

Seat No. : 320

60

N27-103

December-2014

M.Sc., Sem.-I

403 : Chemistry

(Physical Chemistry)

Time : 3 Hours]

[Max. Marks : 70

Instructions : (1) All questions carry equal marks.

(2) Necessary constants :

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

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

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

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

$$R = 8.314 \times 10^7 \text{ ergs K}^{-1} \text{ M}^{-1}$$

$$= 8.314 \text{ J K}^{-1} \text{ M}^{-1}$$

$$= 1.987 \text{ Cal} \cdot \text{K}^{-1} \text{ M}^{-1}$$

$$F = 96500 \text{ C}$$

1. (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

OR

Discuss method of intercept for the determination of partial molar volume.

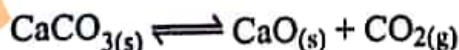
13

(b) Determine fugacity using Vander Waal's equation.

7

OR

(i) Heat of dissociation of calcium carbonate is 42500 cal. Find the dissociation pressure of calcium carbonate at 1000 °K, given that the chemical constant for carbon dioxide is 3.4.



(ii) What is fugacity of gas when it's activity coefficient is 0.836 at 12 atmosphere pressure ?

2 (a) Discuss the Lindemann theory of Unimolecular reactions.

6

OR

Define chain reaction and discuss kinetics of chain reaction.

8

(b) (i) Write a note on explosion limits.

4

(ii) Calculate frequency factor (A) for the decomposition of N_2O_5 at 25 °C. The value of entropy of activation (ΔS^*) is $4.354 \text{ cal} \cdot \text{mol}^{-1} \cdot \text{deg}^{-1}$ (e.u.).

3

OR

1

N27-103

P.T.O.

- (i) Derive theory of absolute reaction rates. 4
 (ii) At 558 °K the frequency factor (A) for a reaction is found to be 8.7×10^{15} second⁻¹. Calculate the entropy of activation (ΔS^*) for reaction. 3

3. (a) Derive an equation to calculate number of Schottky defects in solids. 7
 OR

Classify materials into conductors, semiconductors and insulators. Explain on what basis this classification is made.

(b) Discuss defects in Solid. 7
 OR
 Discuss Super Conductivity.

4. (a) Derive Gibbs adsorption isotherm equation and explain positive and negative surface activity from it. 7

OR
 What are miceller? Explain critical miceller concentration. 7
 (b) Derive BET equation.

OR
 (i) Write a note on detergents. 4
 (ii) According to BET isotherm, the value of V_m for adsorption of nitrogen gas on silica gel at -183 °C is $116.2 \text{ ml} \cdot \text{gm}^{-1}$. The surface area of silica gel is $506.3 \text{ meter}^2 \cdot \text{gm}^{-1}$. Calculate the area covered by one molecule of nitrogen. 3

5. Answer in brief (one mark each) : 14

- (1) What is fugacity?
 (2) Define chemical potential.
 (3) Define ideal solution.
 (4) What is unimolecular reaction?
 (5) Define Chain Length.
 (6) Define order of reaction.
 (7) What is unit cell?
 (8) Define semi-conductor and give two examples.
 (9) Define Schottky defects.
 (10) What is Sorption?
 (11) What is adsorption isotherm?
 (12) What is unit of surface tension (γ) in C.G.S.?
 (13) What is enzyme?
 (14) What is adsorbate?