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CH/AC/OC/CA 403

First Semester M.Sc. Degree Examination, December 2018
(Chemistry/Applied Chemistry/Organic Chemistry/Analytical Chemistry)
(2015 Batch)
PHYSICAL CHEMISTRY
(CBCS-Repeaters)

Time : 3 Hours

Max. Marks : 70

- Note :** i) Answer **10** sub-divisions from Part **A** and **any five** questions from Part **B**.
ii) Figures to the **right** indicate marks.

PART – A

Answer **any 10** sub-divisions :

(10×2=20)

1. a) State and explain the third law of thermodynamics.
- b) Define the terms, (i) fugacity, (ii) activity.
- c) Write the Van't Hoff equation and mention its limitations.
- d) What are complex reactions ? Illustrate with an example.
- e) List the general features of chain reactions.
- f) In the triangular phase diagram of a 3-component system a double salt (2 salt and water) indicate the formation of composition: 30% A, 50% B and 20% C.
- g) Evaluate the ionic strength of a solution formed by mixing 100 mL of 0.1 M NaCl and 200 mL of 0.5 M NaOH in 1 L volume.
- h) Distinguish between electrophoretic and asymmetric effects.
- i) Sketch a polarogram and explain the importance of various regions.
- j) Explain the effect of inhibitors on enzyme catalysis.
- k) Differentiate between physical adsorption and chemisorption.
- l) Mention any 4 industrial applications of catalysis.

P.T.O.



PART – B

Answer **any five** questions :**(5×10=50)**

2. a) Discuss the method of determination of absolute entropy of a solid based on third law of thermodynamics. **6**
b) Explain the determination of partial molar volume by intercept method. **4**
3. a) Deduce Gibbs -Duhem equation and explain its significance. **5**
b) Derive an expression for the elevation of boiling point based on thermodynamic considerations. **5**
4. a) Deduce the expressions for the rate constants of consecutive reactions. **4**
b) Discuss the effect of ionic strength of the medium on the rates of reactions . **6**
5. a) Give the Hammett Equation. Show that it is equivalent to a linear free energy relationship. **4**
b) Discuss the phase diagram of a 3 component system with two pairs of partially miscible liquids. **6**
6. a) Discuss the kinetics of enzyme reactions and obtain the Michaelis-Menten equation. **5**
b) Derive the Bronsted relationships of catalytic activity and acid-base strength. **5**
7. a) Discuss the prototropic mechanism of acid base catalysis. **5**
b) Explain the method of in determination of surface area based on BET theory. **5**
8. a) Deduce an expression for the Debye-Huckel limiting law and write various forms of it. **5**
b) Explain the significance of ionic atmosphere. Calculate the thickness of the ionic atmosphere of 0.02 M solution of a uni-univalent electrolyte in 70% ethanol solution in water at 25°C.
($D = 38.5$, $e = 1.602 \times 10^{-19}$ C; $k = 1.38 \times 10^{-23}$ J.K⁻¹; $N = 6.023 \times 10^{23}$ mol⁻¹) **5**
9. a) Give the principle and any two applications of coulometry. **4**
b) Discuss the application of polarography in pharmacy and agriculture. **6**
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