Worksheet 19.4

Quantitative electrolysis

1 Calculate the quantity of electricity passed (in coulombs) when:

a a current of 5 A flows for 20 min [1]

b a current of 0.2 A flows for 1 h 30 min [1]

c a current of 0.8 A flows for 15 min. [1]

2 Calculate the quantity of electricity (in coulombs) required to produce each of the following. Show your working and give your answers to 3 significant figures.
[A_r values: Cu = 63.5, Ag = 108; F = 96 500 C]

a 1.8 g of silver at the cathode when aqueous silver nitrate solution is electrolysed using silver electrodes [4]

b 12.7 g of copper at the cathode when aqueous copper(II) sulfate solution is electrolysed using copper electrodes [4]

c 320 cm^3 of oxygen at the anode when aqueous sulfuric acid is electrolysed using platinum electrodes [4]

3 Calculate the theoretical mass (in grams) of element produced at the cathode in each of the following cases. Show your working and give your answers to 3 significant figures.
[A_r values: Al = 27.0, Zn = 65.4, Ag = 108; F = 96 500 C]

a A current of 2.00 A is passed through aqueous silver nitrate for 23 min. What mass of silver is produced? [4]

b A current of 0.500 A is passed through aqueous zinc nitrate for 40 min. What mass of zinc is produced? [4]

c A current of 30 000 A is passed through molten aluminium oxide for 1 h. What mass of aluminium is produced? [4]

4 The Avogadro constant can be calculated from the charge on 1 mole of electrons and the charge on one electron. The charge on 1 mole of electrons can be found by electrolysis.
A solution of copper(II) sulfate was electrolysed using copper electrodes. A current of 0.800 A was passed through the solution of copper(II) sulfate for 42.5 min. The cathode increased in mass by 0.650 g.
[A_r value: Cu = 63.5; charge on one electron = 1.60 10^{-19} C]

a Calculate the charge on 1 mole of electrons from this data. Give your answer to 3 significant figures. [4]

b Use your answer to part **a** to calculate a value for the Avogadro constant. Give your answer to 2 significant figures. [2]