Chemguide – questions

ELECTROLYSING SOLUTIONS

1. In each of the following cases of electrolysis of solutions using inert (carbon or platinum) electrodes, say what would be produced at the cathode and the anode, and give the electrode equations.

   a) potassium sulphate solution:

   product at cathode

   cathode equation

   product at anode

   anode equation

   b) dilute hydrochloric acid (of ordinary lab concentration):

   product at cathode

   cathode equation

   product at anode

   anode equation

   c) very, very dilute hydrochloric acid:

   product at cathode

   cathode equation

   product at anode

   anode equation

   d) lead(II) nitrate solution:

   product at cathode

   cathode equation

   product at anode

   anode equation

e) magnesium bromide solution:

> product at cathode
>
> cathode equation
>
> product at anode
>
> anode equation

f) silver nitrate solution:

> product at cathode
>
> cathode equation
>
> product at anode
>
> anode equation

2. a) If you electrolysed a solution using carbon electrodes, and found that a colourless gas which popped with a lighted splint was given off at the cathode, and a red solution flowed from the anode, what could you say about the nature of the solution?

    b) Sketch a piece of apparatus that you could use to carry out this experiment.

3. You can nickel plate a metal object using another piece of nickel, some nickel sulphate solution, and a dc power source. The E° value for nickel is -0.25 volts (between lead and iron in the electrochemical series).

    a) Would you make the metal object the anode or the cathode in the electrolysis?

    b) Write the equations for the reactions taking place at

    > (i) the anode; (ii) the cathode.

4. Suppose you electrolysed dilute sulphuric acid using inert platinum electrodes. Hydrogen and oxygen are produced, and twice the volume of hydrogen is evolved as oxygen.

    a) Write the cathode and anode equations.

    b) Use those equations to explain why you get twice the volume of hydrogen as oxygen. (Hint: You will have to use Avogadro's law which says that equal volumes of gases at the same temperature and pressure contain equal numbers of molecules.)