



Science Council

Laboratory technician

LEARNING GUIDE

Core topic area – Applicable to all Laboratory Technician Apprenticeships

This document contains content knowledge that should be delivered as part of a high quality laboratory technician apprenticeship programme.

To be used in conjunction with one of the following laboratory technician pathways:

- Physics
- Biology
- Chemistry
- Bio Medical
- Dental

Topic/Subject	Links to KSB's	Coverage overview	Suggested learning hours
<p>Introduction the periodic table - elements,trends and basics of chemical/physical properties, atoms</p>	<p>K21</p>	<p>Solid/liquid/gas phase.</p> <p>Periodicity; groups (relative atomic mass; atomic numbers).</p> <p>Principles of inorganic, organic and physical chemistry.</p> <p>Formulae and equations: empirical and molecular ; Periodicity and properties of elements.</p> <p>Understand the physical and chemical properties of elements, molecules (hydrophilicity, hydrophobicity, electronegivity, viscosity etc).</p> <p>Formulae, balanced equations, relative atomic mass and relative isotopic mass, mole concentrations and calculations.</p> <p>Atomic stucture molecular structure and bonding, oxidation and reduction.</p> <p>Understand the following intermolecular forces. Atomic model; electron structure and chemical bonding (Ionic, Covalent, Bohr, Lewis diagrams, relationship of bonding properties exhibited by materials, alloys; polymeric materials); conduction; isotopes; The mole; molar concentration; Oxidation states and their calculation, oxidation and reduction as electron transfer, electrode potentials and their applications.</p> <p>Ideal properties and biomaterials. Quantities in chemical reactions: formulae; balanced equations.</p> <p>Substances: inorganic and organic substances; solids; liquids; gases</p>	<p>20</p>
<p>Introduction on kinetics and thermodynamics and rates of reaction</p>	<p>K21</p>	<p>Affects of physical changes of intra and inter molecular change and affects of external factors - temperature, pH, pressure etc</p> <p>Internal energy; Heat capacity; Gas laws; Pressure in gases and liquids; Kinetic theory; Collision theory; Conditions that affect chemical reactions (e.g. temperature, pressure, catlysts,</p>	<p>15</p>

		enzymes); Viscosity and viscous drag; Heat transfer; Enthalpy and entropy in reactions.	
Awareness of electricity, magnetism and electromagnetism, risks	K21	<p>Building and analysing electrical circuits and circuit diagrams using common components (batteries, lamps, diodes, resistors, LEDs, switches); Electrical current as flow of charge, potential difference in terms of energy transfer.</p> <p>Conservation of energy & charge in circuits (Kirchoff's laws - series & parallel circuits); Power & energy in electrical circuits.</p> <p>Resistance, potential dividers & application of Ohm's law. Electrical fuse use calculation of value; Electrical safety; Risks.</p>	20
Overview of living organisms	K21	<p>Creation of life; Cell theory; large molecules; genetic information and DNA.</p> <p>Ultrastructure of an animal cell: plasma membrane; cytoplasm; nucleus; nucleolus; endoplasmic reticulum; Golgi apparatus; vesicles; lysosomes; ribosomes; mitochondria; centrioles</p>	25
Theory of and use of lab equipment	K21, S6, S7, S10, S12	<p>The use of Laboratory equipment & its calibration, e.g. Preparation & standardisation of solutions using titration & Colorimetry.</p> <p>Use of Thermometers, Cooling curves, Measurement using micrometer & vernier callipers; Power supplies: use & safety (dc and ac; LT, HT, EHT, mains, battery).</p> <p>Measuring instruments: precision, accuracy, robustness, calibration, traceability; scientific balances, glassware, centrifuges, digital and non-digital pipettes, incubators, fridge/freezers, cryogenic equipment, fume cupboards, glove boxes, temperature and humidity recorders, pH meters, microbiological equipment, autoclaves.</p>	20
Chemical analysis/identification of substances	K21, S6, S7	<p>Use of a range of tests & techniques to detect, identify chemical composition and determine amounts of substances (IR, UV, NMR, Mass Spec).</p> <p>To include simple tests, use of instrumental techniques & determination of amounts of acids</p>	15

		and alkalis by titration. Moving onto advanced techniques (knowledge thereof like XRay).	
Separation science	K21, S6, S7	Techniques used in chromatography (TLC, GC, LC, Column Chromatography). Linking to uses in connexion with analysis - LCMS, GCMS & new techniques as they arise.	15
Nuclear physics	K21	Isotopes; Stable and unstable nuclei; Nuclear decay & radioactivity; Use of radioactive sources & detectors; Particles including photon; Interaction of radiation & particles with matter; types of radiation, properties, duality of electron, & wave function, relative atomic mass and relative isotopic mass; Radiation safety	15