8. Metals can be extracted from their compounds by different methods.

(a) The extraction of tin from tin(IV) oxide, SnO_2, by heating with carbon has been investigated in a series of experiments.

(i) In one experiment the effect of temperature on the percentage yield of tin was investigated.

$SnO_2(s)$	+	$C(s)$	$\rightarrow$	$Sn(\ell)$	+	$CO_2(g)$
$GFM =$ 150.7 g				$GFM =$ 118.7 g		

At 850 °C, the percentage yield of tin is 64%.

Calculate the mass of tin oxide required, in g, to produce a mass of 100 g of tin at this temperature. **2**

(ii) In a second experiment, 25.2 g of tin(IV) oxide reacted with 3.0 g of carbon.

$SnO_2(s)$	+	$C(s)$	$\rightarrow$	$Sn(\ell)$	+	$CO_2(g)$
$GFM =$ 150.7 g		$GFM =$ 12.0 g				

Name the reactant in excess **and** calculate the number of moles of this reactant left unreacted. **2**

8. (a) (continued)

(iii) In a third experiment, 26.5 litres of carbon dioxide was produced.

$$SnO_2(s) + C(s) \rightarrow Sn(\ell) + CO_2(g)$$

Calculate the mass of tin(IV) oxide ($GFM = 150.7$ g) that reacted. **2**

Take the volume of one mole of carbon dioxide gas to be 80 litres.

[Turn over

MARKS

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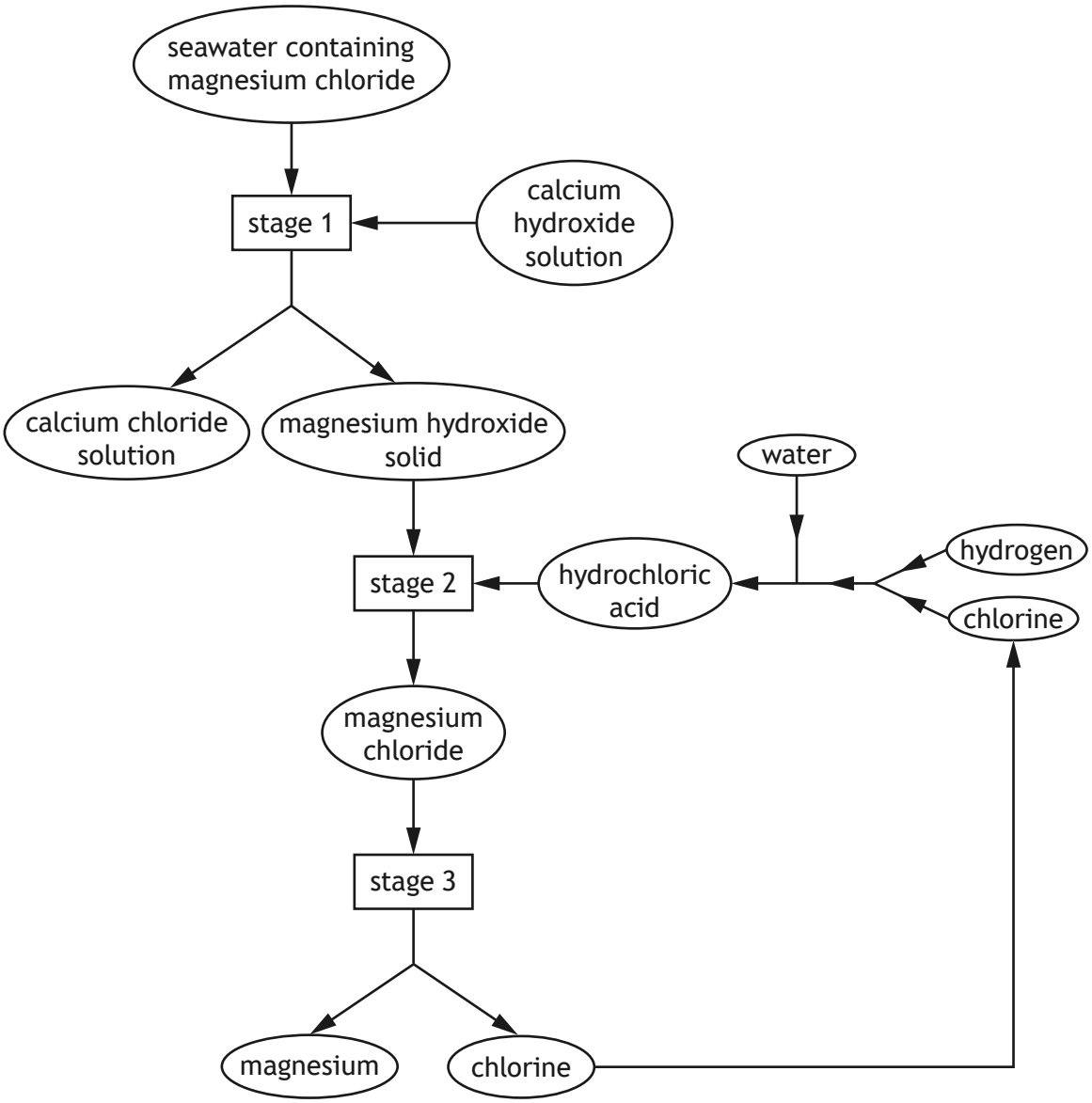
(b) Magnesium metal can be extracted from magnesium chloride present in seawater, as shown in the flow diagram.



(i) Suggest how the magnesium hydroxide and calcium chloride produced in stage 1 can be separated. **1**

(ii) Chlorine produced in stage 3 is recycled back into stage 2.

From the flow diagram, suggest another way that profit is maximised. **1**