## Problems of Redox reactions: Electrolysis

**1)** An electrolytic cell has 1400 mL of 0.2172 mol/L iron(II) solution. A current of 7.8 A flows through the cell for 63 minutes to reduce the ion to its metallic form. Calculate:

**a)** Mass of metal obtained at the cathode.

**b)** Molarity of the metallic ion in the solution at the end.

*Data*: 1 Faraday = 96485 C/mol $e^-$.

*Molar mass* (g/mol): Fe = 55.8.

**2)** An aqueous solution of $Cu_2SO_4$ is electrolyzed with a current of 1 A for 5 h 42 min. Calculate:

**a)** Quantity of electric charge needed.

**b)** Mass of metal obtained at the cathode.

*Data*: 1 Faraday = 96485 C/mol $e^-$.

*Molar mass* (g/mol): Cu = 63.5.

**3)** An aqueous solution of $CrSO_4$ is electrolyzed with a constant current for 3 h 48 min. At the cathode, 4.055 g of metallic chromium is obtained. Calculate:

**a)** Quantity of electric charge needed.

**b)** Electric current applied.

*Data*: 1 Faraday = 96485 C/mol $e^-$.

*Molar mass* (g/mol): Cr = 52.

**4)** A current of 500 mA flowed through an aqueous solution of $NiSO_4$ for 2 h 56 min. At the cathode, 1.606 g of metallic nickel were formed. Determine:

**a)** Quantity of electric charge needed.

**b)** Atomic mass of nickel.

*Data*: 1 Faraday = 96485 C/mol $e^-$.

**5)** We want obtain 283.7 g of gold electrolyzing an aqueous solution of gold(I) with a current of 7.4 A. Find out:

**a)** Electric charge needed.

**b)** Quantity of time required.

*Data*: 1 Faraday = 96485 C/mol $e^-$.

*Molar mass* (g/mol): Au = 197.

**6)** An aqueous solution of $NO_3^-$ is electrolyzed for 3 h 12 min with a current of 9.4 A to obtain nitrogen gas. Find out:

**a)** Electric charge required.

**b)** Moles of $N_2$ formed.

**c)** Volume of $N_2$ gas at 0 °C and at a pressure of 1 atm.

*Data*: 1 Faraday = 96485 C/mol $e^-$.

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**7)** An aqueous solution of a metal is electrolyzed with a current of 4 A for 4 h 11 min. At the cathode, 18.32 g of metal were obtained. Find out:

**a)** Electric charge needed.

**b)** Equivalent mass (*equivalent weight*) of the metal.

*Data*: 1 Faraday = 96485 C/mol $e^-$.

**8)** We have a solution of $H_2O$ that is electrolyzed with a current of 6 A. A volume of 5.751 L of oxygen is obtained at 25 °C and 1 atm. Determine:

**a)** Quantity of electric charge needed.

**b)** Moles of $O_2$ formed.

**c)** Quantity of time required.

*Data*: 1 Faraday = 96485 C/mol $e^-$.

**9)** An electrolytic cell of nickel(II) is electrolyzed with a constant current. At the cathode, 49.49 g of metallic nickel is formed. Another electrolytic cell of chromium(III) is connected in series with the first one. Find out:

**a)** Electric charge needed.

**b)** Mass of chromium obtained.

*Data*: 1 Faraday = 96485 C/mol $e^-$.

*Molar masses* (g/mol): Ni = 58.7, Cr = 52.

**10)** A current of 8.3 A flowed through an aqueous solution of $Fe_2(SO_4)_3$ for 7 h 30 min. At the cathode, 43.2 g of metallic iron were formed. Calculate:

**a)** Electric charge required.

**b)** Oxidation state of the metal in the salt.

*Data*: 1 Faraday = 96485 C/mol $e^-$.

*Molar mass* (g/mol): Fe = 55.8.

**Answers:**

**1)** **a)** 8.526 g; **b)** 0.108 mol/L.

**2)** **a)** 20520 C; **b)** 13.5 g.

**3)** **a)** 15050 C; **b)** 1.1 A.

**4)** **a)** 5280 C; **b)** 58.7 u.

**5)** **a)** $1.390\times10^5$ C; **b)** 5 h 13 min.

**6)** **a)** $1.083\times10^5$ C; **b)** 0.1122 mol; **c)** 2.516 L.

**7)** **a)** 60240 C; **b)** 29.35 g/equiv.

**8)** **a)** 90720 C; **b)** 0.2351 mol; **c)** 4 h 12 min.

**9)** **a)** $1.627\times10^5$ C; **b)** 29.23 g.

**10)** **a)** $2.241\times10^5$ C; **b)** +3.