



Test Paper | Chemistry-XII | Topic – Electrochemistry | Time: 1.5 -Hour,  
Marks 30

- 1 Which cell will measure standard electrode potential of copper electrode? **1**
- (i)  $\text{Pt (s) | H}_2 \text{ (g, 0.1 bar) | H}^+ \text{ (aq., 1 M) || Cu}^{2+} \text{ (aq., 1M) | Cu}$   
 (ii)  $\text{Pt(s) | H}_2 \text{ (g, 1 bar) | H}^+ \text{ (aq., 1 M) || Cu}^{2+} \text{ (aq., 2 M) | Cu}$   
 (iii)  $\text{Pt(s) | H}_2 \text{ (g, 1 bar) | H}^+ \text{ (aq., 1 M) || Cu}^{2+} \text{ (aq., 1 M) | Cu}$   
 (iv)  $\text{Pt(s) | H}_2 \text{ (g, 1 bar) | H}^+ \text{ (aq., 0.1 M) || Cu}^{2+} \text{ (aq., 1 M) | Cu}$
- 2 The difference between the electrode potentials of two electrodes when no current is drawn through the cell is called \_\_\_\_\_. **1**
- (i) Cell potential  
 (ii) Cell emf  
 (iii) Potential difference  
 (iv) Cell voltage
- 3 Which of the following statement is not correct about an inert electrode in a cell? **1**
- (i) It does not participate in the cell reaction.  
 (ii) It provides surface either for oxidation or for reduction reaction.  
 (iii) It provides surface for conduction of electrons.  
 (iv) It provides surface for redox reaction.
- 4 An electrochemical cell can behave like an electrolytic cell when \_\_\_\_ **1**
- (i)  $E_{\text{cell}} = 0$   
 (ii)  $E_{\text{cell}} > E_{\text{ext}}$   
 (iii)  $E_{\text{ext}} > E_{\text{cell}}$   
 (iv)  $E_{\text{cell}} = E_{\text{ext}}$
- 5 Which of the statements about solutions of electrolytes is not correct? **1**
- (i) Conductivity of solution depends upon size of ions.  
 (ii) Conductivity depends upon viscosity of solution.  
 (iii) Conductivity does not depend upon solvation of ions present in solution.  
 (iv) Conductivity of solution increases with temperature.
- 6 The cell in which the following reaction occurs:  $2\text{Fe}^{3+} \text{ (aq) + 2I}^- \text{ (aq)} \rightarrow 2\text{Fe}^{2+} \text{ (aq) + I}_2 \text{ (s)}$  has  $E^\circ_{\text{cell}} = 0.236 \text{ V}$  at 298 K. Calculate the standard Gibbs energy and the equilibrium constant of the cell reaction.? **2**
- 7 The molar conductivity of  $0.025 \text{ mol L}^{-1}$  methanoic acid is  $46.1 \text{ S cm}^2 \text{ mol}^{-1}$ . Calculate its degree of dissociation and dissociation constant Given  $\lambda^\circ(\text{H}^+) = 349.6 \text{ S cm}^2 \text{ mol}^{-1}$  and  $\lambda^\circ(\text{HCOO}^-) = 54.6 \text{ S cm}^2 \text{ mol}^{-1}$  **3**
- 8 Suggest a way to determine the limiting molar conductivity value of water. **2**
- 9 Write the Nernst equation and emf of the following cells at 298 K: **3**
- $\text{Pt(s) | Br}^- \text{ (0.010 M) | Br}_2 \text{ (l) || H}^+ \text{ (0.030 M) | H}_2 \text{ (g) (1 bar) | Pt(s)}$**
- $E^\circ \text{ Br}_2 / \text{Br}^- = 1.09 \text{ V}$
- 10 How much electricity in terms of Faraday is required to produce? **2**
- (i) 20.0 g of Ca from molten  $\text{CaCl}_2$



- (ii) 40.0 g of Al from molten  $\text{Al}_2\text{O}_3$ ?
- 11** Three electrolytic cells A, B, C containing solutions of  $\text{ZnSO}_4$ ,  $\text{AgNO}_3$  and  $\text{CuSO}_4$ , respectively are connected in series. A steady current of 1.5 amperes was passed through them until 1.45 g of silver deposited at the cathode of cell B. How long did the current flow? What mass of copper and zinc were deposited? **3**
- 12** Consider the reaction:  $\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6\text{e}^- \rightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$  What is the quantity of electricity in coulombs needed to reduce 1 mol of  $\text{Cr}_2\text{O}_7^{2-}$ ? **2**
- 13** What is the role of salt bridge? **1**
- 14** Unlike dry cell, the mercury cell has a constant cell potential throughout its useful life. Why? **1**
- 15** Match the terms given in Column I with the units given in Column II. **2**

Column I	Column II
(i) $\wedge_m$	(a) $\text{S cm}^{-1}$
(ii) $E_{\text{Cell}}$	(b) $\text{m}^{-1}$
(iii) $\kappa$	(c) $\text{S cm}^2 \text{mol}^{-1}$
(iv) $G^*$	(d) $V$

### Assertion And Reasoning

Directions: These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.

- (a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- (b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- (c) If the Assertion is correct but Reason is incorrect.
- (d) If both the Assertion and Reason are incorrect.

- 1** Assertion: Conductivity of all electrolytes decreases on dilution. Reason: On dilution number of ions per unit volume decreases. **1**
- 2** Assertion: Mercury cell does not give steady potential. Reason: In the cell reaction, ions are not involved in solution. **1**
- 3** Assertion: Copper sulphate can be stored in zinc vessel. Reason: Zinc is less reactive than copper **1**
- 4** Assertion: Current stops flowing when  $E_{\text{Cell}} = 0$ . Reason: Equilibrium of the cell reaction is attained. **1**