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(40241) **SARDAR PATEL UNIVERSITY**

M.Sc. First Semester Examination

Course No: PS01CCHE03, PHYSICAL CHEMISTRY-I

Wednesday, 5th December,2012

Time: 10.30 am to 1.30 pm

Total marks: 70

N.B **1. Figure to the right of each question indicates full marks.**
2. Answer of all the questions (including multiple choice questions) should be written in the provided answer book only.

Q 1. **Answer the following questions.** **8**

(i) Fugacity integration constant depends on

(a) Nature of gas and temperature (b) Nature of gas and pressure
(c) Temperature and pressure (d) None of these

(ii) Freezing point and melting point, both depend on

(a) Molar volume (b) External pressure
(c) Latent heat constant (d) Temperature

(iii) Which of the following aqueous sofutions has the highest boiling point?

(a) Urea (b) NaCl
(c) Glucose (d) $ZnSO_4$

(iv) The ratio of fugacity to pressure approaches unity as

(a) $p \rightarrow 0$ (b) $f \rightarrow 0$
(c) $T \rightarrow 0$ (d) None of these

(v) For any chemical reaction to be spontaneous

(a) $\triangle G$ is positive (b) $\triangle G$ is negative
(c) Reaction should be in equilibrium (d) Reaction should not take place

(vi) When the liquid components of an ideal solution are mixed then there is no change in

(a) Volume (b) Density
(c) Heat and volume (d) Volume and density

(vii) With increasing dilution of a sofution, which one of the following is correct ?

(a) Solute $\rightarrow 0$, Solvent $\rightarrow 0$ (b) Solute $\rightarrow 0$, Solvent $\rightarrow 1$
(c) Solute $\rightarrow 1$, Solvent $\rightarrow 1$ (d) None of these

(viii) Which one of the following is not an intensive property

(a) Temperature (b) Density
(c) Partial pressure (d) Mass

Q 2. Answer the following (Any Seven) **14**

(i) Derive the equation dF=RT dlnf.

(ii) What is Van der waal's equation? Also state the terms used in the equation.

(iii) Derive equation for relative fugacity of an infinitesimal isothermal process.

(iv) What is the thermodynamic significance of partial molar properties?

(v) Define (I) Partial molar property (ii) Apparent molar property.

(vi) State ideal form of Henry's Law.

(vii) Give the criteria for a reaction to occur spontaneously.

(viii) Derive an expression for mean ionic activity coefficient.

(ix) Justify: Nature of the standard state is of no thermodynamic significance for activity and activity coefficient.

Q 3. (a) Define fugacity. Also discuss equation of state method for determining fugacity of a real gas. **6**

(b) Discuss the Lewis Randall rule for determination of fugacity of a gas in gaseous mixture.

OR

(b) From the following data, calculate the fugacities of Nitrogen gas at various pressure at 0°C. **6**

P (atm)	50	100	200	400	800	1000
PV/RT	0.9846	0.9846	1.0365	1.2557	1.7959	2.0641

Q 4. (a) Define metathetic reaction. Derive the statistical expression for value of quilibrium constent for such reaction. **6**

(b) Derive the equation for the partition function for a chemical reaction. **6**

OR

(b) Write Vant Hoff equation and integrate this equation without limits of integration. **6**

Q 5. (a) Explain the relationship between apparent molar property and partial molar property for infinite dilute solution. 6

(b) What is non ideal solution? Discuss about the solutions exhibiting positive and negative deviations from ideal behavior. 6

OR

(b) The freezing point of the benzene is 5.4°C and its latent heat of fusion is 30.2 Cal/gm. A solution containing 6.054 gm of Triphenyl methane in 1000 gm of benzene has a freezing point which is 0.1263°C below that of pure solvent. Calculate the molecular weight of the solute. 6

Q 6. (a) Discuss analytical procedure for calculating activities of a solution. 6

(b) (i) How to find activity of one component from that of other component in a mixture? 3

(ii) Derive the expression for activity coefficient from e.m.f. measurements. 3

OR

(b) Give osmotic pressure method for determining activity of solvent in a solution. 6

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