

Seat No. _____

MAY - 2017
MSC0C203 (Sem - II)

Time : 3 Hrs.

Physical Chemistry

Total Marks : 70

- Instruction : (1) All Questions are Compulsory.
(2) Figures to the right indicate total marks of the Questions.

Instruction : All questions carry equal marks.

Necessary Constants:

$$N = 6.022 \times 10^{23} \text{ mole}^{-1}$$

$$K = 1.38 \times 10^{-16} \text{ ergs. K}^{-1} = 1.38 \times 10^{-23} \text{ joule K}^{-1}$$

$$h = 6.626 \times 10^{-27} \text{ erg.sec} = 6.626 \times 10^{-34} \text{ J.sec.}$$

$$C = 2.998 \times 10^{10} \text{ cm sec}^{-1} = 2.998 \times 10^8 \text{ M.sec}^{-1}$$

$$R = 8.3145 \times 10^7 \text{ erg K}^{-1} \text{ mole}^{-1} = 8.3145 \text{ JK}^{-1} \text{ mole}^{-1}$$

$$F = 96500 \text{ coulomb.}$$

1. (A) Derive an equation for Boltzmann's most probable distribution. 7
OR

Discuss Permutation and Combination.

- (B) (i) Derive an equation for rotational partition function. 4
(ii) Calculate the rotational partition function of H_2 at $0^\circ C$. 3

OR

- (i) Derive an equation for translational partition function .
(ii) calculate the translational partition function for 1 mole of Oxygen at 1 atm.
Pressure at $25^\circ C$ assume the gas to behave ideally.
Atomic weight of Oxygen = $16.0 \text{ gm mole}^{-1}$

2. (A) Discuss the liquid drop model of atomic nucleus. 7
OR

Discuss the uses of Radio-isotopes as a tracer.

- (B) (i) Write a note on reaction cross section. 4
OR

Write a note on Linear accelerators.

- (ii) write a note on nuclear fusion reaction. 3
OR

Calculate the binding energy per nucleon of Oxygen atom ${}^8O^{16}$ in Mev which has a mass of 15.994910 a.m.u.

$$\text{Mass of neutron} = 1.008665 \text{ amu}$$

$$\text{Mass of proton} = 1.007825 \text{ amu}$$

$$\text{Mass of electron} = 1.005486 \text{ amu}$$

$$1 \text{ amu} = 931.5 \text{ Mev}$$

- Que : 3 (A) Discuss Kinetics of acid catalyzed poly-condensation. 7
OR

Discuss Kinetics of acid cationic polymerization.

- (B) (i) Discuss any one method for determining molecular weights of polymers. 4
 (ii) Intrinsic viscosity of methyl acrylate in benzene at 30 °C. η is 2.19 dl/gm. 3
 Relation between intrinsic viscosity and molecular weight is given below.
 $[\eta] = 8.63 \times 10^{-5} \cdot M^{0.75}$ calculate molecular weight of polymer.

OR

- (i) What are polymers ? Give the difference between simple molecules and polymer molecules.
 (ii) There are 100 polymer molecules of molecular weight 1000, 200 molecules of molecular weight 10,000 and 200 molecules of molecular weight 1,00,000 calculate \bar{M}_n

Que : (A) Determine the dissociation constant of mono basic acid by potentiometric Method.

OR

Determine the dissociation constant of mono basic acid by conductometry method.

(B) Derive an equation of polarographic wave.

OR

Describe the American , European and IUPAC conventions for expressing electrode potential.

Que : 5. Answer the following questions in one or two lines.

1. What is partition function ?
2. Define thermodynamic probability.
3. What is the value of symmetric factor σ -for symmetric and asymmetric diatomic molecule.
4. Find the value of $8!$
5. What is half life period ?
6. Define Isobar.
7. What is co-polymer?
8. Write the unit of viscosity.
9. Define initiator.
10. What is the unit of specific conductance ?
11. Define over voltage.
12. What is half wave potential ?
13. Write the unit of cell constant.
14. Define polymerization.