

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

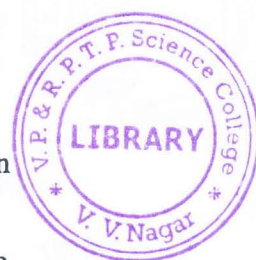
Total Marks: 50

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 molecules
- (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 $a \rightarrow b$, 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 \AA 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 $14.50 \times 10^{-47} \text{ Kg m}^2$.
- (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 $\bar{\nu} = 20.8 \text{ cm}^{-1}$. 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 2885 cm^{-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 $\text{C}_3\text{H}_6\text{O}$ gives the molar refraction of $16.982 \text{ cm}^3 \text{ mol}^{-1}$. Indicate whether the substance is acetone or allyl alcohol. (Given: R_M value for C = $2.591 \text{ cm}^3/\text{g atom}$, H = $1.028 \text{ cm}^3/\text{g atom}$, O in $>\text{C}=\text{O}$ = $2.573 \text{ cm}^3/\text{g atom}$, O in $-\text{OH}$ = $1.518 \text{ cm}^3/\text{g atom}$ one double bond = $1.575 \text{ cm}^3/\text{g atom}$ respectively.) [04]

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

(b) Calculate the equilibrium constant for reaction: $\text{N}_{2(\text{g})} + \text{H}_{2(\text{g})} \rightarrow 2\text{NH}_{3(\text{g})}$ at 25°C . [04]
Given: $\Delta G^\circ_f(\text{NH}_3) = 16.48$, $\Delta G^\circ_f(\text{N}_2) = 0$, $\Delta G^\circ_f(\text{H}_2) = 0$, $R = 8.3143 \text{ J K}^{-1}$.

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]

