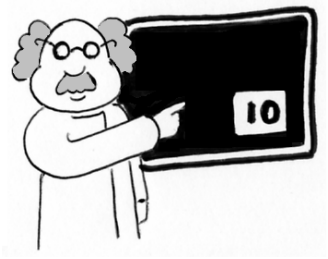

STARTER FOR 10...

1.1.4. Moles summary

Mark the student's answers to the questions below (shown to the right). Mark all 10 correctly to get the full 10 marks.

1. Magnesium reacts with acid as shown; $Mg + 2\,HCl \rightarrow MgCl_2 + H_2$

(a) How many moles of Mg reacts with 1 mole of HCl — 1 mole

(b) How many moles of Mg must be reacted to produce 1 mole of H_2 — 1 mole

2. Potassium reacts with water to produce potassium hydroxide and hydrogen gas.

(a) Write a balanced equation for the reaction — $K + 2\,H_2O \rightarrow K(OH)_2 + H_2$

(b) How many moles of potassium must be reacted with an excess of water to produce 0.075 moles of potassium hydroxide? — 0.075 moles

3. The dehydration of hydrated copper sulphate is a reversible reaction;

$$CuSO_4.5H_20 \rightleftharpoons CuSO_4 + 5\,H_2O$$

(a) What mass water is produced when 0.25 moles of hydrated copper sulphate is heated? — 22.5 g

(b) What mass of hydrated copper sulphate must be heated to produce 18 g of H_2O? — 249.6 g

4. The equation for the complete combustion of methane is; $CH_4 + 2\,O_2 \rightarrow CO_2 + 2\,H_2O$

(a) How many moles of carbon dioxide would be produced by the complete combustion of 8 g of CH_4? — 0.5 moles

(b) What mass of oxygen is needed for the complete combustion of 32 g of methane? — 64 g

5. In an acid / base titration between ethanoic acid and sodium hydroxide the equation for the reaction is;

$$CH_3COOH + NaOH \rightarrow CH_3COO^-Na^+ + H_2O$$

(a) How many moles of NaOH is needed to neutralise 50 cm^3 of 0.1 mol dm^{-3} CH_3COOH?

5×10^{-3} moles

(b) What volume of 0.1 mol dm^{-3} ethanoic acid is needed to neutralise 75 cm^3 of 0.125 mol dm^{-3} NaOH?

93.8 cm^3

1.1.4. Moles summary

1. (a) 1 mole × (correct answer, 0.5 moles)

(b) 1 mole ✓

2. (a) $K + 2 H_2O \rightarrow K(OH)_2 + H_2$ × (correct answer; $2 K + 2 H_2O \rightarrow 2 KOH + H_2$)

(b) 0.075 moles ✓

3. (a) 22.5 g ✓

(b) 249.6 g × (correct answer; 49.9 g)

4. (a) 0.5 moles ✓

(b) 64 g × (correct answer; 128 g)

5. (a) 5×10^{-3} moles ✓

(b) 93.8 cm^3 ✓

1.2 The ideal gas equation

Hydrogen; 5 moles, 54 K

Methane; 0.625 moles, 0.025 m^3

Helium; 2.5 moles, 3,745 kPa

Carbon dioxide; 0.227 moles, 4.27×10^{-3} m^3

Chlorine; 0.141 moles, 2387 °C

1.3 Molar gas volume

Syringe A links with **syringe H**; no. of moles = 4.7×10^{-3} moles

Syringe B links with **syringe I**; no. of moles = 0.25 moles

Syringe C links with **syringe F**; no. of moles = 2.8×10^{-3} moles

Syringe D links with **syringe G**; no. of moles = 3.8×10^{-3} moles

Syringe E links with **syringe J**; no. of moles = 5.5×10^{-3} moles

1.4 Empirical and molecular formulae

Amino acid A has an empirical formula of $C_5H_{10}N_2O_3$ and is therefore **glutamic acid**

Amino acid B has an empirical formula of C_3H_7NO and is therefore **lysine**

Amino acid C has an empirical formula of $C_4H_8N_2O_3$ and is therefore **aspartic acid**

Amino acid D has an empirical formula of $C_4H_9NO_3$ and is therefore **threonine**

Amino acid E has an empirical formula of $C_3H_7NO_2$ and is therefore **alanine**