Assignment I: Quantitative Electrochemistry

SCH4UE 05 - 06

1. How many coulombs of charge are required to cause a reduction of 0.200 mol of Cr^{+3} to $Cr_{(s)}$?
(Answer: 5.80×10^4 C)

2. How many coulombs of charge are required to cause a reduction of 0.250 mol of Cu^{+2} to $Cu_{(s)}$?
(Answer: 4.80×10^4 C)

3. How many Faradays are transferred in an electrolytic cell when a current of 2.0 a flows for 12 h ?
(Answer: 0.90 F)

4. A metal object is to be gold plated by an electrolytic procedure using aqueous $AuCl_3$ electrolyte. Calculate the number of mol of Au deposited in 3.0 min by a current of 10 A.
(Answer: 6.2×10^{-3} mol)

5. How many coulombs of electrical charge must pass through an electrolytic cell to reduce 0.44 mol Ca^{+2} ion to calcium metal?
(Answer: 85 000 C)

6. How many coulombs are required to electroplate 35.0 g of chromium by passing an electric current through a solution of $CrCl_{3(aq)}$?
(Answer: 1.95×10^5 C)

7. When a solution of a certain gadolinium salt is electrolysed with a current of 1.0 A for 2.0 h, 0.025 mol of Gd metal form. Calculate the charge of the gadolinium ion.
(Answer: Gd^{+3})

8. An electroplating solution is made up of nickel(II) sulphate. How much time would it take to deposit 0.500 g of metallic nickel on a custom car part using a current of 3.00 A?
(Answer: 9.11 min)

9. (a) Show that 0.0016 mol of oxygen is produced when a current of 1000 a is passed through sulphuric acid solution for 10 minutes.
(b) Calculate the volume of oxygen that should be liberated.
(c) Suggest why the actual volume collected may be less than this.

10. Explain why:
(a) hydrogen and oxygen are evolved when aqueous sodium hydroxide is electrolysed.

(b) when aqueous copper(II) sulphate is electrolysed with platinum electrodes, the cathode becomes plated with copper and oxygen is evolved at the anode.
(c) when aqueous copper (II) sulphate is electrolysed with copper electrodes, the anode dissolve.