Roll No. :
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1. Can absolute electrode potential of an electrode be measured? 1

2. Can $E°_{cell}$ or $\Delta_rG°$ for a cell reaction ever be equal to zero? 1

3. Predict whether F_2 and Na will react with one another. Give reason. 1
   $E°_{F_2/F^-}$ = + 2.87 V, $E°_{Na^+/Na}$ = – 2.71 V.

4. If E° for the reaction $Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq)$ is + 0.77 V, what will be E° value for the reaction $2Fe^{3+}(aq) + 2e^- \rightarrow 2Fe^{2+}(aq)$? 1

5. What does the negative sign in expression $E°_{Zn^+/Zn} = -0.76$ V mean? 1

6. Consider a cell given below: 1
   Cu | Cu^{2+} || Cl^-|Cl_2, Pt.
   Write reactions that occur at anode and cathode.

7. What is the sign of ΔG in electrolytic cell? 1

8. The standard electrode potential (E°) for Daniel cell is +1.1 V. Calculate the ΔG° for the reaction: 2

$$Zn(s) + Cu^{2+}(aq) \longrightarrow Zn^{2+}(aq) + Cu(s) \quad (1\ F = 96500\ C)$$

9. Determine the values of equilibrium constant (K_c) and ΔG° for the following reaction: 2
   $Ni(s) + 2Ag^+(aq) \rightarrow Ni^{2+}(aq) + 2Ag(s)$, E° = 1.05 V (1 F = 96500 C mol^{-1})

10. (a) Calculate ΔrG° for the reaction: 3
    $Mg(s) + Cu^{2+}(aq) \rightarrow Mg^{2+}(aq) + Cu(s)$
    Given: $E°_{cell}$ = + 2.71 V, 1 F = 96500 C mol^{-1}
    (b) Name the type of cell which was used in Apollo space programme for providing electrical power.

11. Calculate emf of the following cell at 25 °C: 3
    Fe | Fe^{2+} (0.001 M) || H^+(0.01 M) | H_2(g) (1 bar) | Pt(s)
    $E°(Fe^{2+} | Fe) = -0.44$ V $E°(H^+ | H_2) = 0.00$ V

12. The E° values at 298 K corresponding to the following two reduction electrode processes are: 3
    (i) Cu^+/Cu = + 0.52 V
    (ii) Cu^{2+}/Cu^+ = + 0.16 V
    Formulate the galvanic cell for their combination. What will be the cell potential? Calculate the $\Delta_rG°$ for the cell reaction. (1 F = 96500 C mol^{-1})

13. Calculate the emf of the following cell at 25 °C: 3

    Zn | Zn^{2+} (0.001 M) || H^+ (0.01 M) | H_2(g) (1 bar) | Pt(s)

    $E^0_{(ZN^{2+}/Zn)} = -0.76$ V; $E^0_{(H^+/H_2)} = 0.00$ V

14. Calculate the equilibrium constant, K for the reaction at 298 K, 3

$$Zn(s) + Cu^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Cu(s)$$

Given $E^\circ_{Zn^{2+}/Zn} = -0.76\ V$

$E^\circ_{Cu^{2+}/Cu} = +0.34\ V$

15. For the cell: Zn(s) | Zn^{2+}(2M) || Cu^{2+}(0.5 M) | Cu(s) 3
(a) Write equation for each half-reaction.
(b) Calculate the cell potential at 25 °C.
[Given: $E^\circ_{Zn^{2+}/Zn} = -0.76\ V$; $E^\circ_{Cu^{2+}/Cu} = +0.34V$]

16. Consider the cell: Mg(s) | Mg^{2+} (0.13 M) || Ag^{+} (1.0×10^{-4}) M | Ag(s) 3
Its emf is 2.96 V. Calculate E°cell.
(R = 8.314 $JK^{-1}\ mol^{-1}$, 1F = 96500 C mol^{-1})