

SEAT No. _____

No. of Printed Pages: 03

[69 & A-05]

SARDAR PATEL UNIVERSITY
B.Sc. (SEMESTER - V) EXAMINATION

Physical Chemistry: US05CCHE05

Time: 2:00 p.m. to 5:00 p.m.

Date: 13-04-2018, Friday

Total Marks: 70

Q - 1: Choose the correct option from the following. (Multiple choice question) [10]

- (i) Mathematical form of absorbance is _____.
- (a) $\log(I_t/I_0)$ (b) $\log(I_0/I_t)$ (c) $\ln(I_t/I_0)$ (d) $\ln(I_0/I_t)$
- (ii) The quantum yield in the reaction $H_2 + Br_2 \rightarrow 2HBr$ is _____.
- (a) 10 (b) less than unity (c) equal to unity (d) 0.01
- (iii) Photochemistry is the study of chemical effects produced by light radiations ranging from _____ wave length.
- (a) 2000 to 4000 Å (b) 4000 to 6000 Å
(c) 2000 to 8000 Å (d) 1000 to 2000 Å
- (iv) The number of atoms per unit cell in a simple cubic, fcc, and bcc are _____ respectively.
- (a) 1, 2, 4 (b) 1, 4, 2 (c) 4, 2, 1 (d) 2, 4, 1
- (v) How many types of crystal systems are known?
- (a) 9 (b) 3 (c) 7 (d) 4
- (vi) HDPE consists of _____.
- (a) number of coiled units (b) several short and long branches
(c) linear unbranched chains (d) styrene monomers
- (vii) Natural rubber is basically a polymer of _____.
- (a) propylene (b) isoprene (c) ethylene (d) propane
- (viii) Which one is a step-growth polymer?
- (a) polybutadine (b) Teflon (c) PVC (d) Bakelite
- (ix) Tailor made block copolymers can be synthesis by _____.
- (a) free radical polymerization (b) cationic polymerization
(c) anionic polymerization (d) all of the above
- (x) Weight average molar mass of a polydispersed sample of polymer is _____.
- (a) smaller than number average molar mass (b) larger than number average molar mass
(c) equal to the number average molar mass (d) none of the above

(P.T.O.)

Q-2 : Answer the following. (Write Any ten)

[20]

- (i) Give statement of first law of photochemistry and explain.
- (ii) Define chemiluminescence and electroluminescence.
- (iii) Give reasons of high and low quantum yield.
- (iv) Define: (a) Covalent Radii (b) Axis of Symmetry
- (v) Crystalline substances are anisotropic: Explain
- (vi) Calculate the molecular mass of polyvinyl chloride molecule containing 1,300 monomer units.
- (vii) Draw the optical isomers of polyvinyl chloride.
- (viii) Write repeating units of following polymers.
(a) Polyacrylic acid (b) Polytetrafluoroethylene (c) Nylon 6, 6 (d) Polyethers
- (ix) Draw cubic system for the plane (100), (011), (111) and (001).
- (x) Give the formula for number average, weight average, viscosity average and Z-average molecular weight of polymer.
- (xi) State the limitations of membrane osmometry method used for the molecular weight determination of polymer.
- (xii) Write the formula of absolute value of viscosity coefficient. Give the details about the terms involved in the same.

Q-3 (a) Give characteristics of fluorescence and phosphorescence.

[6]

- (b) Radiation of wave length 2540 \AA was passed through a cell containing 10 ml of a solution of 0.0495 molar oxalic acid and 0.01 molar uranyl sulphate. After the absorption of 8.81×10^8 ergs of radiation, the concentration of oxalic acid was reduced to 0.0383 molar. Calculate the quantum yield for the photochemical decomposition of oxalic acid at a given wave length. ($h = 6.625 \times 10^{-27} \text{ erg .sec}$).

[4]

OR

Q-3 (a) Derive and explain Beer-Lambert's law.

[6]

- (b) The dissociation energy of hydrogen is $102900 \text{ cal mol}^{-1}$. If H_2 is dissociated by illumination with radiation of wave length 2537 \AA . What fraction of the radiation energy will be converted into kinetic energy?

[4]

Q-4 (a) Discuss the powder method of x-ray crystallography to determine the structure of a crystal.

[6]

- (b) Calculate the crystal lattice energy of NaCl in kJ mol^{-1} at 25°C , where Madlung constant is 1.7426, firmness constant is 30 pm, equilibrium distance is 281 pm, $N = 6.023 \times 10^{23}$ ion pairs per mole and $e^2/4\pi\epsilon_0 = 2.307 \times 10^{-28}$.

[4]

OR

Q-4 (a) How many types of crystal system are known? Give the axial and angular relation for each crystal system along with at least one example.

[6]

- (b) Define unit cell. Calculate the number of particle in unit cell of simple cubic, bcc and fcc lattice. [4]

- Q-5 (a) Describe the mechanism of free radical polymerization using suitable example and also explain kinetics of chain polymerization by free radical. [10]

OR

- Q-5 (a) Explain the polycondensation reaction with example. Discuss the kinetics of catalyzed and non-catalyzed polycondensation. [10]

- Q-6 (a) List the different polymerization techniques. Discuss any two techniques in detail. Mention the advantages, disadvantages and its applications also. [6]

- (b) The intrinsic viscosity of myosin is $217 \text{ cm}^3\text{g}^{-1}$. Calculate the approximate concentration of myosin in water, which would have a relative viscosity of 1.5 [4]

OR

- Q-6 (a) List the different methods of molecular weight determination. Describe the membrane osmometry method for the molecular weight determination of polymer. [6]

- (b) Equal masses of polymer molecules with $M_1 = 10,000$ and $M_2 = 1,00,000$ are mixed. Calculate \overline{M}_n and \overline{M}_w . [4]

—X—

