Progressive Education Society's
Modern College of Arts, Science & Commerce Ganeshkhind, Pune – 16
End Semester Examination: April 2024
Faculty: Science and Technology

Program: B.Sc. **Semester: I** **SET: B**
Program (Specific): Chemistry **Course Type:**
Class: S.Y.B.Sc **Max.Marks: 35**
Name of the Course: Physical and Analytical Chemistry
Course Code: CH-401 **Time: 2Hr**
Paper: I

Instructions to the candidate:

1) ***There are 4 sections in the question paper. Write each section on a separate page.***
2) ***All Sections are compulsory.***
3) ***Figures to the right indicate full marks.***

Draw a well labeled diagram wherever necessary.

SECTION: A

Q1) Multiple choice questions: **5 M**

1. The total number of mole fractions for all components in solution is equal to _____.

   a.1.0 b. 2.0 c. 0.5 d. 0.75

2. When a solute is present in trace quantities the following concentration expression is used _____

   a. grams/Lit b.milligram per kg c. Normality d. parts per million

3. _____ is the standard electrode.

   a.Hydrogen b. daniel cell

   c. silver d. platinum

4. The equivalent conductance at infinite dilution is independent of its ions is given by _____.

   a. Wheatstone bridge b. Beers' law

   c. Kohlraush law d. Lambert' law

5. Equation for Beer's Law _____

   a.$A \propto bc$ b. $A \propto C$ c. $A \propto b$ d. $A = \varepsilon bC$

Q2) Very short answer questions (Attempt any 4/6) **4 M**

1. State Lambert's law.
2. Explain the specific conductance.
3. What is a standard electrode potential?
4. What is adsorption chromatography?
5. Explain the Neutralization Point.
6. What is a secondary standard?

SECTION: B

Q3) Short answer questions (Attempt any 4/6) **8 M**

1. Derive the Nernst equation for a given Cell $Zn/Zn^{2+}//Cd^{2+}/Cd$.
2. Explain the positive and negative deviation in P Vs N graphs.
3. Give an account of various chromatography techniques.
4. Explain the graph for variation of equivalent conductance with $\sqrt{C}$.
5. What is the Ecell for a cell Cd/Cd^{2+} having 'a' of 0.082, Eo=0.257 at 25°C? F=96500 C, R=8.314 $JK^{-1}Mole^{-1}$.
6. What is the Molar absorptivity for 0.01N of $KMnO_4$ if the absorbance of the solution is 0.06, path length is 1 cm?

SECTION: C

Q4) Short answer questions (Attempt any 4/6) **8 M**

1. Explain what is a standard electrode potential.
2. Draw the P-N and T-N diagram graphs.
3. Explain the process of desalination of water using chromatography.
4. Explain the graph of equivalent conductance Vs concentration for weak and strong electrolyte.
5. Explain the working of any one standard electrode.
6. Show the calculation of $\boldsymbol{\lambda}_o$ for weak electrolyte by mathematical method.

SECTION: D

Q5) Solve the following (Any two) **10 M**

1. What is the Molar absorptivity for 0.01N of $KMnO_4$, if the % transmittance of the solution is 60%, path length is 1 cm.
2. Calculate the electrode potential for a cell having a reaction Cd/Cd^{2+}. Its standard electrode potential is -0.439 V and concentration of Zinc ion solution is 0.08 M.
3. Calculate $\boldsymbol{\lambda}_o$ for CH_3COOH if the $\boldsymbol{\lambda}_o$ for CH_3COONa is 91.0, HCl is 426.16 and NaCl is 126.45.