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SARDAR PATEL UNIVERSITY

M.Sc Chemistry , First Semester Examination

Friday, Date: 24-04-2015

Time: 10:30 a.m. to 01:30 p.m.

Subject: Physical Chemistry-I Paper: PS01CCHE03

N.B. (1) Figures to the right indicate marks.

(2) Attempt all questions.

[Total Marks: 70]

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|------------|--|-----------|
| Q.1 | Choose the correct alternatives from the following | 08 |
|------------|--|-----------|
- 1 At freezing point, the solution will always be in equilibrium with ..
 - (a) pure solid solvent
 - (b) pure liquid solvent
 - (c) pure solid solute
 - (d) pure liquid solute
 - 2 Blood is the example ofsystem.
 - (a) heterogeneous system
 - (b) homogeneous system
 - (c) any solution
 - (d) colloidal solution
 - 3 Which of the following is an extensive property?
 - (a) mass
 - (b) pressure
 - (c) density
 - (d) temperature
 - 4 In reaction isotherm, if reaction is spontaneous then which of the following is true
 - (a) $J_a < K$
 - (b) $J_a \leq K$
 - (c) $J_a > K$
 - (d) $J_a \geq K$
 - 5 At low pressure , the value of PV for any gas is a linear function of its.....
 - (a) temperature
 - (b) pressure
 - (c) density
 - (d) Both a & c
 - 6 Isopiestic solutions are such in which...
 - (a) solute is having same activity
 - (b) solvent is having same activity
 - (c) solute is having same activity co efficient
 - (d) solvent is having same activity co efficient
 - 7 At infinite dilution , the activity of ions becomes equal to its
 - (a) molality
 - (b) formality
 - (c) molarity
 - (d) formality

- 8 The fugacity and pressure are in general, not proportional to one another for
- real gas
 - ideal gas
 - both real and ideal gas
 - none of these

Q-2 Answer the following. (Any seven)

14

- Define: (i) System (ii) Intensive properties.
- What is apparent molar property? Derive the expression for the same.
- Derive the expression for Direct method for partial molar property.
- What are tests of reversibility?
- Give the confirmation of 3rd law of thermodynamics.
- What is fugacity? How will you obtain the equation for relative fugacity.
- Explain positive deviation from ideal solution.
- Derive the equation $dF = RT \ln F$
- State ideal form of Henry's law.

Q.3 A Explain the term fugacity and fugacity co-efficient. Describe the Graphical method for determination of fugacity.

06

B Discuss the Lewis Randall rule for determination of fugacity of a gas in gaseous mixture.

06

OR

B How one can calculate fugacity of solids and liquids? The vapour pressure of liquid chlorine is 3.66atm at 0°C and the molar volume of the vapour under these conditions is 60.1 lit /mole. Evaluate the fugacity of liquid chlorine at 0°C. Give your comments.

06

Q.4 A Write Van't Hoff equation and integrate this equation without limits of integration.

06

B What is Metathesis? Derive the equation for equilibrium constant for such a reaction.

06

OR

B Derive the equilibrium constant for homogeneous reaction in dilute solutions.

06

Q.5 A Derive the Duhem- Margulas equation. Explain its use in understanding the positive and negative deviations of binary solutions from ideal behaviour.

06

B

1 1 molal aqueous solution of mannitol has vapour pressure of 17.22 mm. of mercury at 20°C. At the same temperature the vapour pressure of pure water is 17.53mm. of mercury. Calculate the activity and activity co efficient of water in given solution.

03

2 Determine the mean ionic activity of 0.5 molal solution of sodium sulphate.

03

OR

B When liquid components of an ideal solutions are mixed, ΔV and ΔH_{mix} are always zero. Justify.

06

Q.6 A Discuss relationship between apparent molar property and partial molar property for infinite dilute solution. **06**

B Derive the following equation, $\bar{V}_2 = \frac{M_2}{1000(\rho - c \frac{d\rho}{dc})}$ **06**

OR

B Using the expression for V as a function of m for aqueous NaCl at 25°C : $V = 1002.94 + 16.40m + 2.140 m^{3/2} + 0.027m^{5/2}$. **06**

Find V_{NaCl} & $V_{\text{H}_2\text{O}}$ in a 1 molal solution.

($V_1 = 18.06\text{ml/mole}$, molecular mass of water = 18.02 gm/mole)
