Chemicals from Salt: Answers

Chlorine gas **+** **−** Hydrogen gas

Dilute sodium chloride

Concentrated sodium hydroxide

Concentrated sodium chloride

Dilute sodium hydroxide

Membrane
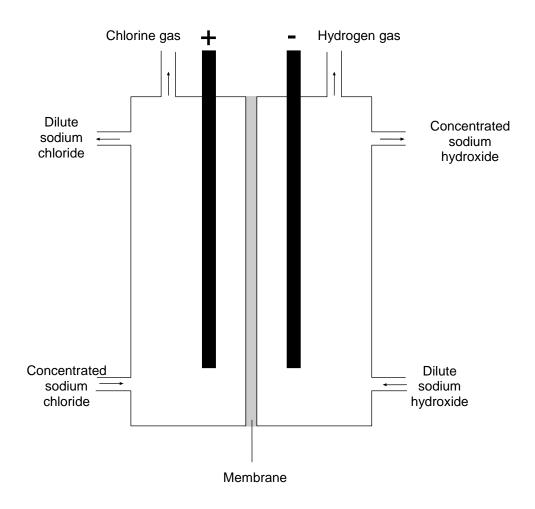
1. (a)   1 mark per correct label   [7]

    (b)   Sodium ions   [1]

    (c) $2Cl^- \rightarrow Cl_2 + 2e^-$ [1]

          $2H_2O + 2e^- \rightarrow H_2 + 2OH^-$ [1]

    (d)   Mercury is expensive   [1]

2. (a)   One mole (formula mass) of hydrogen and one mole (formula mass) of chlorine produced   [1]

          Chlorine atom 35.5 times heavier than hydrogen atom   [1]

    (b)   Two moles (formula masses) KCl produce 2 moles (formula masses) KOH   [1]

          149 tonnes $\rightarrow$ 112 tonnes   [1]

          Mass of potassium chloride = $\dfrac{149 \times 5.6}{112}$ = 7.45 tonnes   [1]

(c)   Named apparatus – burette, pipette

Measure out 25 cm^3 of potassium hydroxide solution

Add named indicator

Add hydrochloric acid in small portions

Until indicator changes colour

Repeat until consistent results

Mark any five of the above points [5]

KOH + HCl $\rightarrow$ KCl + H$_2$O [1]

3.   (a)   Hole drilled down to salt deposits [1]

Cold water pumped down to deposits [1]

Salt dissolves and salt solution is pumped to the surface [1]

(b)   Salt dissolves in water, coal does not [1]

(c)   Salt has almost the same solubility at all temperatures [1]

Extra costs of heating the water cannot be recovered [1]

(d)   Any possible problem – eg subsidence caused by salt being removed underground [1]

4.   (a)   Salt (sodium chloride) and water or brine [1]

Sodium hydroxide, hydrogen and chlorine [2]

Two marks for three products and one mark for one or two

(b)   Salt is available close to the site

Brine can be delivered to the factory by pipeline

Close to other chemical factories which might use the products

Specific mention of use of one of the products

Ports close to factory for exporting products

Other good distribution systems – eg road, rail and canal

Suitable labour force in the area

Mark any five of the above points or alternatives [5]