Zoom session part -1 (Electrochemistry - nernst equation, relation between delta G and cell potential, and electrolytic cell)

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1.

If an iron rod is dipped in $CuSO_4$ solution, then:

1. Blue colour of the solution turns red
2. Brown layer is deposited on iron rod
3. No change occurs in the colour of the solution
4. None of the above

2.

When 0.1 mol MnO_4^{2-} is oxidized the quantity of electricity required to completely oxidise MnO_4^{2-} to MnO_4^{-}, is

1. 96500 C
2. 2 x 96500 C
3. 9650 C
4. 96.50 C

3.

The EMF of the given cell is:

Zn(s) | Zn^{+2} (0.1M) || Sn^{+2} (0.001M) | Sn(s)

Given $E^{o}_{Zn^{+2}/Zn} = -0.76\ V,\ E^{o}_{Sn^{2+}/Sn} = -0.14\ V$

1. 0.62V
2. 0.56V
3. 1.12V
4. 0.31V

4.

The potential of hydrogen electrode having a pH = 10 is

1. 0.59V
2. –0.59V
3. 0 V
4. –059V

5.

The equilibrium constant of a 2 electron redox reaction at 298 K is 3.8 x 10^{-3}. The cell potential E° (in V) and the free energy change ΔG° (in kJ mol^{-1}) for this equilibrium respectively, are

1. -0.071, -13.8
2. -0.071, 13.8
3. 0.71, -13.8
4. 0.071, -13.8

6.

Aluminium oxide may be electrolysed at 1000 C to furnish aluminium metal (Atomic mass = 27 amu; 1 Faraday = 96,500 Coulombs). The cathode reaction is

$Al^{3+} + 3e^{-} \rightarrow Al$

To prepare 5.12 kg of aluminium metal by this method would require

1. $5.49 \times 10^{7} C$ of electricity
2. $1.83 \times 10^{7} C$ of electricity
3. $5.49 \times 10^{4} C$ of electricity
4. $5.49 \times 10^{1} C$ of electricity

7.

For the cell, Ti/Ti^{+}(0.001M)||Cu^{2+}(0.1*M*)|Cu, E^{o}_{cell} at 25°C is 0.83 V. E_{cell} can be increased:

1. By increasing [Cu^{2+}]
2. By increasing [Ti^{+}]
3. By decreasing [Cu^{2+}]
4. None of the above

8.

What will be the electrode potential of Cu electrode dipped in 0.025 M $CuSO_4$ solution at 298 K. Cu has the standard reduction potential 0.34 V :-

1. 0.047 V
2. 0.293 V
3. 0.35 V
4. 0.387 V

9.

$\mathrm{Cu(s)}\left|\mathrm{Cu^{+2}(aq,\ 10^{-3})}\right|\left|\mathrm{Ag^{+}(10^{-5}M)}\right|\ \mathrm{Ag(s)}$

if $\mathrm{E^0_{Cu^{+2}/Cu}} = +0.34\ \mathrm{V}$

$\mathrm{E^0_{Ag^{+}/Ag}} = +0.80\ \mathrm{V}$

$\mathrm{E_{cell}}$ will be :

1. $0.46\ \mathrm{V}$
2. $0.46 - \frac{\mathrm{RT}}{2\mathrm{F}}\ \mathrm{In}\ 10^7$
3. $0.46 + \frac{\mathrm{RT}}{2\mathrm{F}}\ \mathrm{In}\ 10^7$
4. $0.46 - \frac{\mathrm{RT}}{2\mathrm{F}}\ \mathrm{In}\ 10^2$

10.

Consider the following cell reaction

$2Fe(s) + O_2(g) + 4H^+(aq) \rightarrow 2Fe^{2+}(aq) + 2H_2O(l)$
$E° = 1.67$ V, At $[Fe^{2+}] = 10^{-3}$ M, $P_{O_2} = 0.1$ atm and pH = 3, the cell potential at 25°C is

1. 1.27 V
2. 1.77 V
3. 1.87 V
4. 1.57 V

11.

A fuel cell develops an electrical potential from the combustion of butane at 1 bar and 298 K

$\mathrm{C_4H_{10}(g) + 6.5O_2(g) \rightarrow 4\,CO_2(g) + 5H_2O(l);}$

What is $\mathrm{E^\circ}$ of a cell? given $\Delta G^o = -2746 kJ/mole$

1. 4.74 V
2. 0.547 V
3. 4.37 V
4. 1.09 V

12.

A gas X at 1 atm is bubbled through a solution containing a mixture of 1M Y^-
and 1M Z^- at 25 ^oC . If the reduction potential of Z>Y>X, then

1. Y will oxidize X and not Z
2. Y will oxidize Z and not X
3. Y will oxidize both X and Z
4. Y will reduce both X and Z

13.

The number of Faradays required to produce 20.0 g of Ca from molten $CaCl_2$ is-

1. 2F
2. 1F
3. 4F
4. 3F

14.

Which cell will measure the standard electrode potential of a copper electrode?

1. Pt (s) | H_2(g, 0.1 bar) | H^+(aq., 1M) || Cu^{2+}(aq, 1 M)| Cu
2. Pt (s) | H_2(g, 1 bar) | H^+(aq, 1M) || Cu^{2+} (aq, 2 M) | Cu
3. Pt (s) | H_2(g, 1 bar) | H^+(ag, 1 M)|| Cu^{2+} (aq, 1 M)| Cu
4. Pt (s) | H_2(g, 0.1 bar) | H^+(aq, 0.1 M) || Cu^{2+}(aq, 1M) | Cu

15.

Electrode potential for Mg electrode varies according to the equation .$E_{Mg^{2+}|\,Mg} = E^0_{Mg^{2+}|\,Mg} - \frac{0.059}{2}\log\frac{1}{[Mg^{2+}]}$

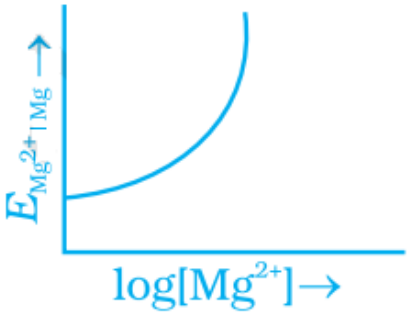
.

The graph of $E_{Mg^{2+}\,/\,Mg}$ vs log $[Mg^{2+}]$ among the following is -

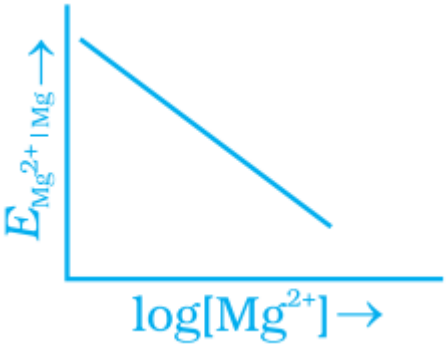
1.

2.

3.



4.



16.

Which of the following statement is correct?

1. E_{cell} and $\Delta_r G$ of cell reaction both are extensive properties
2. E_{cell} and $\Delta_r G$ of cell reaction both are intensive properties
3. E_{cell} is an intensive property while $\Delta_r G$ of cell reaction is an extensive property
4. E_{cell} is an extensive property while $\Delta_r G$ ofcell reaction is an intensive property

17.

The difference between the electrode potentials of two electrodes when no current is drawn through the cell is called

1. Cell potential
2. Cell emf
3. Potential difference
4. Cell voltage

18.

An electrochemical cell can behave like an electrolytic cell when .....

1. E_{cell} =O
2. $E_{cell} > E_{ext}$
3. $E_{ext} > E_{cell}$
4. $E_{cell} = E_{ext}$

19.

$E^{\ominus}_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33V$; $E^{\ominus}_{Cl_2/Cl^-} = 1.36V$

$E^{\ominus}_{MnO_4^-/Mn^{2+}} = 1.51V$; $E^{\ominus}_{Cr^{3+}/Cr} = -0.74V$

Use the data give above, find out the most stable oxidized species.

1. Cr^{3+}
2. MnO_4^-
3. $Cr_2O_7^{2-}$
4. Mn^{2+}

20.

The quantity of charge required to obtain one mole of aluminium from Al_2O_3 is :

1. 1 F
2. 6 F
3. 3 F
4. 2 F

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