is Rf value?

viii) What is ultrafiltration?

ix) Define gold number.

x) Define: a) Isobar b) Isotopes.

xi) What is radioactive element?

xii) What is Carbon Dating?

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