

# CHEMISTRY SYLLABUS

The following syllabus is presented as a guide to candidates but is not an all-inclusive list of topics.

**Stoichiometry** - Determination of relative atomic mass and relative molecular mass of atoms, molecules and ions. Chemical equations and calculations based upon stoichiometry and the mole concept. Manipulation of analytical data to derive empirical and molecular formula.

**Gases and gas laws** - Properties and behaviour of ideal gases. Calculation based upon the universal gas equation. The molar volume of a gas at STP, Avogadro's hypothesis and calculations based on these concepts. Dalton's Law of partial pressures.

**Atomic structure and periodicity** - A detailed understanding of the periodic table and the structure of the elements with reference to electron configuration, use of periodic table to predict properties of elements and bonding behaviour. General trends in ionisation energies, electron affinities, etc.

**Bonding** - The nature of covalent and ionic bonds, and the properties of compounds exhibiting these types of bonding. Simple Lewis structures.

**Oxidation and Reduction** - Common oxidising and reducing agents, balancing redox equations, concept of oxidation number.

**Electrochemistry** - Nature of electrochemical cells, half cell equations, overall equations, reference electrodes, standard reduction potentials, electrodeposition of metals, Faraday's laws.

**Chemical Equilibrium** - Equilibrium constants, simple problems on gas equilibria, including application of Le Chatelier's Principle. Simple equilibria in solution. Catalysis and rates of reaction.

**Acids bases and pH** - Concept of Lowry Bronsted acids and bases,  $K_w$ , pH,  $pK_a$ ,  $pK_b$ . Calculations based upon pH for simple systems.

**Main group elements** - A basic systematic knowledge of the chemistry of main group elements.

**Introductory organic chemistry** - Classification of molecules according to functional groups. Isomerism, reactions of alkenes and simple reactions of alcohols, ketones, aldehydes, acids, esters, amines and amides. Basic laboratory techniques of distillation, crystallisation and extraction.

**Industrial Chemistry** - An understanding of the chemistry relating to extraction of metals from ores with particular reference to Al, Fe, Sn, Pb, Zn, Cu. Hydrometallurgical and pyrometallurgical processes. By-products of metal extraction such as sulfuric acid. Simple processes of industrial organic chemistry such as PVC manufacture.

**Chemical Analysis** - Qualitative analysis for common elements, calculations related to volumetric and gravimetric analysis, acidimetry, redox methods, iodometry, iodimetry, and electrochemical methods of quantitative analysis.