Reg. No. :

Question Paper Code: 50944

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Fourth Semester

Chemical Engineering

15UCH404 - PHYSICAL CHEMISTRY

(Regulation 2015)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The $t^{1/2}$ of a reaction is doubled as the initial concentration of reactant is doubled. The order of the reaction is

   (a) 1   (b) 2   (c) 3   (d) 1/2

2. If $E_a > E_b$, (where E_a and E_b are the energies of activation for forward and reverse reactions respectively), then the reaction is

   (a) exothermic   (b) endothermic

   (c) chain reaction   (d) explosive

3. The units for molar conductance are

   (a) Sm^2mol^{-1} (b) m^2S^{-1}

   (c) $Sm^{-1}mol^{-1}$ (d) none of these

4. The distance travelled by an ion per second under a potential gradient of 1 volt per metre is

   (a) 0   (b) 2   (c) 3   (d) none of these

5. The triple point is the point where

   (a) three components are in equilibrium
   (b) the number of degrees of freedom is 3
   (c) the number of degrees of freedom is zero
   (d) none of these

6. The condensed phase rule is

    (a) $F' = C-P+2$ (b) $F' = C-P+1$

    (c) $F' = C+P+3$ (d) $F' = C-P-1$

7. The curve showing effect of temperature on extent of adsorption at a given pressure is called

    (a) physical adsorption   (b) adsorption

    (c) Chemical adsorption   (d) None of these

8. In the steady state approximation, if I is the intermediate formed, then

    (a) $[I] = 0$ (b) $[I] \neq 0$ (c) $[I]/dt = 0$ (d) none of these

9. For colloidal solutions, the particles generally lie in the size range of

    (a) nm   (b) cm   (c) mm   (d) m

10. Which of the following is not an example of colloid?

    (a) Milk   (b) Paint   (c) Blood   (d) Isotonic solution

<div align="center">PART - B (5 x 2 = 10 Marks)</div>

11. How does threshold energy differ from activation energy?

12. Specific conductance decreases with dilution whereas equivalent conductance increases- Why?

13. State condense phase rule.

14. What are homogeneous and heterogeneous catalysts? Give example.

15. Mention how a hydrophilic colloid can stabilize with a hydrophobic colloid.

<div align="center">PART - C (5 x 16 = 80 Marks)</div>

16. (a) Discuss the kinetics of parallel and opposing reactions.   (16)

<div align="center">Or</div>

    (b) Illustrate the influence of ionic strength and the nature of the solvent on rates of ionic reactions.   (16)

17. (a) State Kohlrausch's law of independent migration. Discuss its applications in detail.   (16)

<div align="center">Or</div>

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(b) (i) Derive Ostwalds dilution law for weak electrolytes. (8)

(ii) The molar conductance s at infinite dilution of HCl , NaCl and NaZ (sodium crotonate) are 425 x 10^{-4}, 125 x 10^{-4} and 80 x 10^{-4} S $m^2 mol^{-1}$ respectively. The specific conductance of 0.001 M aqueous solution of crotonic acid (HZ) is 3.8 x 10^{-3}S m^{-1}. Calculate the degree of dissociation and the dissociation constant of the acid. (8)

18. (a) (i) Write the mathematical form of Gibbs phase rule equation and explain the terms involved in it with suitable examples. (10)

(ii) Define the term cooling curves and explain the phase diagram of two component system. (6)

Or

(b) (i) State the Distribution law. Under what conditions is the law valid? How is the law derived from thermodynamic considerations. (10)

(ii) Draw and explain the water system. (6)

19. (a) (i) With postulates, derive Langmuir adsorption isotherm equation. (10)

(ii) Define adsorption isotherm and show the different types of adsorption isotherms with the help of diagrams. (6)

Or

(b) (i) Derive Michaelis-Menten equation. (10)

(ii) Write the characteristics of enzyme catalysis. (6)

20. (a) Discuss any three methods for the preparation of colloidal solutions. (16)

Or

(b) Discuss briefly the kinetics of addition and condensation polymerization. (16)

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