

# MIP|W

## Birmingham

### AS and A2 Level Course Outlines

#### Chemistry

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This course covers the following topics that are common to all specifications but students should check carefully that sessions are relevant to their own particular studies:

**Topic 1 (AS) - Introductory Chemistry:** Atomic structure: simple atomic models, orbitals and electronic configurations, ionisation energies; Ionic, covalent and metallic bonding; simple and giant covalent structures; inter-molecular forces. Shapes of molecules and ions.

**Topic 2 (AS) - Amount of Substance and Associated Calculations:** Equations and formulae: producing correct formulae and writing full balanced and ionic equations; mole calculations; solution and titration calculations. Empirical formula. Atom economy and percentage yield.

**Topic 3 (AS) - Physical Chemistry:** Kinetics: the factors influencing reaction rates; Maxwell - Boltzmann distribution of energies; reaction profiles. Energetics: bond-breaking and bond – forming, definitions of  $\Delta H_c$ ,  $\Delta H_f$  and Hess Law calculations; enthalpy level diagrams. Chemical equilibrium: reversibility, dynamic equilibrium, movement of equilibrium.

**Topic 4 (AS) - Inorganic Chemistry:** The Periodic Table: Group trends and periodic trends; Redox Chemistry: Assignment of oxidation number and its use in balancing redox equations; Chemistry; Groups 2, and 7.

**Topic 5 (AS) - Organic Chemistry:** Introductory organic chemistry: homologous series, naming and isomerism. Reactions of the Alkanes, alkenes, halogenoalkanes and alcohols. Mechanisms: attacking species and reactive intermediates. IR and MS spectroscopy of organic compounds.

**Topic 6 (A2) - Physical Chemistry I:** Equilibria:  $K_c$  calculations, heterogeneous equilibria. Kinetics: rate equations. Energetics: Entropy and free energy.

**Topic 7 (A2) - Physical Chemistry II:** Acids and Bases: Bronsted-Lowry Theory, pH and calculations, acid strength,  $K_a$ ,  $K_w$ ,  $pK_a$  and  $pK_w$ , titrations, curves and indicators, buffers,  $\Delta H_{\text{neutr}}$ ;

**Topic 8 (A2) - Inorganic Chemistry:** Transitions metals: definition, complex formation, shapes and the origin of colour, reaction with NaOH and  $\text{NH}_3$ ; catalysis. Redox equilibria:  $E$ ,  $E_{\text{cell}}$  and reaction prediction.

**Topic 9 (A2) - Organic Chemistry I:** Isomerism: Geometrical and optical isomerism; Aldehydes and ketones: reactions, tests and mechanisms. Carboxylic acids and derivatives reactions, tests and mechanisms. Nitrogen compounds: amines, nitriles, amides, amino acids reactions, tests and mechanisms.

**Topic 10 (A2) - Organic Chemistry II:** Aromatic compounds: reactions and mechanisms; Polymers: addition and condensation, properties. Spectroscopy: IR, MS and NMR. Chromatography.