Science Council

Laboratory technician

LEARNING GUIDE

Optional route – Dental

This document contains content knowledge that should be delivered as part of a high quality laboratory technician apprenticeship within the dental sector.

This document should be used in conjunction with the core.

Topic/Subject	Links to KSB's	Overview of Coverage	Sugested learning hours
Chemistry	K1 K4 K6 K7 K8 K11 K15 K21 K22 S1 S4 B3	The periodic table: organisation of elements that are used as constituents of dental materials including metals and non-metals used to form dental alloys, ceramics composites, acrylics and dental plaster Ideal properties: dental materials and biomaterials Basic polymer science: Classification of dental polymers: thermoplastic; thermoset; elastomer; bioplastic; standard abbreviation in each classification. Function of additives: fillers; plasticisers; cross-linking agents; impact modifiers; antioxidants; stabilisers; blowing agents. Materials: thermo forming plastics; denture base and repair resins; denture teeth polymers; curing techniques and cycles; heat cure; cold cure and autopolymerising; milling. Uses of polymeric materials in dental technology: denture base materials; denture teeth; orthodontic resins; models	5
Physics	K1 K4 K6 K7 K8 K11 K15 K21 K22 S1 S4 S8 B3	Physical properties: Viscocity of dental materials and the effects of good and poor wetting; thixotropy; elasticity of dental polymers and dental alloys; electrical conductivity, thermal conductivity of dental materials, thermal diffusion in dental alloys and other materials; thermal expansion of materials used in the oral environment; appearance; malleability, ductility, surface texture to include dental alloys, ceramics and polymers; polished and etched surfaces. Mechanical properties: requirements of dental biomaterials, tensile and compressive properties applied to dental alloys, ceramics, composites and acrylics, e.g. stress/strain, yield, elastic and plastic deformation, Young's modulus applied to dental alloys and ceramics; use of load/extension curve to record test results and illustrate behaviour; hardness, e.g. Vickers, Brinell, Rockwell used to determine the surface hardness of alloys, ceramics and other dental materials, Rebound; further property definitions, e.g. toughness/impact, fatigue strength, creep strength of dental ceramics or alloys; testing of materials including gypsum	20

Biology	K4 K16 K21 S13 S14 S16 S17 S19	Biological properties: biomaterials; biocompatibility; importance of this type of property when employed in the oral environment; metal ratios in dental alloys and the effects on biocompatibility; host reaction, non-toxic, non-irritant; allergenic properties of dental alloys and polymeric materials; principles of osseointegration; carcinogenic potential. Ultrastructure of an animal cell: plasma membrane; cytoplasm; nucleus; nucleolus; endoplasmic reticulum; Golgi apparatus; vesicles; lysosomes; ribosomes; mitochondria; centrioles. Tissue types: epithelial (glandular, lining, covering), e.g. salivary glands of oral cavity, epithelial lining of the oral cavity; muscular, e.g. smooth muscle surrounding the gastrointestinal tract, gastrointestinal tract; characteristics of hormones; names and actions of principal hormones produced by each gland; hormone responses to extremes of stress and alarm, e.g. fight and flight. Principles of homeostasis: definition of homeostasis; principles of homeostatic control systems; significance of maintaining an optimum internal environment for cell function Homeostatic systems: endocrine control and feedback in general; regulation of blood glucose (insulin, glucagon, adrenaline, glucocorticoids); regulation of body fluids and temperature. Dental Anatomy - Understand the human oro-facial structures and anatomical landmarks. Anatomical landmarks: sagittal plane; median plane; transverse plane; coronal plane; medial; lateral; anterior; posterior; mesial; distal; buccal; labial; proximal; superior; inferior Intra-oral landmarks: mucosa; sulcus; tongue; frenal attachments; hard palate; soft palate; uvula; palatine tonsils; palatine fovea; palatal torus; rugae; alveolar ridges. Extra-oral landmarks: chin; lips; cheeks; nose; orbital ridge; eye; external auditory meatus. Alveolar bone and tooth support: alveolar bone structure (simple bone morphology); function; periodontal ligament; gingivae; bone cells (osteoclasts, osteoblasts, osteocytes).	30

		Nerve supply to the jaws: trigeminal nerve (fifth cranial); mandibular division; maxillary division; appropriate branches of the facial nerve (seventh cranial); general nerve innovation to the oral cavity Blood supply to and from the oral cavity: arterial supply (external and internal carotid, lingual, maxillary, facial); venous drainage (jugular, facial, pterygoid plexus, maxillary, anterior retro-mandibular. Lymph nodes: (submental, submandibular, parotid, cervical); interconnection of lymph nodes Human saliva: functions; main components; salivary glands (parotid, submandibular, sublingual);production and flow. Bones of the cranium: frontal; temporal; occipital; pariatal; ethmoid; sphenoid. Bones of the facial skeleton: maxillae; nasal; palatine; zygomatic; lacrymal; mandible (body, ramus, angle, coronoid process, sigmoid notch, condyle head, mylohyoid ridge, external oblique line); associated bone features (foramen, fossa, meatus, canal, condyle, process). Temporo mandibular joint: condyle head; glenoid fossa; articular eminence; styloid process; capsule; synovial cavity; ligaments (temporo mandibular, stylo mandibular); main movements (hinge, lateral, protrusive, retrusive); centric position. TMJ Dysfunction causes and treatments.Muscles of expression: orbicularis oris; zygomaticus major; zygomaticus minor; levator labii superioris; levator anguli oris; depressor anguli oris; depressor labii inferioris; levator labii inferioris; risorius; buccinator The tongue: muscles (stylohyoid, hyoglossus, genioglossus, styloglossus, palatoglossus); changes in shape (swallowing, speech); features (taste buds, papillae); functions. Muscles of the soft palate: levator veli palatini; tensor veli palatini; palatoglossus; palatopharyngeus; uvula. Craniofacial growth; cranial growth, facial development; factors affecting development. Theories of ageing related to oral tissues: epithelium; connective tissue; bone	

		(maxillary,mandibular, alveolar); wound healing in the oral cavity. Changes in the dentition: freeway space; over eruption; tooth loss; drifting. Diseases and disorders: impact on patient; normal and abnormal development; oral flora and fauna (candida albicans); the role of oral micro-organisms in the formation of plaque; caries; periodontal disease; potentially malignant conditions of the oral cavity and diseases such as hepatitis B and C and HIV that pose a cross-infection risk. Structure of natural teeth: development; eruption cycles and patterns (deciduous, permanent); Range of human teeth: characteristics (incisors, canines, premolars, molars); variations (shape, size, position, number of cusps); coronal features (pits, fossae, developmental grooves, disectional grooves, marginal ridges, mamelons); average tooth measurements, number of teeth (deciduous, permanent); composition and form (enamel, dentine, pulp, cementum); function. Natural and simulated occlusion: relationship between the upper and lower occlusal surfaces (deciduous, permanent, mixed); interdigitation; articulation; masticatory efficiency; Tooth morphology. Muscles of mastication: temporalis; masseter; medial pterygoid; latral pterygoid; mylohyoid;geniohyoid; digastric. Skeletal muscle, intercostal muscles of the lungs, cardiac muscle of the heart; nervous, e.g. neurones and neuroglia; involuntary innervation throughout the body systems; connective, diverse group, cartilage, bone (e.g. ribs in respiratory system), areolar (within mucous membranes of the digestive system), adipose, elastic (fibres in artery walls within cardiovascular system), reticular, collagenous. Levels of organisation: through differentiation, cells form tissues; organs; organ systems. Organisation and function of the nervous system: central nervous system (main features of the brain and spinal cord); peripheral nervous system	

		(afferent and efferent pathways); autonomic system (sympathetic and parasympathetic pathways); synaptic structure; structure of neurones, sense organs, effector organs; sensory (afferent) and motor (efferent) neurones; somatic and autonomic (sympathetic and parasympathetic) neurons. Organisation and function of the endocrine system: pituitary gland; hypothalamus; thyroid and parathyroid gland; pancreas; adrenal medulla; adrenal cortex; gonads and placenta; pineal;	

Dental Specific	K21 S6 B1 B2 B4	Prescription interpretation. Protect patient information; impression identification; impression checks; impression treatment prior to casting; cross- infection protocols, health and safety; communication and use of effective feedback; legal and ethical legislation and professional responsibility; GDC standards. Properties of impression materials: limitations; ideal properties; handling and disposal; decontamination and cross-infection control procedures Materials: mucostatic; mucocompressive; impression pastes; putties; elastomers; silicones; disposal procedures; Design requirements for Physical and digital dental models: purpose of a model; model design, e.g. preliminary, study, master, orthodontic, and sectioned; construction techniques; material selection; anatomical requirements; base design; die design. Design features of impression trays: purpose of trays; tray design Dental + Digital types, edentulous, partially dentate. Design requirements of record blocks: cast analysis; peripheral outline; elimination of undercuts; materials selection; recording data registration; assessment of tooth position, e.g. occlusal record block or digital assessment of occlusion. Articulators: types, e.g. simple hinge, average value, semi adjustable, fully adjustable; uses; simulation of jaw movements; adjustments; interpretation and transfer of data from record blocks to articulator Properties of gypsum materials inc H&S.	35

Dental Skills	K21 S13 S14 S14 S16 S17 S19 B1 B2 B3 B4 B5 B7 B6 B8	Construct a simple acrylic removable prosthodontic appliance. Tooth selection and setting: tooth selection by information from various sources; types available; shades and moulds of artificial teeth; tooth position and interdigitation. Waxing procedures: waxing up techniques; aesthetics; baseplate design and contours; surface finish and accuracy. Processing dentures: flasking preparations; flasking, packing and injection moulding techniques and systems; curing methods; de-flasking techniques; trimming and polishing; health and safety; Remounting techniques and final checks: re-establishing occlusion; final checks for fit and fitness for purpose; decontamination of dentures; Medical Devices Regulation (MDR); packing and dispatch of finished dentures. Construct a single-unit fixed prosthodontic for example a single-unit metallic substructure, metallic or zirconia/ceramic crown, a temporary restoration designed traditionally or digitally. Prescriptions and terminology: interpretation of basic prescription requirements and terminology Anterior and posterior single unit metallic substructures: types, e.g. post and core, coping; die preparation; contouring and dimensions; lost wax techniques; finishing and metal preparation; health and safety; passing on for next process Metallic crowns: die preparation; waxing up methods; anatomical considerations; dimensions and contours; lost wax techniques; trimming, polishing and fitting; health and safety; Medical Devices Regulation (MDR); packing and dispatching. Temporary crowns: design requirements; material selection; die preparation; construction techniques; trimming, polishing and finishing methods; health and safety; Medical Devices Regulation (MDR); packing and dispatching Construct a simple removable orthodontic appliance Orthodontic appliance: for example a Hawley retainer, Begg retainer, an appliance with two	10

		Adams cribs and additional component, a vacuum-formed retainer Prescriptions and terminology: interpretation of basic prescription requirements and terminology Baseplate: simple baseplate design; construction techniques; trimming and polishing methods; correcting faults. Direct retaining components (clasps): purpose of clasps; types of clasp; wire bending techniques; positioning and fixing prior to spraying up/ forming. Finishing and final checks: baseplate and metallic component checks; baseplate and component fit to model; decontamination of appliance; Medical Devices Regulation (MDR); packing and dispatch of finished appliance. Modify an existing prosthetic appliance addition, repair or relining of a denture Receiving cases: checking dentures and accepting contract; decontamination of dentures Denture relining: reasons for relining; material selection; construction techniques; health and safety.Remounting and final checks: remounting techniques; final checks of dentures and fit to model; decontamination of dentures; Medical Devices Regulation (MDR); packing and dispatch of modified dentures. Demonstrate professional conduct towards dental team colleagues and all patients. Professional behaviour: body language; speech patterns; interpersonal skills; verbal and non-verbal. Dental Technicians; scope of practice compliance with organisational procedures and codes of practice; take responsibility for and act to raise concerns about your own or others' health,behaviour or professional performance. Communication skills: patients; patient management; recognise and respect patient's perspective, differences and expectations and the role of the dental team; dentists; treatment plans, prescriptions and contracts; dental nurses and receptionists; oral health promotion role; telephone techniques; digital communication; methods of dealing with complaints; know how and where to report any patient safety issues that arise.	