Amounts of substance Knowledge organiser

Vocabulary

Relative Atomic Mass: (Ar)	Average mass of an atom / $^{1}/_{12}$ th Carbon 12
Relative Molecular Mass: (Mr)	Average mass of a molecule / $^{1}/_{12}$ th Carbon 12
Relative Isotopic Mass:	Average mass of an isotope / $^{1}/_{12}$ th Carbon 12
Avogadro's constant	The number of particles that make up 1 mole of a substance.
Mole	The unit the amount of a substance is measured in. The number of particles need to make 12.00g of Carbon-12
Concentration	The amount of particles in a fixed volume. Measured in moles per litre (Mol dm^{-3})
Ideal gas	Idea gases are any gas which behaves in accordance with the ideal gas equation. It does not matter what substances are in the gas.
Empirical formula	Simplest whole number ratio of the elements in a compound
Molecular formula	The actual ratio of elements in a specific compound. Should add up to the Mr.
Balanced full equation	A balanced chemical equation showing all atoms and their relative amounts and states
Ionic equation	An equation which only shows the species which change during a chemical reaction
Spectator ions	The ions omitted from an ionic equations because they are not involved
Atom economy	Mr desired product x100 / Mr of all reactants

Calculating moles

Mass = Mr x moles

Mass	g
Mr	g $mole^{-1}$
moles	moles

Calculating concentration

Concentration = moles/Volume

Concentration	Mol dm^{-3}
moles	moles
Volume	dm^3

Ideal gas equation

pV = nRT

p	Pressure	Pa (pascals)	1 atm = $1x10^5$ pa
V	Volume	m^3	$1m^3 = 1x10^6$ cm^3
n	No. of moles	Moles	
R	Boyles gas const.	J/mol K.	8.314
T	Temperature	K (kelvin)	T °C + 273

Method for calculations

1. Calculate the number of moles of the know substance
2. Identify the moles of the unknown using the molar ratio
3. Use the number of moles for the final calculation

$$\text{atom economy} = \frac{\text{mass of required product}}{\text{total mass of reactants}} \times 100$$

Note: *Don't forget to use any associated balancing numbers.*

$$\text{percentage yield} = \frac{\text{mass of product obtained}}{\text{maximum theoretical mass}} \times 100$$

Note: *Often the theoretical mass is not given directly in the question and will need to be calculated.*