



EEN-301003

Seat No. _____

M. Sc. (Sem I) Examination

February-2022

MSC1C103 : Physical Chemistry

(New Course)

Time : 3 Hours]

[Total Marks : 70

Instructions :

(1) Attempt all question.

(2) Necessary constant :

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

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

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

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

$$R = 8.314 \times 10^7 \text{ erg. K}^{-1} \text{ mole}^{-1} = 8.314 \text{ J. K}^{-1} \text{ mole}^{-1}$$

$$F = 96,500 \text{ C}$$

1 (A) Derive Gibbs-Duham equation. 7

OR

(A) State the third law of thermodynamics. Show how the absolute entropy of a substance can be determined with the help of this law. 7

(B) Discuss method of intercept for the determination of partial molar volume. 7

OR

(B) (1) The activity of 3.0 moles of substance change from 0.05 to 0.35. What would be the change in it's free energy at 300 K. 4

(2) What is fugacity of gas when its activity coefficient is 0.930 at 21 atmosphere pressure. 3

2 (A) Derive theory of absolute reaction rate. 7

OR

(A) Explain the mechanism and kinetics of chain reaction between hydrogen and bromine. 7

- (B) (1) Write a note on branched chain reaction. 4
 (2) Calculate the entropy of activation (ΔS^*) for 3
 reaction $H_2 + I_2 \rightarrow 2HI$ at 575 K. The value
 of frequency factor (A) is $7.94 \times 10^{10} \text{ sec}^{-1}$.

OR

- (B) (1) Write a note on enzyme catalyzed reaction. 4
 (2) Calculate the activation energy of a reaction 3
 whose rate constant is tripled by 10 °C rise
 in temperature at 27 °C.

- 3 (A) On which basis the solids are classified as metals, 7
 semi-conductors and insulator ? Discuss the mechanism
 of electrical conductivity in each of the case.

OR

- (A) What are Frenkel defects ? Derive an expression for 7
 number of Frenkel defects in crystal.
 (B) Derive an equation to calculate number of schottky 7
 defects in solids.

OR

- (B) (1) Write a note on Perovskites. 4
 (2) Write a note on non stoichiometry defects. 3

- 4 (A) What are Micellar ? Explain critical Micellar 7
 concentration.

OR

- (A) Give difference between physical and chemical 7
 Adsorption.
 (B) What is surface tension ? Derive Gibb's Adsorption 7
 isotherm equation.

OR

- (B) (1) According to BET isotherm the value of V_m for 7
 adsorption of nitrogen gas on silica gel at -163°C
 is 160.2 ml.gm^{-1} . One molecule of nitrogen cover
 area 16.2 \AA^2 . Calculate the surface area of silica
 gel.
 (2) Write a note on detergents. 3

- (1) Define Ideal solution.
 - (2) What is fugacity ?
 - (3) What is chain reaction ?
 - (4) Define order of the reaction.
 - (5) Define chemical potential.
 - (6) Define Adsorption.
 - (7) Define unit cell.
 - (8) Define Adsorbate and Adsorbant.
 - (9) Define chain length.
 - (10) Define Schottky defects.
 - (11) Why the rate constant vary with temperature ?
 - (12) What is transition state ?
 - (13) What is stoichiometric defects ?
 - (14) Explain the term defect in crystal.
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