V.P. & R.P.T.P.SCIENCE COLLEGE
B.Sc.(SEMESTER – VI) INTERNAL EXAMINATION

Physical Chemistry: US06CCHE05 **Time: 10:00 a.m. to 12:00 noon**

Date: 11-03-2019, Monday **Total Marks: 50**

Q – 1 : Choose the correct option from the following.(Multiple choice question) **[08]**

(i) The polarizability due to the alignment of the molecules possessing dipole moment in the direction of the field is called ----------.

(a) electronic polarisation (b) orientation polarisation (c) atomic polarisation (d) all

(ii) In symmetric top moleclecs

(a) $I_A = I_B = I_C$ (b) $I_A \neq I_B = I_C$
(c) $I_A = I_B \neq I_C$ (d) $I_A \neq I_B \neq I_C$

(iii) Infrared spectroscopy in the _____ region is extremely useful for the study of Organic compounds.

(a) Far IR (b) Middle IR (c) Near IR (d) all of above

(iv) Radioactivity is_____

(a) additive property (b) additive-cum-constitutive property
(c) purely constitutive property (d) colligative property

(v) For a reaction a ⟶ b , the free energy change is zero, then the reaction _____.

(a) occurs reversibly (b) is non-spontaneous
(c) can proceed spontaneously (d) is at equilibrium

(vi) A substance (state) for which the molecule possesses more number of available states also possesses _____ entropy.

(a) lower (b) medium (c) higher (d) zero

(vii) Milk is example of _____.

(a) sol (b) gel (c) true solution (d) emulsion

(viii) The nature of coagulate in lyophobic sol are_____

(a) reversible (b) soluble (c) irreversible (d) none

Q – 2 : Answer the following. (Any five) **[10]**

(i) Why microwave spectra are difficult to observed in the case of liquids and solids?

(ii) Give reasons for reduction in theoretical number of spectral lines.

(iii) State the four classes of physical properties and define any two.

(iv) The bond length of Na-Cl bond is 2.36 A° and dipole moment observed in this case is 8.5 D. Calculate the percent ionic character of NaCl molecule.

(v) What is free energy? Write the criteria for spontaneous process.

(vi) Calculate the rotational entropy of one mole of carbon monoxide molecules at 25°C. The moment of inertia of a CO molecule is 14.50×10^{-47} Kg m^2.

(vii) Explain tyndall effect for colloidal system.

(viii) Define: Electrophoresis and Electro-osmosis.

Q–3 (a) Differentiate between Infrared and Microwave spectroscopy. **[04]**

(b) In the rotational spectrum of HCl, the lines in the pure rotational bands are given by $\bar{\upsilon} = 20.8\ cm^{-1}$. Calculate moment of inertia and bond length of HCl bond. (at. wt. H = 1, Cl = 35.5) **[04]**

OR

Q–3 (a) Derive an expression correlating the rotational frequency and molecular parameter of a dipole. **[04]**

(b) The IR absorption spectrum of HCl gas shows an absorption band at $2885cm^{-1}$. Calculate force constant of HCl bond. **[04]**

Q–4 (a) Discuss the electrical polarization of molecules under applied electric field, in details. **[04]**

(b) Define the dipole moment. Describe the Vapour-Temperature method for measuring the dipole moment of a molecule. **[04]**

OR

Q–4 (a) Describe the principle, construction and working of Abbe's refractometer. **[04]**

(b) A substance of molecular formula C_3H_6O gives the molar refraction of 16.982 $cm^3\ mol^{-1}$. Indicate whether the substance is acetone or allyl alcohol. (Given: R_M value for C = 2.591cm^3/g atom, H = 1.028 cm^3/g atom, O in >C=O = 2.573 cm^3/g atom, O in -OH = 1.518 cm^3/g atom one double bond = 1.575 cm^3/g atom respectively. **[04]**

Q–5 (a) Derive the relation $\Delta G^\circ = - RT \ln K_P$ **[04]**

(b) Calculate the equilibrium constant for reaction: $N_{2(g)} + H_{2(g)} \rightarrow 2NH_{3(g)}$ at 25° C. **[04]**

Given: $\Delta G^\circ_f (NH_3) = 16.48$, $\Delta G^\circ_f (N_2) = 0$, $\Delta G^\circ_f (H_2) = 0$, $R = 8.3143\ J\ K^{-1}$.

OR

Q–5 (a) Derive the standard entropy for (1) Vibrational (2) Rotational (3) Translational motions of the molecule. **[08]**

Q–6 (a) Describe the condensation methods for the preparation of lyophobic sols. **[04]**

(b) With suitable examples explain the origin of charge on colloidal particles. **[04]**

OR

Q–6 (a) Distinguish between true solution, a colloidal solution and a suspension. **[04]**

(b) Discuss the methods for the purification of colloidal solutions. **[04]**