Subject	Year	Term
Chemistry	12	1

Topic

2.1.1, 2.1.3, 2.1.4 Atoms and reactions.

Content (Intent)

Prior Learning (Topic) 11C1 structure and bonding, 11C3 Acids, neutralisation and calculations

Atomic structure and isotopes

(a) isotopes as atoms of the same element with different numbers of neutrons and different masses

(b) atomic structure in terms of the numbers of protons, neutrons and electrons for atoms and ions, given the atomic number, mass number and any ionic charge

Relative mass

(c) explanation of the terms relative isotopic mass (mass compared with 1/12th mass of carbon-12) and relative atomic mass (weighted mean mass compared with 1/12th mass of carbon-12), based on the mass of a 12C atom, the standard for atomic masses

(d) use of mass spectrometry in:

  (i) the determination of relative isotopic masses and relative abundances of the isotope,

  (ii) calculation of the relative atomic mass of an element from the relative abundances of its isotopes

(e) use of the terms relative molecular mass, Mr, and relative formula mass and their calculation from relative atomic masses.

The mole

(a) explanation and use of the terms:

  (i) amount of substance

  (ii) mole (symbol 'mol'), as the unit for amount of substance

  (iii) the Avogadro constant, NA (the number of particles per mole, 6.02×10^{23} mol^{-1})

  (iv) molar mass (mass per mole, units g mol^{-1}),

  (v) molar gas volume (gas volume per mole, units dm^3 mol^{-1})

Determination of formulae

(b) use of the terms:

  (i) empirical formula (the simplest whole number ratio of atoms of each element present in a compound)

  (ii) molecular formula (the number and type of atoms of each element in a molecule)

(c) calculations of empirical and molecular formulae, from composition by mass or percentage compositions by mass and relative molecular mass

(d) the terms anhydrous, hydrated and water of crystallisation and calculation of the formula of a hydrated salt from given percentage composition, mass composition or based on experimental results

Calculation of reacting masses, gas volumes and mole concentrations

(e) calculations, using amount of substance in mol, involving:

  (i) mass

  (ii) gas volume

  (iii) solution volume and concentration

(f) the ideal gas equation: $pV = nRT$

(g) use of stoichiometric relationships in calculations

Percentage yields and atom economy

(h) calculations to determine:

  (i) the percentage yield of a reaction or related quantities

(ii) the atom economy of a reaction
(i) the techniques and procedures required during experiments requiring the measurement of mass, volumes of solutions and gas volumes
(j) the benefits for sustainability of developing chemical processes with a high atom economy.

Acids, bases, alkalis and neutralisation
(a) the formulae of the common acids (HCl, H_2SO_4, HNO_3 and CH_3COOH) and the common alkalis ($NaOH$, KOH and NH_3) and explanation that acids release H^+ ions in aqueous solution and alkalis release OH^- ions in aqueous solution
(b) qualitative explanation of strong and weak acids in terms of relative dissociations
(c) neutralisation as the reaction of:
  (i) H^+ and OH^- to form H_2O
  (ii) acids with bases, including carbonates, metal oxides and alkalis (water-soluble bases), to form salts, including full equations
Acid–base titrations
(d) the techniques and procedures used when preparing a standard solution of required concentration and carrying out acid–base titrations
(e) structured and non-structured titration calculations, based on experimental results of familiar and non-familiar acids and bases.

Future Learning (Topic) 3.2.1 Enthalpy changes 4.2.3 Practical skills and synthesis 5.1.1 How Fast? 5.1.2 How Far? 5.1.3 Acids, Bases and Buffers 5.3.1 Transition elements 5.2.3 Redox titrations

How will knowledge and skills be taught? (Implementation)	How will your understanding be assessed & recorded (Impact)
Practical work For Acids; • Reactions of acids with metals, carbonates, bases, alkalis • Comparing a weak acid to a strong acid *Practical work For Moles*; • PAG 1.2 determination of the RAM of Mg • PAG 2.1 determination the concentration of HCl • PAG 2.2 determine the molar mass of an acid ($H_3X.nH_2O$) *Written work for Atomic structure and isotopes*; Determining atomic structure and isotopes *Written work for Relative mass*; The terms of relative atomic mass and relative isotopic mass and calculate from isotopes *Written work for Acids*; Balancing equations with acids *Written work for Moles*; Empirical formulae	- several calculation homeworks - 5 x standard homeworks –on Atoms and RAM/empirical formulae/moles/atom economy and %yield/acids (grade given. Written feedback and verbal feedback to the group.) -1 x end of topic test on Moles (grade given. Verbal feedback to class and individuals.)

| Masses in reactions calculations
Gases and moles calculations
Concentration of solutions and calculations
Water of crystallisation calculations
Ideal gases and calculations | |

How can parents help at home?

Look at the topic specific resources on the VLE

Use appropriate websites: MachemGuy, Allery Chemistry, Chemistry World – by Royal Society of Chemistry, ChemGuide.

Take an interest! Ask your children what they have learnt and be curious about their learning.

Helpful further reading/discussion

Reading	**Vocabulary Lists**	**Careers Links**
Chapters 2-4 of A level chemistry for OCR	isotopes Moles stoichiometry Avogadro's constant Dissociation Titration titre Water of crystallisation Empirical formulae Molecular formulae	Analytical chemist Chemical engineer Clinical biochemist Forensic scientist Pharmacologist Process chemist Quality control analyst Research scientist Science writer Site chemist Teacher or lecturer Degrees; Chemistry Biochemistry Biomedical science Biological sciences Medicine Research chemist Veterinary medicine