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Total No. of Questions : 19

M.Sc.(Chemistry) (Campus) (2015 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

1. What is the role of liquid junction potential?
2. 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.
3. Write down the relation between specific conductance and equivalent conductance.
4. Why calomel electrode is called reversible electrode?
5. What is anodic depolarizer? Give one example.
6. Write Nernst equation with meaning of the parameters involved.
7. How do you test for the irreversibility of a redox reaction in CV?
8. Mention the limitation of direct current polarography.
9. Draw the conductometric titration curve of weak acid with strong base.
10. How concentration cells are different from electrochemical cells?

SECTION-B

11. For the following cells, write down the cell reactions and calculate the EMF at 298K.

    (a) $Ag(s)|Ag^+(a\pm = 0.1) \parallel Zn^{2+}(a\pm = 0.1)|Zn$

    Given the following standard potential values :

    $E^0_{(Ag^+/Ag)} = 0.799V$; $E^0_{(Zn^{2+}/Zn)} = -0.763V$; Predict whether the cell reaction is spontaneous or not.

12. Write a short note on linear sweep voltammetry (LSV).

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

14. The molar conductances of CH_3COONa, HCl and NaCl at infinite dilution are 91×10^{-4}, 426×10^{-4} and 126×10^{-4} Sm^2mol^{-1} respectively at 25°C. Calculate the molar conductance at infinite dilution for CH_3COOH.

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

16. Write a short note on oscillometry.

SECTION-C

17. Construct the Frost diagram of manganese from the following scheme :

$$MnO_4^- \xrightarrow{1.7V} MnO_2 \xrightarrow{0.95V} MN^{3+} \xrightarrow{1.5V} Mn^{2+} \xrightarrow{-1.18V} Mn$$

From this diagram justify that :

a) Mn^{3+} is unstable,

b) MnO_2 is an oxidising agent,

c) Mn^{2+} is the usual product of reduction of Mn (VII).

Can you use a nickel spatula to stir a solution of copper sulphate? Explain.

18. Differentiate between cathodic and anodic stripping methods. Draw a typical excitation signal and voltammogram in case of striping method. Define microelectrode and mention its advantages.

19. Specific conductance of a decimolar solution of KC1 at 18°C is 1.12 Sm^{-1}.The resistance of a conductivity cell containing the solution at 18°C was found to 55 Ω. Calculate the cell constant.

What is the effect of dilution on :

a) The specific conductance

b) The equivalent conductance of CH_3COOH.

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.