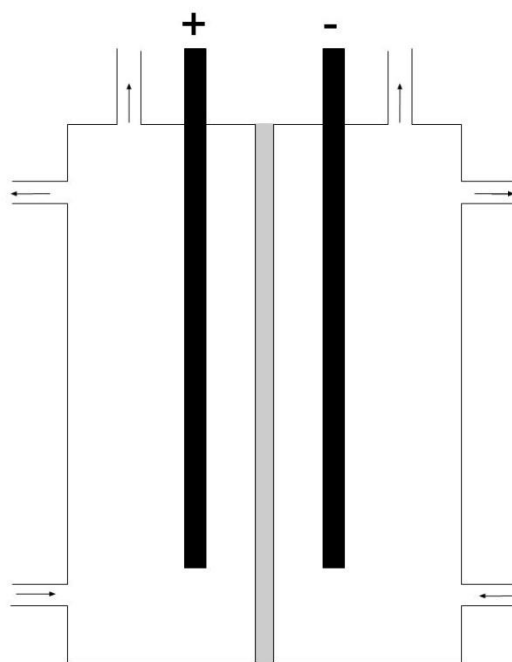


Chemicals from Salt: Questions



1. The diagram shows a membrane cell used for the electrolysis of sodium chloride solution.

(a) Add the following labels to the diagram:

chlorine gas

concentrated sodium chloride solution

concentrated sodium hydroxide solution

dilute sodium chloride solution

dilute sodium hydroxide solution

hydrogen gas

membrane

[7]

(b) Which ions pass through the membrane from left to right?

_____ [1]

(c) Finish the ionic equations for the reactions at the positive and negative electrodes.

Positive electrode $\dots\text{Cl}^- \rightarrow \text{Cl}_2 + \dots\text{e}^-$

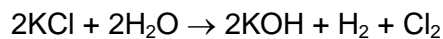
Negative electrode $\dots\text{H}_2\text{O} + 2\text{e}^- \rightarrow \text{H}_2 + \dots\text{OH}^-$ [2]

(d) Suggest why the cost of setting up a mercury cell is greater than setting up a membrane cell.

_____ [1]

2. Potassium hydroxide can be produced by the electrolysis of aqueous potassium chloride solution.

The overall process is summarised by the equation:



- (a) Hydrogen and chlorine are produced in equal volumes.

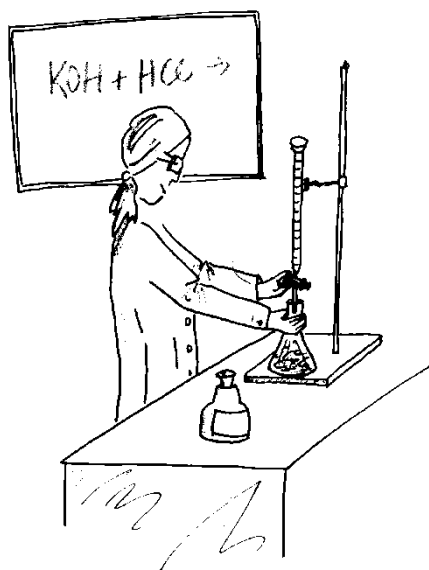
Explain why a much greater mass of chlorine is produced than of hydrogen.
(Relative atomic masses: H = 1, Cl = 35.5)

[2]

- (b) Calculate the mass of potassium chloride required to produce 5.6 tonnes of potassium hydroxide. Assume that all of the potassium chloride is converted into potassium hydroxide. (Relative atomic masses: H = 1, O = 16, Cl = 35.5, K = 39)

tonnes [3]

- (c) This scientist is finding the concentration of a dilute solution of potassium hydroxide in mol/dm³. Describe how they do this experiment, naming the pieces of apparatus they are using. Complete the equation written on the board.



Equation: _____ [6]

3. Salt can be mined from deposits deep underground by solution mining.

(a) Outline the process of solution mining.

[3]

(b) Why is it possible to mine salt but not coal by solution mining?

[1]

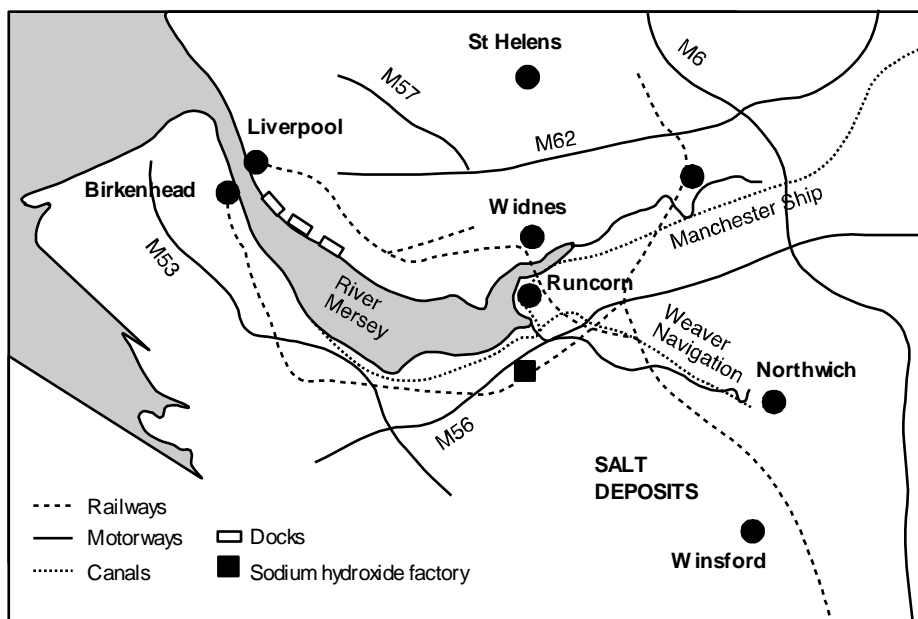
(c) Why is hot water not used in the process?

[2]

(d) Suggest any social, economic or environmental problems caused by solution mining.

[2]

4. The map shows an area in North Cheshire. Electrolysis of brine is carried out in this area.



(a) What are the raw materials and products of this process?

[3]

(b) List reasons why a factory producing sodium hydroxide using membrane cells might be built at the place labelled on this map.

[5]