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SARDAR PATEL UNIVERSITY

M. Sc. (Chemistry), (First Semester) (NC)

Monday, 25th March 2019

10.00 A.M TO 1.00 P.M.

Course – PS01CCHE23, Topics in Physical Chemistry-I

Que.1 Choose correct answer of the following questions.

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- 1 Which of the following statement is correct for non ideal solution?
 - A) If the solution obey's Raoult's law.
 - B) If the values of $\Delta H \neq 0$, $\Delta V = 0$
 - C) If the values of $\Delta H \neq 0$, $\Delta V \neq 0$
 - D) If vapour pressure of the solution is equal to predicted by Raoult's law.
- 2 The equivalent conductance of KCl at concentration C and at infinite dilution is λ_c and λ_∞ , respectively. The correct relationship between λ_c and λ_∞ is given as (where the constant B is positive)
 - A) $\lambda_c = \lambda_\infty + (B)C$
 - B) $\lambda_c = \lambda_\infty - (B)\sqrt{C}$
 - C) $\lambda_c = \lambda_\infty - (B)C$
 - D) $\lambda_c = \lambda_\infty + (B)\sqrt{C}$
- 3 Which of the following statements is correct for an electrolytic cell?
 - A) Electrons flow from cathode to anode through the external battery.
 - B) Electrons flow from cathode to anode within the electrolytic solution.
 - C) Migration of the ions along with oxidation reaction at cathode and reduction reaction at anode
 - D) Migration of ions along with reduction reaction at cathode and oxidation reaction at anode.
- 4 Spontaneous adsorption of a gas on solid surface is an exothermic process because
 - A) ΔH increases for system
 - B) ΔS increases for gas
 - C) ΔS decreases for gas
 - D) ΔG increases for gas
- 5 A reaction involving two different reactants can never be
 - A) Unimolecular reaction
 - B) First order reaction
 - C) Second order reaction
 - D) Bimolecular reaction

- 6 The integrated rate equation is $R_t = \log C_0 - \log C_t$, The straight line graph is obtained by plotting
- A) Time vs. $\log C_t$ B) $\frac{1}{\text{time}}$ vs. C_t
 C) Time vs. C_t D) $\frac{1}{\text{time}}$ vs. $\frac{1}{C_t}$
- 7 The surfactant that will form micelles in aqueous solution at the lowest molar concentration at ambient conditions is
- A) $\text{CH}_3(\text{CH}_2)_{15}\text{N}^+(\text{CH}_3)_3 \text{Br}^-$ B) $\text{CH}_3(\text{CH}_2)_{11}\text{OSO}_3^- \text{Na}^+$
 C) $\text{CH}_3(\text{CH}_2)_6\text{COO}^- \text{Na}^+$ D) $\text{CH}_3(\text{CH}_2)_{11}\text{N}^+(\text{CH}_3)_3 \text{Br}^-$
- 8 Adsorption of gases on solid surface is generally exothermic because
- A) free energy increases B) Entropy decreases
 C) entropy decreases
 D) interaction developed between gas and solid particles

Que.2 Attempt any SEVEN from the following in short.

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- 1 Write limitations of thermodynamics?
- 2 The activity of 2.5 moles of a substance changes from 0.05 to 0.35. What would be the changes in its free energy at 27°C ?
- 3 What are the difference between Stern model and Gouy-Chapmann model?
- 4 State thermodynamics significance of partial molar properties.
- 5 A first order reaction is 40% complete in 50 min. Calculate the value of the rate constant. In what time will the reaction be 80% complete?
- 6 Calculate the ionic strength of: (i) 0.15 molal KCl solution (ii) 0.25 molal K_2SO_4 solution.
- 7 What is electrokinetics? How can occur electrokinetic phenomena?
- 8 Give difference between molecularity and order of reaction.
- 9 Explain electroosmosis?

Que.3 A What is fugacity? Derive an expression $\ln f = \ln P - \frac{1}{RT} \int_0^P \alpha dp$

06

B Discuss fundamental equations for partial molar properties.

06

OR

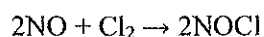
B Calculate free energy change under ideal and non ideal condition 06
 compressing 1 mole of gas 57°C from 25 atm. to 200 atm. The fugacity values at 57°C are found to be 23 and 91 respectively.

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(2)

Que.4 A What is integrated rate law? Discuss integrated rate law for first order reaction. **06**

B For the reaction between gaseous chloride and nitric oxide **06**



It is found that doubling the concentration of both reactants, increases the rate by a factor of eight, but doubling the chlorine concentration alone only doubles the rate. What is the order of reaction with respect to nitric oxide and chlorine?

OR

B The time for 50% completion of certain second order reaction is 150 min. **06**

When the initial concentration is 0.08 M. Calculate the rate constant of the reaction. How much time will it take to consume 60% reactant?

Que.5 A Derive the Butler-Volmer equation. **06**

B What is over potential? Explain Tafel plot? **06**

OR

B Explain ion solvent interaction at electrified interface? **06**

Que.6 A What are surface active agents? Give classification of surface active agents. **06**

B What is CMC? Explain factor affecting the CMC of surfactants? **06**

OR

B Explain mass action model for thermodynamics of micellization? **06**

*****X*****

