Your notes

KS3 Science: revision notes

C3.2 Introduction to quantitative chemistry

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Relative formula mass

- The **relative atomic mass** (Ar) of each element is on the periodic table: H = 1, C = 12, N = 14, O = 16, Na = 23, Mg = 24, Cl = 35.5, Ca = 40.
- The **relative formula mass** (Mr) of a compound is the sum of the Ar values of all the atoms in its formula.
- H_2O: (2 × 1) + 16 = 18. CO_2: 12 + (2 × 16) = 44. $CaCO_3$: 40 + 12 + (3 × 16) = 100.

Percentage by mass

- **Percentage by mass** of an element = (Ar × number of atoms of that element) ÷ Mr × 100.
- Calcium in calcium carbonate (Mr 100): 40 ÷ 100 × 100 = 40%.
- Oxygen in magnesium oxide (Mr 40): 16 ÷ 40 × 100 = 40%.

Conservation of mass and balanced equations

- In a **balanced equation**, the total Mr of the reactants equals the total Mr of the products, because atoms are only rearranged.
- $2H_2 + O_2 \rightarrow 2H_2O$: 4 + 32 = 36, and 2 × 18 = 36.
- $Mg + 2HCl \rightarrow MgCl_2 + H_2$ is balanced: 1 magnesium, 2 hydrogen and 2 chlorine atoms on each side.

Concentration, uncertainty and salts

- **Concentration** (g/dm³) = mass of **solute** (g) ÷ volume of solution (dm³). 1 dm³ = 1000 cm³, so divide volumes in cm³ by 1000.
- 10 g of salt in 0.5 dm³ of solution has a **concentration** of 10 ÷ 0.5 = 20 g/dm³.

- Repeat readings show how uncertain a result is: **uncertainty** = ± half the range. Readings of 20.1 s, 20.5 s and 20.3 s have a mean of 20.3 s and an **uncertainty** of ±0.2 s.
- **Soluble salts** are made by adding an **excess** of an insoluble metal oxide or carbonate to an acid, filtering off the extra solid, then crystallising the solution.
- All sodium, potassium and ammonium salts, and all nitrates, are soluble. Most chlorides are soluble, but silver chloride isn't. Most carbonates are insoluble.

Your notes

Key terms

Relative atomic mass	The mass of an atom compared with an atom of carbon-12 (Ar).
Relative formula mass	The sum of the relative atomic masses of all the atoms in a formula (Mr).
Percentage by mass	The percentage of a compound's mass that comes from one element.
Conservation of mass	The total mass of the products equals the total mass of the reactants.
Balanced equation	A symbol equation with the same number of each atom on both sides.
Concentration	The mass of solute in a certain volume of solution.
Solute	The substance that dissolves.
Uncertainty	How much a measured value could vary: plus or minus half the range.
Soluble salt	A salt that dissolves in water.
Excess	More than is needed to react completely.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. What is the relative formula mass (Mr) of water, H_2O? (Ar: H = 1, O = 16)
2. What is the Mr of carbon dioxide, CO_2? (Ar: C = 12, O = 16)
3. What is the Mr of calcium carbonate, $CaCO_3$? (Ar: Ca = 40, C = 12, O = 16)
4. What is the percentage by mass of calcium in calcium carbonate (Mr = 100, Ar of Ca = 40)?
5. What is concentration?
6. How many cm^3 are there in 1 dm^3?
7. 10 g of salt is dissolved to make 0.5 dm^3 of solution. What is the concentration?
8. 3 g of copper sulfate is dissolved to make 250 cm^3 of solution. What is the concentration in g/dm^3?

Answers

1. 18
2. 44
3. 100
4. 40%
5. The mass of solute in a certain volume of solution
6. 1000
7. 20 g/dm^3
8. 12 g/dm^3

What to do next

Practise 14 questions on this topic

Try 4 exam questions, with mark schemes

Read the lesson, one step at a time

Free revision for GCSE and KS3 at lycolearn.co.uk. Some notes are for one exam board only, and say so in brackets.

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