## B.Sc. CBCS Pattern Semester-VI

## CHT14 - Chemistry Paper-II: Discipline Specific Elective Chemistry VI Physical Chemistry

P. Pages: 2 GUG/W/23/13342 Time: Three Hours Max. Marks: 50 Notes: 1. All questions carry equal marks. Diagrams wherever necessary. 2. Draw Jablonski diagram and explain radiative and non-radiative transition. 5 1. a) b) Explain polarization of polar molecule in an electric field. 5 In a sodium chloride molecule, the bond length between Na & Cl atom is  $2.36 \times 10^{-10}$  m and its dipole moment is 8.0D. Calculate the percentage of ionic character of Na-Cl bond ( $q = 4.8 \times 10^{-10} \text{ esu}$ ). OR Explain the reasons for high quantum yield.  $2^{1/2}$ c) d) State and explain second law of photochemistry.  $2^{1/2}$ e) Explain the term dipole moment. Discuss its application in determination of shape of  $2^{1/2}$ molecules.  $2^{1/2}$ f) State Beer's law and derive its mathematical equation. The far infrared spectrum of HI consists of series of equally spaced lines 12.4 cm<sup>-1</sup> a part 5 2. a) Calculate (i) Moment of inertia (ii) Bond length H-I bond Given  $M_H = 1.6739 \times 10^{-27} \text{kg}$  $M_I = 2.1089 \times 10^{-25} \text{kg}$  $h = 6.62 \times 10^{-34} \text{ Js}$  $c = 3 \times 10^8 \,\text{m/s}.$ Explain vibrational energy level of a diatomic molecule as a simple harmonic oscillator 5 b) using energy level diagram shows that only one absorption line obtained in vibrational spectra. OR  $2^{1/2}$ c) Explain the normal modes of vibration in CO<sub>2</sub> molecule. Show that each two spectral line in a rotational spectrum are separated by 2B.  $2^{1/2}$ d) Calculate force constant of HCI bond if fundamental vibrational frequency is  $2^{1/2}$ e)  $8.667 \times 10^{13} \,\mathrm{sec}^{-1}$ . Reduced mass of HCI is  $1.63 \times 10^{-27} \,\mathrm{kg}$ . Explain different types of degrees of freedom possessed by linear & non linear molecule. f)  $2^{1/2}$ 

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.	21/2
	d)	What is Freundlich adsorption isotherm? What are its limitation?	21/2
	e)	Explain term electrophoresis.	21/2
	f)	Define micelle concentration. What is the effect of temperature on CMC?	21/2
4.	a)	What are nuclides? How they are classified. Discuss nuclear stability on the basis of binding energy curve.	5
	b)	Explain the application of radioisotopes in. i) Reaction mechanism ii) Medicinal application.	5
		OR	
	c)	Write a short note on G.M. counter method for radioactivity measurement.	21/2
	d)	What are general characteristics of radioactive decay.	21/2
	e)	The isotope 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 and 1.008665 amu respectively.	21/2
	f)	Define natural and artificial radioactivity give one examples of each.	21/2
5.		Attempt any ten.	
		a) What is quantum yield?	1
		b) State Grotthus- Draper law.	1
		c) Define group moment.	1
		d) Which of the following molecule show rotational spectra – HCI, N <sub>2</sub> , CH <sub>4</sub> .	1
		e) Give the selection rule for pure rotational spectrum.	1
		f) Define fundamental vibrational frequency.	1
		g) What is Adsorption chromatography?	1
		h) What is ultrafiltration?	1
		i) Define gold number.	1
		j) Define.	1
		i) Isotope ii) Isobar.	1
		k) What is radioactive element?	1
		1) What is carbon dating?	1

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