NOTE: i) All the questions are compulsory.
ii) Figures to right indicate full marks.
iii) Use of non –programmable calculator / log table is allowed.

Q.1. Attempt any four: [20]
 A) Discuss the different recording devices used in the actinometer.
 B) Give the relationship between Gibb's free energy and Helmholtz free energy.
 C) State Gibbs – Duhem equation. Derive the equation.
 D) i) Write a note on thermal chain reaction.
  ii) $A \rightarrow B$ 1ST order reaction
  Rate of reaction is doubled when temperature rises from 27^0 C to 127^0 C. Find energy of activation.
 E) Discuss ozone depletion.
 F) Derive the Gibb's-Helmholtz equation.
 G) State : a) the Grotthus Draper law b) The Stark- Einstein law
 H) Explain the kinetics of complex reactions in detail.

Q.2. Attempt any four: [20]
 A) Write a note on relaxation effect in Debye –Huckel theory.
 B) Discuss the titration of weak acid versus strong base. Explain its graph. Which indicators are suitable for such titrations?
 C) Explain any two applications of Kohlrausch's Law in detail.
 D) At 298 K the specific conductance of 0.05 M acetic acid is 3.678×10^{-2} Sm^{-1}. The molar ionic conductance of H^+ ions and CH_3COO^- ions are 0.03498 Sm^2mol^{-1}. Calculate the dissociation constant of acetic acid at 298 K.
 E) (i) Calculate the molar conductance of NH_4OH at infinite dilution. The molar conductance at infinite dilution of NH_4Cl, NaOH and NaCl are 0.01497, 0.02481 and 0.01265 Sm^2mol^{-1}.
  (ii) Discuss limitations of Arrhenius Theory
 F) Define (i) specific conductance (ii) molar conductance (iii) equivalent conductance
  (iv) electrolytic conductors and state Debye Huckel Onsagar equation.
 G) Discuss points of Arrhenius Theory.
 H) Discuss the titration of weak base versus strong acid. Explain its graph. Which indicators are suitable for such titrations?

Q.3. Attempt any four: [20]
 A) What is the function of Complexing agents in solvent extraction? What are the factors to be considered in selection of solvent in solvent extraction?
 B) State the types of EDTA titrations. Explain 'Direct titration' in detail.
 C) Explain the selectivity of EDTA titrations with respect to
  (i) pH   (ii) Use of masking agents (iii) Use of demasking agents ; giving suitable examples.
 D) Write a short note on Complexones.
 E) Give the stepwise dissociation of EDTA.
 F) Derive an equation for the amount of substance unreacted Wn in solvent extraction using Vo cm^3 of organic phase in 'n' titrations.
 G) The distribution ratio 'D' is 10 in favour of the organic solvent for a particular system. Calculate the % extraction for a volume ratio Vo/Vw of (i) 1   (ii) 10   (iii) 0.1
  (iv) 500 (v) 0.4 for a single extraction.

H).Explain the factors affecting stability of complexes.

[15]

Q.4. Attempt any three:
A) Explain the concept of energy of activation.
B) State: 1) Law of mass of action 2) Le- Chateliar-Braun principle.
C) Explain Kohlrausch's Law in detail giving suitable examples
D) Discuss neutralization of polyprotic acid with strong base. Explain its graph. Which indicators are suitable for such titrations?
E) What do you understand by continuous extraction? How is continuous extraction carried out if the extraction is (i) heavier than water (ii) lighter than water.
F) Define Distribution ratio. Why is Distribution law not valid for benzoic acid. Two extractions with 20 cm^3 portions of ether removed 89% of solute from 100 cm^3 of an aqueous solution. Calculate the Distribution ratio

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