



FC-302003

Seat No. _____

M. Sc. (Sem. II) Examination

June / July - 2021

MSC1C203 : Chemistry

(Physical Chemistry) (New Course)

Time : 2 Hours]

[Total Marks : 50

- Instructions :** (1) Answer only **three (3)** questions.
(2) The examination will be for **two (02)** hours.
(3) Q. No. 9 is **compulsory** and carries **14** marks.
(4) Answer any **two** questions from questions No. 1 to 8. Each question carries **18** marks.

Necessary constants :

$$N = 6.022 \times 10^{23} \text{ mole}^{-1}, K = 1.38 \times 10^{-16} \text{ ergs K}^{-1} = 1.38 \times 10^{-23}$$

$$\text{joule K}^{-1}, h = 6.626 \times 10^{-27} \text{ erg. sec} = 6.626 \times 10^{-34} \text{ J.Sec}$$

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

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

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

- 1 (a) Discuss permutation and combination.
(b) Derive an equation for Boltzman's most probable distribution.
- 2 (a) (i) Derive an equation for rotational partition function.
(ii) Calculate the rotational partition function of $\text{H}_{2(g)}$ at 0°C .
(b) (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°C assume the gas to behave ideally.
Atomic weight of oxygen = 16.0 gm mole $^{-1}$.

- 3 (a) Discuss the Fermi gas model of atomic nucleus.
 (b) Discuss the uses of Radio-isotopes as a tracer.
- 4 (a) (1) Write a note on reaction cross section.
 (2) Write a note on linear accelerators.
- (b) (1) Write a note on nuclear fission reaction.
 (2) Calculate the binding energy per nucleon of oxygen atom ${}^8\text{O}^{16}$ in MeV which has a mass of 15.994910 a.m.u ?
 Mass of neutron = 1.008665 amu
 Mass of proton = 1.007825 amu
 Mass of electron = 1.005486 amu
 1 amu = 931.5 MeV.
- 5 (a) Discuss the kinetics of Anionic polymerization.
 (b) What is poly condensation ? Discuss the kinetics of acid catalyzed poly condensation.
- 6 (a) (i) Discuss any one method for the determination of molecular weight of polymer.
 (ii) Intrinsic viscosity of polymer solution (η) at 30°C is 2.20 dl/gm. Relation between intrinsic viscosity (η) and molecular weight is given below

$$(\eta) = 8.63 \times 10^{-5} M^{0.70}$$
 Calculate molecular weight.
- (b) (i) Discuss thermodynamics of polymer solution.
 (ii) Calculate (\bar{X}_n) and (\bar{X}_w) for an equimolar mixture of a diacid and a glycol at the following extent of reaction.
 P : 0.750, 0.900, 0.950

- 7 (a) Determine the dissociation constant of mono basic acid by potentiometric method.
- (b) Determine the dissociation constant of mono basic acid by conductometry method.
- 8 (a) Derive an equation of polarographic wave.
- (b) Describe the American, European and IUPAC conventions for expressing electrode potential.
- 9 Answer in brief : (one mark each)
- (1) Define – Probability
 - (2) At which temperature the value of partition function is one.
 - (3) Define – Partition function.
 - (4) Define – Isotopes.
 - (5) Define – Nuclear Reaction.
 - (6) Define – Isobar
 - (7) Define – Polymer
 - (8) Write the unit of viscosity.
 - (9) Define initiator.
 - (10) Write the unit of specific conductance.
 - (11) Define – Over voltage.
 - (12) Define – Half wave potential.
 - (13) Write the unit of cell constant
 - (14) Define Polymerization.
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