Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 19

M.Sc (Chemistry) PIT (2015 to 2017) (Sem.-2)

ELECTROCHEMICAL TECHNIQUES

Subject Code : CHL-415

Paper ID : [51152]

Time : 3 Hrs. Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains SIX questions carrying FIVE marks each and students have to attempt ALL questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. What do you mean by half wave potential in polarography?
2. What is the function of salt bridge?
3. Why calomel electrode is called reversible electrode?
4. How concentration cells are different from chemical cells?
5. Given that $E^0_{(Zn^{2+}/Zn)} = -0.76V$ and $E^0_{(Cu^{2+}/Cu)} = +0.34V$. Identify cathode and anode of the electrochemical cell.
6. What is cathodic depolarizer? Give one example.
7. Mention the limitation of direct current polarography.
8. How do you test for the irreversibility of a redox reaction in CV?
9. Write down the unit of specific conductance.
10. How molar conductance is related with specific conductance?

SECTION-B

11. Write down the working principle, and explain the role of different types of electrodes used in voltammetry.

12. Write down Randle-Sevcik equation and Cotrell equation with meaning of different parameters.

13. Derive Nernst equation and give its significance.

14. Write a short note on standard weston cell.

15. Write down the merits and demerits of dropping mercury electrode (DME) used in polarography.

16. What is log-plot in polarography? Mention its characteristic physical significance.

SECTION-C

17. Write down Butler-Volmer equation with meaning of different parameters. Draw the plot of current density against potential. Discuss two limiting cases of the equation. What is mass-transfer control?

18. Differentiate between electrolytic cell and electrochemical cell. Define EMF of a cell. How will you predict the spontaneity of any redox system using EMF? Can you use a nickel spatula to stir a solution of copper sulphate? Explain.

    Given that, $E^0_{Ni^{2+}/Ni} = +0.0025, E^0_{Cu^{2+}/Cu} = +0.34V$.

    Calculate the reduction potential of $ClO_4^-/HClO$ couple from the Latimer diagram :

    $$ClO_4^- \xrightarrow{1.2V} ClO_3^- \xrightarrow{1.18V} ClO_2^- \xrightarrow{1.7V} HClO \xrightarrow{1.63V} Cl_2 \xrightarrow{1.36V} Cl^-$$

19. Explain the conductometric titration of mixture of strong and weak acid against strong base. Write a short note on oscillometry.