7. (a) State First and Third Law of Thermodynamics. Discuss the calculation of absolute entropies of substances using Third Law of Thermodynamics. (5)

(b) The molar conductance at infinite dilution of HCl, NaCl and NaZ are 425×10^{-4}, 125×10^{-4} and $80 \times 10^{-4} Sm^2 Mol^{-1}$1, respectively. The specific conductance of 0.001 M aqueous solution of HZ is $3.8 \times 10^{-3} Sm^2 mol^{-1}$, Calculate the degree of dissociation and dissociation constant of HZ. (5)

(c) Derive relation between K_p, K_c and K_s. (5)

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325403

May 2023

B.Sc. (LS) IVth Semester

Physical Chemistry for the Biosciences (BLS-403)

Time : 3 Hours]   [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*

2. *Answer any four questions from Part -B in detail.*

3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) Define Fluorescence and Phosphorescence. (1.5)

(b) Explain the effect of dilution on conductance and specific conductivity. (1.5)

(c) Calculate ionic product of water at 25 °C. (1.5)

(d) The rate constant of zero order in A is 0.001 mol $L^{-1} S^{-1}$. How long will it take for (1.5) the initial concentration of A to fall from 0.20 M to 0.01 M. (1.5)

(e) What is buffer solution? Explain the term buffer capacity and buffer range. (1.5)

(f) Define standard enthalpy of formation and standard Enthalpy of Combustion. (1.5)

(g) The solubility of AgCl in water at is 25° C is 0.0017 gL^{-1} Calculate the solubility (1.5) product at 25° C. (1.5)

(h) Distinguish between Extensive and Intensive thermodynamic properties. (1.5)

(i) What is salt bridge? Give its functions. (1.5)

(j) Define Quantum efficiency of a photochemical reaction. (1.5)

PART–B

2. (a) Explain the laws of photochemistry. Draw and discuss the Jblonski diagram for depicting various photochemical processes. (10)

(b) Derive expression for rate constant, half-life period and life time of first order kinetic. (5)

3. (a) What do you mean by electrochemical series? Discuss its significance in details. (5)

(b) What do you mean by activation energy and enzyme catalysts? Derive the Michaelis Menten equation for enzyme catalysis. (10)

4. Write notes on :

(i) Hensderson -Hassel balch equation.

(ii) pH scale.

(iii) Primary and secondary processes in photochemical reactions.

(iv) Order and molecularity of a reaction.

(v) Variations of conductivity with concentration of strong and weak electrolyte. (5×3=15)

5. (a) State and derive Kirchoffs equation thermodynamically. (5)

(b) Discuss in the detail the phenomenon 'hydrolysis of salt'. Illustrate your answer taking example of the salt (i) a weak acid and strong base (ii) a weak acid and weak base. (10)

6. (a) Derive Nernst equation for calculation of the EMF and equilibrium constant of chemical cells. (5)

(b) State and discuss Le-Chatelier principle in detail. Apply Le-Chatelier principle to predict suitable condition for getting maximum yield of ammonia by Haber's process. (5)

(c) Explain the term 'active mass'. Derive the Law of Chemical Equilibrium thermodynamically. (5)