



# Quantitative Chemistry

## Multiple Choice Questions

### Set 3 (Chemistry Only)

Tick **one** box.

- The balanced symbol equation for the reaction between sodium and chlorine is  $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$ . What mass of sodium chloride is produced when 42.6g of chlorine reacts with sodium?  
Relative atomic masses ( $A_r$ ): Na = 23, Cl = 35.5
  - 35.1g
  - 42.0g
  - 70.2g
  - 195g
- The percentage yield of a reaction that produces 22.0g of product is 80%. What is the maximum theoretical mass of product?
  - 4.4g
  - 17.6g
  - 26.4g
  - 27.5g
- Which of the following is **not** a reason why the actual yield of a reaction may be less than the expected yield?
  - some atoms are destroyed during the reaction process
  - the reaction may not go to completion because it is reversible
  - some of the product may be lost when it is separated from the reaction mixture
  - some of the reactants may react in ways different to the expected reaction
- The balanced symbol equation for the reaction between methane and water is  $\text{CH}_4 + \text{H}_2\text{O} \rightarrow \text{CO} + 3\text{H}_2$ . What is the atom economy of this reaction to produce hydrogen?  
Relative formula masses ( $M_r$ ):  $\text{CH}_4 = 16$ ,  $\text{H}_2\text{O} = 18$ ,  $\text{CO} = 28$ ,  $\text{H}_2 = 2$ 
  - 5.9%
  - 17.6%
  - 33.3%
  - 82.4%



5.  $500\text{cm}^3$  of a solution contains 5 moles of solute. What is the concentration of the solution?
- A.  $0.01\text{mol/dm}^3$
- B.  $1\text{mol/dm}^3$
- C.  $10\text{mol/dm}^3$
- D.  $100\text{mol/dm}^3$
6. What will happen to the concentration of a solution if the mass of solute is doubled?
- A. the concentration will double
- B. the concentration will triple
- C. the concentration will stay the same
- D. the concentration will halve
7. A solution of copper sulfate ( $\text{CuSO}_4$ ) has a concentration of  $0.15\text{mol/dm}^3$ . What mass of copper sulfate is dissolved in  $0.2\text{dm}^3$  of the solution?  
Relative formula mass ( $M_r$ ):  $\text{CuSO}_4 = 159.5$
- A.  $0.03\text{g}$
- B.  $0.75\text{g}$
- C.  $4.79\text{g}$
- D.  $31.9\text{g}$
8.  $25\text{cm}^3$  of hydrochloric acid (HCl) is needed to neutralise  $30\text{cm}^3$  of  $0.20\text{mol/dm}^3$  sodium hydroxide (NaOH). The balanced symbol equation for the reaction is  
 $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ .  
What is the concentration of the hydrochloric acid?
- A.  $0.15\text{mol/dm}^3$
- B.  $0.20\text{mol/dm}^3$
- C.  $0.24\text{mol/dm}^3$
- D.  $0.30\text{mol/dm}^3$
9. What is the volume of one mole of any gas at room temperature and pressure?
- A.  $1\text{dm}^3$
- B.  $20\text{dm}^3$
- C.  $24\text{dm}^3$
- D.  $100\text{dm}^3$



10. What is the volume of 264g of carbon dioxide (CO<sub>2</sub>) at room temperature and pressure?

Relative atomic masses (A<sub>r</sub>): C = 12, O = 16

A. 120dm<sup>3</sup>

B. 144dm<sup>3</sup>

C. 264dm<sup>3</sup>

D. 600cm<sup>3</sup>

### Bonus Challenge Question

The balanced symbol equation for the reaction between sodium hydrogen carbonate and sulfuric acid is  $2\text{NaHCO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{CO}_2 + 2\text{H}_2\text{O}$ . What mass of sodium hydrogen carbonate (NaHCO<sub>3</sub>) is needed to react with an excess of sulfuric acid to produce 10.65g of sodium sulfate (Na<sub>2</sub>SO<sub>4</sub>)?

Relative atomic masses (A<sub>r</sub>): Na = 23, H = 1, C = 12, O = 16, S = 32

A. 5.6g

B. 8.45g

C. 10.65g

D. 12.6g