

SOLUTION TEST-A

$$1. \quad K = 1.0 \times 10^8, \quad \log K = \frac{nE^\circ}{0.059} \quad E^\circ = \frac{0.059}{2} \log 10^8$$

$$n = 2$$

$$E^\circ = \frac{0.059 \times 8}{2} = 0.059 \times 4$$

$$E_{\text{cell}}^\circ = 0.236 \text{ V}$$

$$E_{\text{cell}}^\circ = E_{\text{Fe}^{3+}/\text{Fe}^{2+}}^\circ - E_{\text{I}_2/\text{I}^-}^\circ \quad \text{or} \quad E_{\text{Fe}^{3+}/\text{Fe}^{2+}}^\circ = E_{\text{cell}}^\circ + E_{\text{I}_2/\text{I}^-}^\circ$$

$$E_{\text{Fe}^{3+}/\text{Fe}^{2+}}^\circ = +0.236 + 0.54 = 0.776 \text{ V}$$

The correct answer is (iv)

$$2. \quad \text{The correct answer is (iii),} \quad 2\text{Cl}^- \longrightarrow \text{Cl}_2 + 2\text{e}^-$$

3. Any metal having E° value greater than -0.44 V will oxidise Fe to Fe^{2+} . All three metals given will oxidise Fe to Fe^{2+} .

The correct answer is (iv)

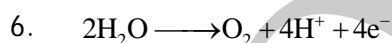
4. Assertion and reason are correct and reason is the correct explanation.

$$E_{\text{Zn}^{2+}/\text{Zn}}^\circ < E_{\text{Cu}^{2+}/\text{Cu}}^\circ, \text{ so copper cannot displace zinc from zinc sulphate solution.}$$

The correct answer is (i)

5. Assertion is wrong.

The conductivity increases with increase in concentration for both strong and weak electrolytes.

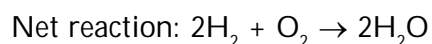
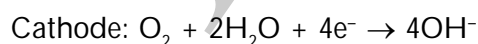


$$1 \text{ mol } \text{O}_2 \rightarrow 4 \text{ mol } \text{e}^- \rightarrow 4\text{F} \\ \rightarrow 4 \times 96500 = 386000 \text{ C}$$

7. It states that at infinite dilution, the total molar conductance of an electrolyte is equal to the sum of their ionic conductances.

8. Fuel cells are the cells in which heat energy of the fuel directly converted into electrical energy.

For $\text{H}_2 - \text{O}_2$ cell



$$9. \quad I = 100 \text{ mA} = 0.1 \text{ A}$$

$$n_{\text{H}_2} = \frac{112}{22400} = 5 \times 10^{-3} \text{ mol}$$

from 1st law of electrolysis

$$m = ZIt$$

$$m_{H_2} = \frac{MW_{H_2}}{2 \times 96500} \times I \times t$$

$$\frac{m_{H_2}}{MW_{H_2}} = n_{H_2} = \frac{I \times t}{2 \times 96500}$$

$$t = \frac{n_{H_2} \times 2 \times 96500}{I}$$

$$t = \frac{5 \times 10^{-3} \times 2 \times 96500}{0.1} = 9650 \text{ s}$$

10. (i) On dilution, the inter-ionic interaction between the oppositely charged ions decreases. The ions are more free to move and molar conductance increases linearly with dilution according to the equation $\wedge = \wedge^\circ + A\sqrt{C}$.

(ii) D.C voltage results in the electrolysis of the solution which changes the concentration. This change in concentration changes the resistance. Hence, accurate value of resistance cannot be measured

11. $E^\circ_{\text{cell}} = E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} - E^\circ_{\text{I}^-/\text{I}_2}$

$$E^\circ_{\text{cell}} = +0.77 - 0.57 = 0.20\text{V}$$

$$\Delta rG^\circ = -nFE^\circ$$

$$\Delta rG^\circ = -2 \times 96500 \times 0.20$$

$$\Delta rG^\circ = -38600 \text{ J mol}^{-1}$$

$$K = \text{antilog} \left(\frac{nE^\circ}{0.059} \right)$$

$$K = \text{antilog} \left(\frac{2 \times 0.20}{0.059} \right)$$

$$K = \text{antilog} (6.779)$$

$$K = 6.02 \times 10^6$$

12. (i) $\text{Pt(s)} | \text{H}_2(\text{g}) | \text{H}^+_{\text{aq}} (0.02 \text{ M}) || \text{Ag}^+_{\text{aq}} (0.01 \text{ M}) | \text{Ag(s)}$
(-ve) (+ve)

(ii) $E^\circ_{\text{cell}} = E^\circ_{\text{Ag}^+/\text{Ag}} - E^\circ_{\text{H}^+/\text{H}_2} = +0.80 - 0$

$$E^\circ_{\text{cell}} = +0.80 \text{ V}$$

$$E_{\text{cell}} = E^\circ_{\text{cell}} - \frac{0.059}{n} \log \frac{[\text{H}^+]^2}{[\text{Ag}^+]^2}$$

$$E_{\text{cell}} = 0.80 - \frac{0.059}{n} \log \left(\frac{0.02}{0.01} \right)^2$$

$$E_{\text{cell}} = +0.80 - 0.059 \log 2$$

$$E_{\text{cell}} = 0.80 - 0.059 \times 0.301$$

$$E_{\text{cell}} = 0.80 - 0.0178$$

$$E_{\text{cell}} = 0.7822 \text{ V}$$

13. $R_{\text{KCl}} = 180 \text{ ohm}$

$$\kappa_{\text{KCl}} = 1.23 \times 10^{-3} \text{ S cm}^{-1}$$

$$R_{\text{AgNO}_3} = 230 \text{ ohm}$$

(i) cell constant = $\kappa_{\text{KCl}} R_{\text{KCl}}$

$$\text{cell constant} = 1.23 \times 10^{-3} \times 180 = 0.2214 \text{ cm}^{-1}$$

(ii) $\kappa_{\text{AgNO}_3} = \frac{\text{cell constant}}{R_{\text{AgNO}_3}} = \frac{0.2214}{220} = 1.00 \times 10^{-3} \text{ S cm}^{-1}$

(iii) $\wedge = \frac{10^3 \kappa}{M}$

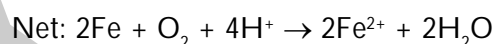
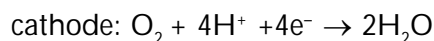
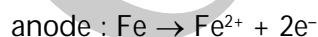
$$\wedge = \frac{10^3 \times 1.00 \times 10^{-3}}{0.002} = 500 \text{ S cm}^2 \text{ mol}^{-1}$$

14. (i) It states that the mass of an element produced at a given electrode is directly proportional to the amount of electricity passed.

(ii) (a) anode: O_2 gas
cathode: Ag

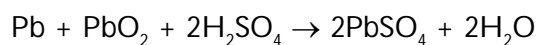
(b) anode: Ag^+ + impurities
cathode: pure silver

15. (a) (i) Corrosion is an electrochemical process as it involves redox reaction.



(ii) Presence of alkaline medium neutralises H^+ ion and prevent the forward reaction.

(b) The net reaction during discharging of lead storage battery is



Due to the formation of H_2O , the density of H_2SO_4 decreases.

(c) $\text{Zn} < \text{Al} < \text{Mg}$

(d) Cell constant is the ratio of the distance separating two electrodes to the area of cross section in a conductivity cell. Cell constant is unaffected by changing concentration.

