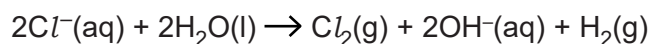


AS Level Chemistry B
H033/02 Chemistry in depth

Question Set 3

- 3** Brine is a concentrated aqueous sodium chloride solution. Chlorine is made by the electrolysis of brine. Sodium hydroxide and hydrogen are co-products.

The equation representing the overall reaction that occurs during this electrolysis is shown below.



- (a) (i)** Calculate the amount (in moles) of NaOH in 0.50 tonne of sodium hydroxide.

amount of NaOH =mol **[1]**

- (ii)** Calculate the mass of chlorine (in tonnes) produced at the same time as 0.50 tonne of sodium hydroxide.

mass =tonnes **[1]**

- (iii)** Calculate the volume (in m³) that this chlorine would occupy at RTP.

volume =m³ **[1]**

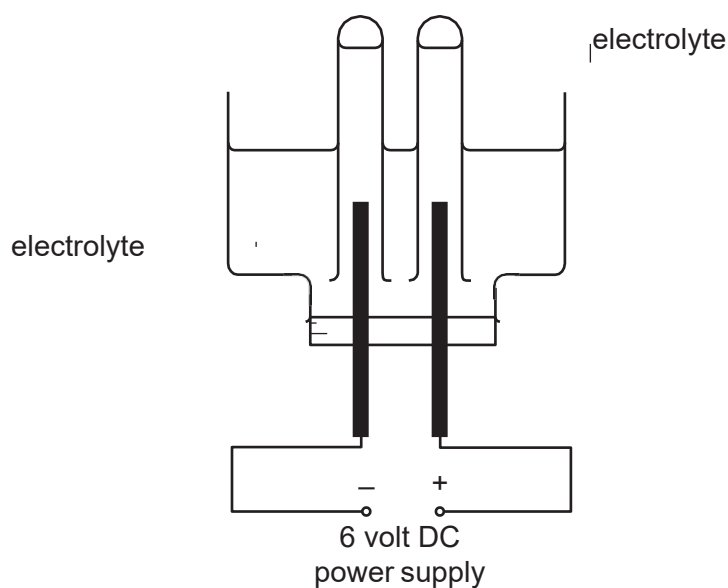
- (b)** Molten sodium chloride is electrolysed instead of an aqueous solution.

What would be the similarity and the difference in the products at the two electrodes?

Similarity

Difference **[1]**

- (c) A student investigates the electrolysis of aqueous solutions of sodium halides in the laboratory using the apparatus shown below.



Describe what would be **observed** at each electrode when the electrolyte is aqueous sodium **iodide**.

- (i) at the anode (positive electrode)
- (ii) at the cathode (negative electrode) [1]
- (d) Write the half-equations involved in the electrolysis of sodium **bromide** solution.
- (i) at the anode (+) [1]
- (ii) at the cathode (-) [1]

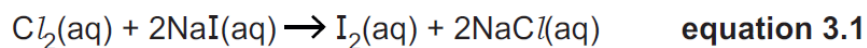
- (e) A student investigates the reactions of aqueous halogen solutions with aqueous solutions of sodium halides.

The student adds 1 cm depth of bromine solution to an equal volume of a sodium halide solution in a test-tube.

A 1 cm depth of cyclohexane is then added, the mixture is shaken and the immiscible liquids allowed to separate. The upper layer is purple.

- (i) What is the colour of the lower layer? [1]
- (ii) Write the **ionic** equation for the reaction between the aqueous solutions of bromine and the sodium halide. [1]

- (f) In a separate test-tube reaction, aqueous solutions of chlorine and sodium iodide are mixed. The equation for the reaction is shown below.



- (i) Write the ionic half-equation for the oxidation reaction. [1]
- (ii) Identify the oxidising agent in the reaction in **equation 3.1**. [1]
- (g) The oxidising strength of the halogens decreases going down the Group. Explain this trend. [3]

Total Marks for Question Set 3: 14



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