C4: Chemical Calculations: Trilogy Specification: Foundation

Conservation of Mass

The law of conservation of mass says that no atoms are lost or made during a chemical reaction. This means that the mass of the products equals the mass of the reactants.

Relative Formula Mass

The relative formula mass is represented by the symbol M_r. RFM is the sum of the relative atomic masses of the atoms in the formula. In a balanced chemical equation, the total of the relative formula masses of the reactants equals the total of the relative formula masses of the products in the quantities shown.

Mass Changes when Products or Reactants are Gases

Some reactions may appear to have a change in mass but this can is because a reactant or product is a gas and its mass has not been taken into account. For example if a gas is made in a chemical reaction and escapes into the atmosphere the mass will appear to decrease.

Concentration of Solutions

Lots of chemical reactions take place in solutions. The concentration of a solution is measured in mass per given volume of solution and so the units are g/dm^3.

Using Concentrations of Solutions

To calculate concentration you:

1. Identify if the volume you have been given is in cm^3 or dm^3
2. Write in the formula.
3. Substitute numbers.
4. Do the working out.
5. Round to appropriate number of s.f
6. Add units.

For example: 25g of sodium chloride is dissolved into $200cm^3$ of water. Calculate the concentration.

Concentration (g/dm^3) = (mass of solute (g) / volume of solution (cm^3)) x 1000

= (25/ 200) x 1000

= 0.125 x 1000

= $125g/dm^3$

Relative Formula Mass

To calculate RFM of a substance you:

1. Identify the different types of atoms.
2. Identify how many of these atoms you have.
3. Identify the atomic mass for each of these atoms.
4. Multiply the atomic mass for each atom by the number of atoms.
5. Add the totals together.

For example: RFM of C_2H_6

C x 2 = 12 x 2 = 24

H x 6 = 1 x 6 = 6

RFM = 30

Using Concentrations of Solutions

The concentration of a solution is measured in mol/dm^3. The amount in moles of solute or its mass in grams in a given volume of solution can be calculated from its concentration. If the volumes of two solutions that react completely are known and the concentration of one solution is known, the concentration of the other solution can be calculated.

To find the concentration of a substance use the formulas:

Concentration (g/dm^3) = mass of solute (g) / volume of solution (dm^3)

Concentration (g/dm^3) = (mass of solute (g) / volume of solution (cm^3)) x 1000