SEAT No._____

No. of Printed Pages: 03

[30]

SARDAR PATEL UNIVERSITY

M.Sc. Semester-I Examination (CBCS)(NC)

Subject: Physical Chemistry-I

Examination: April-2018 **Max. Marks:** 70
Day: Friday **Date:** 13.04.2018
Time: 10:00 a.m. to 01:00 p.m. **Paper Code:** PS01CCHE03

N.B.: i. Attempt all questions.
ii. Figures to right indicate full marks.
iii. Unless otherwise mentioned, symbols and notations have their usual standard meanings.
iv. Neat sketches are to be drawn to illustrate answers, wherever required.
v. Assume suitable data, if necessary and indicate the same clearly.

Q.1 The question i) to viii) contain a Multiple Choice Questions (MCQ).Each MCQ question has up to four alternative responses marked a),b),c) and d).Out of which *only one* is the correct response. Please mark correct response i e a) /b) /c) /d). **[08]**

i) Free energy, fugacity and activity co-efficient are all affected by change in the temperature. The fugacity co-efficient of a gas at constant pressure ____with the increase of reduced temperature.
(a) increases (b) remains constant
(c) decreases (d) decreases logarithmically

ii) Volume occupied by a single gas alone of a mixture at the same temperature and pressure of the mixture is called
(a) Absolute volume (b) Total volume of a gas mixture
(c) Partial volume (d) None of the mentioned

iii) Under the ideal gas laws, which of the following is NOT a correct assumption
(a) Molecules occupy a negligible volume
(b) Gas volume are insensitive to changes in pressure
(c) No energy is lost when molecules collide
(d) Forces between molecules are insignificant

iv) An equilibrium constant for a reaction varies with
(a) presence of a catalyst (b) concentration of products
(c) concentration of reactants (d) temperature

v) The three liquids 1, 2, and 3 with vapor pressures V1, V2 and V3 respectively, are kept under same pressure. If V1 > V2 > V3, which liquid will start boiling early?
(a) liquid 1 (b) liquid 2
(c) liquid 3 (d) they will start boiling at the same time

vi) Which of the following statements will always apply when a reversible chemical reaction has attained equilibrium?
(a) All reactants will convert to products
(b) The reaction proceeds alternately in the forward and reverse directions
(c) The Gibbs free energy of the system reaches a minimum
(d) The forward reaction will dominate over the reverse reaction

[P.T.O.]

vii) For ideal systems, the reduction in the chemical potential of solvent molecules upon the addition of solute depends only on which one of the following?
(a) The melting point of the solute (b) The solubility of the solute
(c) The number of solute particles (d) The boiling point of the solute

viii) In which condition can real gas obey closely the ideal gas equation?
(a) pressure is very small and temperature is very high
(b) pressure is very high and temperature is very low
(c) both pressure and temperature are very high
(d) both pressure and temperature are very low

Q.2 Answer the following questions as directed **(ANY SEVEN).** **[14]**

i) Derive an expression: $F_2-F_1 = RT \ln \frac{f_2}{f_1}$

ii) Give the confirmation for the 3rd Law of Thermodynamics.

iii) Explain Negative deviation from ideal solution

iv) Discuss fugacity of Solids and liquids.

v) Derive an expression for the Mean Ionic Activity Coefficients.

vi) Define: Apparent Molar Property. Derive the expression for the Apparent Molar Property.

vii) Explain activity of solvent from Vapour Pressure measurement.

viii) Write down with terms: Ideal form of Henry's Law.

ix) Mention the applications of Free Energy Function.

Q.3 a) State Lewis Randall Rule. How determination of fugacity of a gas in gaseous mixture be done by Lewis Randall rule? **[06]**

b) Define: Fugacity. Derive equation of State Method for determining Fugacity of a real gas. **[06]**

OR

b) Define: Fugacity and fugacity co-efficient. Discuss the Graphical method for determination of fugacity. **[06]**

Q.4 a) Converse Integration of Van't Hoff equation for a long range of temperature with (i) No limits and (ii) Limits of integration. **[06]**

b) Derive an expression for the Partition function for a Chemical reaction. **[06]**

OR

b) Explain Metathesis Derive an equation for equilibrium constant for Metathesis reaction. **[06]**

Q.5 a)

(i) Discuss the Convenient Standard State and Reference State for solute. **[03]**

(ii) Derive the equation for the determination of Activity of solid using EMF Method. **[03]**

b) Discuss with suitable example Solution exhibiting Positive and Negative deviation from Ideal behavior. **[06]**

OR

b) Derive an expression for Duhem- Margulas equation. How Duhem- Margulas equation is used in understanding the Positive and Negative deviations of binary solutions from ideal behavior? **[06]**

Q.6 a) Explain the Freezing Point method for determining activity of solvent in solution. **[06]**

b) How determination of Activity of solution can be done by Osmotic Pressure Method? **[06]**

OR

b) What is Electrolyte? Derive the equation for the Mean ionic Activity for strong Electrolyte. **[06]**