

Chem12 Electrochem Applications : M.C. Probs - 110

1) The copper produced in smelters contains many impurities. Which of the following procedures is used to produce almost pure copper ?

- a) The impure copper is the cathode of an electrolytic cell and pure copper forms on the anode
- b) The impure copper is melted and centrifuged
- c) The impure copper is boiled and pure copper is condensed
- d) The impure copper is the anode of an electrolytic cell and pure copper forms on the cathode

2) What minimum voltage would be required for an electrolytic cell in which the reaction desired is $\text{Fe}^{2+} + \text{Sn} \rightarrow \text{Sn}^{2+} + \text{Fe}$? The iron and tin electrodes are immersed in 1.0 M solutions of their salts, in separate beakers connected by a salt bridge, at a temperature of 25°C.

- a) -0.59 V b) -0.31 V c) 0.31 V d) 0.59 V

3) How much current will be needed to produce 2.50 g of Zn from Zn^{2+} in a time of 2.00×10^3 s ? (1 Faraday = 9.65×10^4 coulomb/mol of e^-)

- a) 0.922 amp b) 1.84 amp c) 3.69 amp d) 240 amp

4) The equation $\text{Cl}_2 + 2\text{Ag} \leftrightarrow 2\text{Cl}^- + 2\text{Ag}^+$ represents the reaction in a silver-chloride cell. What would be the overall E° for the cell?

- a) 0.56 V b) 0.80 V c) 1.36 V d) 2.16 V

5) Calculate the mass of NaClO_4 that would be produced by the electrolysis of aqueous NaCl by a cell operating for 3.00 hours with a current of 1.00×10^4 amperes. (1.00 Faraday = 96,500 coulombs/mol) Equation for the half reaction is:



6) What mass of copper will be produced in the electrolysis of CuSO_4 solution by a current of 0.200 amperes passed for 40.0 minutes ?

- a) 2.63×10^{-3} g b) 0.158g c) 0.316g d) 0.672g

7) Which one of the following equations represents the cathode reaction in the manufacture of sodium metal by electrolysis of liquid (molten) sodium chloride ?

- a) $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$ b) $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$
c) $\text{NaCl} \rightarrow \text{Na}^+ + \text{Cl}^-$ d) $2\text{H}_2\text{O} + 2\text{e}^- \rightarrow 2\text{OH}^- + \text{H}_2$

8) If 9.65×10^4 C is the charge carried by 1.0 mol of electrons, approximately how much time would it take for a 1.0 A current to release 1.0 mol of hydrogen gas from a solution of HCl ?

- a) 1.9×10^4 s b) 1.0×10^5 s c) 1.9×10^5 s d) 1.9×10^{10} s

9) A Zn/Zn²⁺ || Cu²⁺/Cu electrochemical cell undergoes a mass change of 1.18 g at the zinc electrode when the cell operates for 1.00 hr. What is the average current ?

- a) 0.484 A b) 0.967 A c) 1.45 A d) 1.93 A

10) Of the following metals, which would be the best one to use to make a container in which to store copper(II)sulfate solution ?

- a) Ag b) Fe c) Ni d) Pb

11) How many moles of H₂ gas may be produced by a current of 1.50 A through a 1.00 M HNO₃ solution for 1.00 hr ?

- a) 1.55×10^{-5} b) 2.80×10^{-2} c) 5.60×10^{-2} d) 1.12×10^{-1}

12) A current of 1.00 A passes through an excess of 1.00 M CuSO₄ solution for 2.00 hr. What mass of Cu(s) is deposited ?

13) How many moles of electrons will be required to produce 2 mol of Al(s) when molten AlCl₃ is electrolyzed ?

- a) 1.5 b) 2 c) 3 d) 6

14) What will be produced at the anode during the electrolysis of molten CaBr₂ ?

- a) Br⁻(aq) b) Ca²⁺(aq) c) Ca(s) d) Br₂(g)

15) How much current would be needed to produce 0.0875 mol of cadmium from a solution of $\text{Cd}(\text{NO}_3)_2$ in a time of 4.00×10^3 s ? (the charge on a mole of electrons is 96,500 C)

16) Describe how to plate zinc on to an iron nail using electric current.

Answers : 1) d, 2) c, 3) c, 4) a, 5) 17.1 kg, 6) b, 7) b, 8) c, 9) b, 10) a, 11) b, 12) 2.37 g, 13) d, 14) d, 15) 4.22 A, 16) Immerse an iron electrode and a zinc electrode into a solution of zinc nitrate. Attach the positive terminal of a battery to the zinc and the negative terminal to the iron. Zn will then plate onto the iron.