

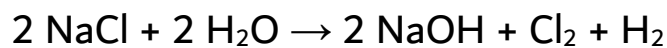
# MARK SCHEME

## **GCSE** CHEMISTRY

---

### Percentage Yield

1. Chlorine can be made by the electrolysis of sodium chloride solution.



- a) Calculate the mass of chlorine that can be formed from 50.0 g of sodium chloride.

$$\text{moles NaCl} = 50.0 / 58.5 = 0.855 \text{ mol}$$

$$\text{moles Cl}_2 = 0.855 / 2 = 0.427 \text{ mol}$$

$$\text{mass Cl}_2 = 71 \times 0.427 = 30.3 \text{ g}$$

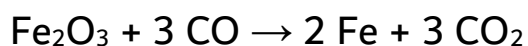
Answer: 30.3 g

- b) 25.0 g of chlorine was formed in this reaction. Calculate the percentage yield.

$$\% \text{ yield} = 25.0 / 30.3 \times 100 = 82.4\%$$

Answer: 82.4%

2. Iron is made by reduction of iron oxide with carbon monoxide.



a) Calculate the mass of iron that can be formed from 126 g of iron oxide.

$$\text{moles Fe}_2\text{O}_3 = 126/160 = 0.7875 \text{ mol}$$

$$\text{moles Fe} = 0.7875 \times 2 = 1.575 \text{ mol}$$

$$\text{mass Fe} = 56 \times 1.575 = 88.2 \text{ g}$$

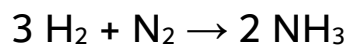
Answer: 88.2 g

b) 78.5 g of iron was formed in this reaction. Calculate the percentage yield.

$$\% \text{ yield} = 78.5/88.2 \times 100 = 89.0\%$$

Answer: 89.0%

3. Ammonia is made by reacting hydrogen with nitrogen.



a) Calculate the mass of ammonia that can be formed from 12.0 g of hydrogen.

$$\text{moles H}_2 = 12.0/2 = 6.00 \text{ mol}$$

$$\text{moles NH}_3 = 6.00 \times 2/3 = 4.00 \text{ mol}$$

$$\text{mass NH}_3 = 17 \times 4.0 = 68.0 \text{ g}$$

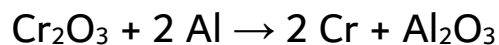
Answer: 68.0 g

b) 20.3 g of ammonia was formed in this reaction. Calculate the percentage yield.

$$\% \text{ yield} = 20.3/68.0 \times 100 = 29.9\%$$

Answer: 29.9%

4. Chromium is a useful metal. It is extracted from chromium oxide by reaction with aluminium.



- a) Calculate the mass of chromium that can be formed from 1.25 kg of chromium oxide.

$$\text{moles Cr}_2\text{O}_3 = 1250/152 = 8.22 \text{ mol}$$

$$\text{moles Cr} = 8.22 \times 2 = 16.4 \text{ mol}$$

$$\text{mass Cr} = 52 \times 16.4 = 855 \text{ g}$$

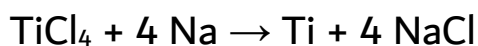
Answer: 855 g

- b) 756 g of chromium was formed in this reaction. Calculate the percentage yield.

$$\% \text{ yield} = 756/855 \times 100 = 88.4\%$$

Answer: 88.4%

5. Titanium is made by the reaction of titanium chloride with sodium.



a) Calculate the mass of titanium that can be formed from 10.0 kg of titanium chloride.

$$\text{moles TiCl}_4 = 10000/190 = 52.6 \text{ mol}$$

$$\text{moles Ti} = 52.6 \text{ mol}$$

$$\text{mass Ti} = 48 \times 52.6 = 2526 \text{ g}$$

Answer: 2526 g

b) 1950 g of titanium was formed in this reaction. Calculate the percentage yield.

$$\% \text{ yield} = 1950/2526 \times 100 = 77.2\%$$

Answer: 77.2%