

Roll No.

Total No. of Pages : 02

Total No. of Questions : 19

M.Sc.(Chemistry) (PIT) (2016 to 2017) (Sem.-2)

ELECTROCHEMICAL TECHNIQUES

Subject Code : CHL-415

M.code : 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

Write briefly :

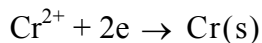
- 1) Why calomel electrode is called reversible electrode?
- 2) Write down Nernst equation with indicating different parameters involved.
- 3) How specific conductance of an electrolyte depends upon the cell constant?
- 4) How molar conductance is related with specific conductance?
- 5) Mention the limitation of direct current polarography.
- 6) How do you test for the irreversibility of a redox reaction in Circular Voltammetry?
- 7) Mention the units of ionic mobility and equivalent conductance.
- 8) Define Half Wave potential in polarography.
- 9) Why EMF measurements are done by potentiometer and not by voltmeter?
- 10) Given that $E^0_{(Zn^{2+}/Zn)} = -0.76V$ and $E^0_{(Cu^{2+}/Cu)} = +0.34V$. Identify the cathode and anode of the electrochemical cell.

SECTION-B

- 11) What are the conditions for a cell to be reversible? What are reversible electrodes?
- 12) The hydrogen electrode is dipped in the solution of pH = 3 at 25°C. Calculate the potential of the cell ($2.303RT/F$ is 0.059V).
- 13) Write down the working principle and explain the role of different types of electrodes used in voltammetry.
- 14) Write short note on linear sweep voltammetry (LSV).
- 15) Molar conductivity of a solution is $1.26 \times 10^2 \text{ Ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$. Its molarity is 0.01. What will be its specific conductivity?
- 16) Briefly discuss about oscillometry.

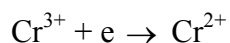
SECTION-C

- 17) Write a short note on standard weston cell. Calculate the standard potential ($E^0_{\text{Cr}^{2+}/\text{Cr(s)}}$) and for the reaction at 298K.



Given that, $\text{Cr}^{3+} + 3e \rightarrow \text{Cr(s)}$

$$E^0_{\text{Cr}^{3+}/\text{Cr}} = 0.50V$$



$$E^0_{\text{Cr}^{3+}/\text{Cr}^{2+}} = 0.41V$$

- 18) Differentiate between cathodic and anodic stripping methods. Draw a typical excitation signal and voltammogram in case of stripping method. Define Microelectrode and mention its advantages.
- 19) What is ionic mobility? A potential of 12.0 volts was applied to two electrodes placed 20 cm apart. A dilute solution of NH_4Cl was placed between the electrodes when NH_4^+ ion was found to cover a distance of 1.60 cm in one hour. What is the mobility of NH_4^+ ion?

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.