

# WJEC (Wales) Chemistry GCSE

## 1.1 - The Nature of Substances and Chemical Reactions Flashcards

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# What is an element?



# What is an element?

An element is a substance made up of a single type of atom - These substances cannot be broken down into any simpler substance



# What is a compound?



# What is a compound?

A substance made from two or more elements that are chemically joined -  
They have completely different properties to its constituent elements



How are elements and simple molecules represented using chemical formulae?



# How are elements and simple molecules represented using chemical formulae?

Use chemical symbols to state the number and type of each atom present

E.g.  $O_2$  represents the element oxygen made up of 2 atoms of oxygen

E.g.  $H_2O$  represents a molecule with 2 atoms of hydrogen and 1 atom of oxygen



How can you represent simple molecules using a diagram and key?

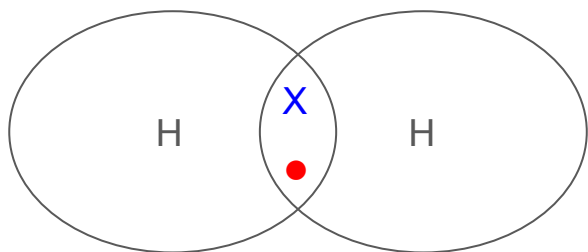




# How can you represent simple molecules using a diagram and key?

Create a dot and cross diagram to model the bonding in simple molecules

E.g. Hydrogen molecule forms when a hydrogen atom shares its outer electron with another hydrogen atom



Key

- Outer shell of each atom is drawn as a circle
- Circles overlap where there is a covalent bond
- Electrons from one atom are drawn as dots, and electrons from another atom as crosses



How can you determine the formulae of ionic compounds given the number of the ions they contain?



# How can you determine the formulae of ionic compounds given the number of the ions they contain?

The overall charge of a compound is zero, so the number of positively and negatively charged ions must be balanced so there is no net charge

E.g. Magnesium forms a 2+ ion and Chlorine forms a 1- ion

So for every Magnesium ion there must be two Chlorine ions to give the ionic compound an overall charge of zero

This gives the chemical formula  $\text{MgCl}_2$



# What is relative atomic mass?



# What is relative atomic mass?

The average mass value which takes the mass and abundance of isotopes of an element into account, on a scale where the mass of  $^{12}\text{C}$  is 12.



# What is relative formula mass?



# What is relative formula mass?

The addition of all the relative atomic mass values for all the atoms in the formula

The relative formula mass of a substance is called one mole of that substance



What is the percentage composition of a compound?





# What is the percentage composition of a compound?

Divide the relative atomic mass of each element by the total relative formula mass of the whole compound, then multiply by 100



What are the methods by which mixtures can be separated (there are 4)? Do these involve chemical reactions?



What are the methods by which mixtures can be separated (there are 4)? Do these involve chemical reactions?

Filtration, evaporation, chromatography, distillation

They do not involve chemical reactions as the atoms/molecules in mixtures are not chemically joined



# What is chromatographic data analysis?



# What is chromatographic data analysis?

Analytical technique separating compounds by their relative speeds in a solvent as it spreads through the paper - The more soluble a substance is, the further up the paper it travels

Compounds in a mixture separate into different spots but a pure mixture will produce a single spot in all solvents



# What are R<sub>f</sub> values?



# What are R<sub>f</sub> values?

R<sub>f</sub> value = distance moved by substance ÷ distance moved by solvent



# What is a chemical reaction?





# What is a chemical reaction?

A process by which atoms in the reactants are rearranged to form products

The number and type of each atom present in the reactants will also be present in the products - this is why chemical equations must be balanced



What are the observations that show a reaction has taken place?



# What are the observations that show a reaction has taken place?

Colour changes

Effervescence - occurs when a gas is released and fizzing is seen

Temperature changes - exothermic reactions give off heat to the surroundings (causing an increase in temperature) whereas endothermic reactions take in heat from the surroundings (causing a decrease in temperature)



How can you represent chemical reactions using word equations?



# How can you represent chemical reactions using word equations?

Word equations use the chemical names instead of formulas to show the reaction

E.g. methane + oxygen  $\longrightarrow$  carbon dioxide + water



How can you represent chemical reactions using chemical equations?



# How can you represent chemical reactions using chemical equations?

Chemical equations use the chemical formulas and show the ratio of molecules reacting - total relative mass of reactants and products is equal

E.g.  $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$  (shows combustion of methane)



What is the percentage yield of a chemical reaction?





# What is the percentage yield of a chemical reaction?

$$\text{Percentage yield} = \frac{\text{mass of product produced}}{\text{Theoretical maximum mass of product possible}} \times 100$$



How can you calculate the empirical formula from reacting mass data?



# How can you calculate the empirical formula from reacting mass data?

Calculate the number of moles = mass (in grams)  $\div$  relative atomic mass

The ratio is calculated by dividing each number of moles by the lowest number of moles present

Multiply the ratio so there are no decimals. This gives the empirical formula



How can you calculate the masses of reactants or products from a balanced chemical equation?



# How can you calculate the masses of reactants or products from a balanced chemical equation?

Calculate the number of moles = mass (in grams)  $\div$  relative atomic mass

Multiply the moles by the ratios given by the balanced chemical equation

Now calculate the mass of a reactant or product using the equation above but rearranged: mass (in grams) = relative atomic mass  $\times$  moles



# What is the Avogadro constant?



# What is the Avogadro constant?

The number of atoms/ions/molecules that make up 1 mole of a substance  
- this number is called the Avogadro constant and is  $6.02 \times 10^{23}$



How can you convert amount of substance (in grams) to moles?





# How can you convert amount of substance (in grams) to moles?

Number of moles = mass of particle (in grams)  $\div$  relative atomic mass of particle



How can you convert moles to amount  
substance (in grams)?



# How can you convert moles to amount of substance in grams?

Mass of particle (in grams) = number of moles x relative atomic mass of particle

