RAFFLES INSTITUTION RAFFLES PROGRAMME - YEAR THREE CHEMISTRY

STOICHIOMETRY AND MOLE CONCEPT

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Moles are a quantity that helps count particles atoms, molecules and ions.
Mol is the unit for the number of moles.

1) No. of particles = No. of moles (mol) X (6 X 10^23) (Avogrado's Number)
2) Mass of sample (g) = No. of moles (mol) X Molar Mass (g/mol)
3) 1 mol of gas at rtp = 24 dm3 = 24,000 cm3

Empirical Formula – The simplest whole number ratio of the atoms or ions present in the compound.
[Must have table]

Assuming 100g mass / Mass of sample
Ar (Relative Atomic Mass)
Amount (in mol)
Divide by smallest no. of mol
Simplest ratio

Molecular Formula – The actual composition of a compound composed of molecules.
[Must have table]

Mr of empirical formula
Mr of compound
Mr of compound is _____ times Mr of empirical formula
Therefore, molecular formula of compound is _____

Calculations involving Mass

Convert any given mass (g) to amount (mol)
Read the theoretical mole ratio from the balanced equation
Use simple proportion to find the amount of result (mol)
Convert result in mol to mass(g)

Excess/Limiting Reactant (Identifiable when masses/amounts of all reactants are given)
[May not explicitly ask for, be careful and look out for ways this can be disguised.]

Find the amount of each reactant (mol)
Compare the mole ratio to the ratio of amounts
Determine the excess and limiting reactant
Use mole ratio to find out how much product is formed (mol) in comparison to amount of limiting reactant
Find mass of product formed based on Mr.

Percentage Purity (reactant) and Percentage Yield (product)

[May not explicitly ask for, be careful and look out for ways this can be disguised.]

Find the amount of product formed (mol)
Find the amount of reactant reacted (mol) using mole ratio
Find the mass of reactant (g) reacted using Mr
Percentage Purity = 100% X Mass of reactant reacted / Mass of reactant given

Find the amount of reactant reacted (mol)
Find the amount of product expected to form (mol)
Find the mass of product expected to form (g) using Mr
Percentage Yield = 100% X Mass of product produced / Mass of product expected

Molecular Mass and Rate of Diffusion

1. Gases undergo effusion, that is they can pass through very small openings. (a kind of diffusion)
2. The rate of escape depends on the gas
3. A denser gas diffuses slower than a less dense gas
4. the gas with the larger relative molecular mass has a slower rate of diffusion

Volumetric Analysis (VA)

1. The solution of known concentration is called a standard solution.
2. Equivalence point of a titration occurs when the acid is fully neutralised by the added base; it indicates that the complete reaction of the two reagents.
3. End point is where the indicator changes color. For acid-base titration, the indicator should have an end point which coincides with the equivalence point of the titration.

To calculate (All measurements given in 3sf)

1. Write the balanced equation for the reaction
2. Calculate the amount of the standard solution used in the experiment
3. Determine the amount of the unknown solution that must have reacted (by comparing mole ratio)
4. Calculate the concentration (in $moldm^{-3}$) of the unknown solution by taking the amount in moles divided by the volume in dm3.