[ ] SEAT No._____ *No. of Printed pages: 03*

[80]

SARDAR PATEL UNIVERSITY

M. Sc. Chemistry, SEMESTER-I Examination

Monday, 25th March 2019

10.00 a.m. to 01.00 p.m.

Course – PS01CCHE03, Physical Chemistry-I [70 Marks]

N.B. Figures to the right of each of the question indicate marks

Q. 1. Answer the following multiple choice questions **08**

(i) A gas will approach non-ideal behavior at,
(a) Low temperature and low pressure
(b) Low temperature and high pressure
(c) High temperature and low pressure
(d) High temperature and high pressure

(ii) Fugacity integration constant depends on
(a) Pressure and nature of gas
(b) Temperature and nature of gas
(c) Temperature and pressure
(d) None of these

(iii) For any chemical reaction to be spontaneous
(a) ΔG is negative
(b) ΔG is positive
(c) Reaction should be in equilibrium
(d) Reaction should not take place

(iv) Blood is an example of _____ system
(a) Heterogeneous
(b) Homogeneous
(c) Colloidal
(d) Isotonic

(v) For a solution exhibiting negative deviation which of the following is true?
(a) A-B interactions are stronger than A-A & B-B
(b) A-B interactions are weaker than A-A & B-B
(c) $\Delta H_{mix} = 0$
(d) $\Delta V_{mix} = 0$

(vi) Formation of a solution exhibiting positive deviation from Raoult's law is accompanied by
(a) evolution of heat
(b) absorption of heat
(c) constant temperature
(d) none of above

(P.T.O.)

(vii) The partial molar property is an
(a) Extensive property
(b) Intensive property
(c) Bulk property
(d) All of these

(viii) The molar volume of water at 25 ^{0}C is
(a) 18.150
(b) 18.00
(c) 17.962
(d) 18.068

Q. 2. Attempt any seven **14**

1 Explain the term 'fugacity' and derive the equation for relative fugacity.

2 Obtain the relation for the fugacity of solids and liquids.

3 Write a short note on free energy function.

4 Discuss the criteria for the spontaneity of the chemical reaction.

5 Write about the applications of Raoult's law for an ideal solution.

6 Derive an expression for the mean ionic activity coefficient.

7 What is the thermodynamic significance of partial molar properties?

8 Derive the expression for Direct method for partial molar property.

9 Explain the vapour pressure curve for the solution exhibiting positive deviation.

Q. 3.

[A] State and derive Lewis Randall rule to determine fugacity of a gas in a mixture. **06**

[B] Discuss the equation of state method for the determination of fugacity. **06**

OR

[B] From the following data, calculate the fugacity's of N_2 gas at various pressure at 0 $^\circ$C. **06**

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 and derive the statistical expression for value of equilibrium constant. **06**

[B] Derive the equation for the partition function for a chemical reaction. **06**

OR

[B] Derive van't Hoff equation considering longer range of temperature with and without the limits of integration. **06**

Q. 5.

[A] Derive the Duhem-Margulas equation. Explain its use in understanding the positive and negative deviations of binary solutions from ideal behavior. **06**

[B] When liquid components of an ideal solution are mixed, ΔV and ΔH_{mix} are always zero. Justify. **06**

OR

[B] Derive the relations: (i) $\theta = (RT_0^2/\Delta H_f)\, N_2$ (ii) $\theta = \lambda m$ **06**

Q. 6.

[A] Write a short note on Isopiestic method. **06**

[B] Discuss the analytical method for calculating activities of a solution. **06**

OR

[B] Discuss the relationship between partial molar property and apparent molar property for the case of the infinitely dilute solution. **06**