

iUHB249 – Anatomy and physiology for trichology

URN – T/617/5715

Guided Learning Hours: 60

Learning outcome	Assessment criteria	Taught content to include
LO1 Understand the major cell and tissue types, their components and processes	1.1. Describe the components of an animal cell, its extracellular matrix and their functions	<ul style="list-style-type: none"> • Cytoplasm • Organelles • Mitochondria • Ribosomes • Endoplasmic reticulum • Golgi apparatus • Lysosomes • Peroxisomes • Vacuoles • Centrioles • Centrosomes • Nucleus • Flagella and cilia • Plasma membrane • Cytoskeleton • Extracellular matrix
	1.2. Explain the key cellular processes	<ul style="list-style-type: none"> • Metabolism • Catabolism • Anabolism • Transport • Adenosine tri-phosphate • Adenosine di-phosphate • Inorganic phosphate • Phosphorylation

	1.3. Describe how substances enter and leave a cell	<ul style="list-style-type: none"> • Osmosis • Diffusion • Bulk flow • Facilitated diffusion • Active transport • Vesicular transport
	1.4. Describe the main types of cell in biology	<ul style="list-style-type: none"> • Prokaryotic cells • DNA • Plasmid • Flagellum • Capsule • Cytoplasm • Eukaryotic cells • DNA • Nucleus • Centriole • Ribosomes • Rough endoplasmic reticulum • Smooth endoplasmic reticulum • Mitochondria • Golgi apparatus
	1.5. Describe the functions of each of the 4 main tissue types of the human body	<ul style="list-style-type: none"> • Epithelial tissue <ul style="list-style-type: none"> - Absorption - Barrier to absorption - Covering & lining • Connective tissue <ul style="list-style-type: none"> - Bind structures - Protection - Immunological function - Fat-storage - Transport - Tissue damage repair - Structural support • Muscle tissue <ul style="list-style-type: none"> - Movement - Posture maintenance - Thermogenesis

		<ul style="list-style-type: none"> • Nervous tissue <ul style="list-style-type: none"> - Action potentials - Control - Sensory - Integration - Motor functions
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LO2 Understand the structures, functions and pathologies of the hair and integumentary system	2.1. Describe the structures of the integumentary system and broad functions of the skin	<ul style="list-style-type: none"> • Integumentary structures <ul style="list-style-type: none"> - Skin - Hair - Nails - Glands - Sensory receptors • Regulation of body temperature • Protection • Sensation • Excretion • Immunity • Blood reservoir • Synthesis of vitamin D • Epidermis <ul style="list-style-type: none"> - Functions <ul style="list-style-type: none"> ▪ Immune response ▪ Sensation ▪ Physical and chemical protection ▪ Barrier to ultraviolet radiation - Stratum basale - Stratum spinosum - Stratum granulosum - Stratum lucidum - Stratum corneum - Keratinocytes - Keratin - Keratohyalin - Tonofilaments - Merkel cells - Nociceptors - Langerhans cells
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		<ul style="list-style-type: none"> - Melanocytes - Lamellar granules • Dermis <ul style="list-style-type: none"> - Functions <ul style="list-style-type: none"> ▪ Temperature control ▪ Sensation ▪ Lubrication ▪ Protection ▪ Elasticity and structural support - Papillary region - Reticular region - Areolar connective tissue - Dermal papillae - Meissner’s corpuscles - Dense - Irregular connective tissue - Hair follicles - Nerves - Sebaceous glands - Ducts of sweat glands - Small quantity of adipose tissue - Thermoreceptors - End organ of Ruffini - Hair root plexuses • Hypodermis <ul style="list-style-type: none"> - Functions <ul style="list-style-type: none"> ▪ Energy storage and insulation ▪ Blood reservoir ▪ Sensation ▪ Sweat secretion ▪ Protection ▪ Attachment of skin to underlying structures • Areolar connective tissue • Adipose tissue • Sweat glands • Lamellar (Pacinian) corpuscles
	<p>2.2. Describe the hair and its parts in relation to the layers of the skin</p>	<ul style="list-style-type: none"> • Hair follicle • Shaft

		<ul style="list-style-type: none"> • Root • Bulb • Papilla • Matrix • Sebaceous glands • Arrector pili • Hair root plexuses • Skin layers <ul style="list-style-type: none"> - Epidermis - Dermis - Hypodermis • The hair in cross-section: <ul style="list-style-type: none"> - Medulla - Cortex and cuticle - Hair follicle - Internal root sheath: <ul style="list-style-type: none"> ▪ Cuticle ▪ Huxley's layer ▪ Henle's layer - External root sheath and connective tissue sheath - Keratinocytes - Melanocytes
	2.3. Explain how hair is supplied with oxygen and nutrients	<ul style="list-style-type: none"> • Papilla of hair • Matrix • Subcutaneous arteries and veins • Capillary loops
	2.4. Describe how keratin provides elasticity and strength to a hair fibre	<ul style="list-style-type: none"> • Keratinocytes • Cell junctions • Keratin fibres • Cortex • Orthocortex • Paracortex • Microfibrils and macrofibrils
	2.5. Describe the types of the hair and their origins	<ul style="list-style-type: none"> • Hair types: <ul style="list-style-type: none"> - African - Caucasian - Asian

		<ul style="list-style-type: none"> • Growth rates • Cross-sectional shapes • Pigmentation • Shaft diameter • Size of medulla • Hair's exit angle from scalp • Density (weight per unit volume) • Origins <ul style="list-style-type: none"> - East African origins - Migration - Global distribution of hair types - Interaction and interbreeding
	2.6. Explain the three types of peptide bond and how they are affected by hairstyling techniques	<ul style="list-style-type: none"> • Breaking hydrogen bonds • Wetting hair • Breaking disulphide bonds • Perming hair • Ammonium thioglycolate • Hydrogen peroxide
	2.7. Describe the three stages of the hair growth cycle and the factors that affect hair growth	<ul style="list-style-type: none"> • Stages of hair growth • Anagen phase • Catagen phase • Telogen phase
	2.8. Explain the factors that result in male pattern hair loss (MPHL) and its genetic basis and how this affects the hair growth cycle	<ul style="list-style-type: none"> • Post-puberty onset of MPHL • Rise in the level of androgens • Genetic basis • Maternal and paternal inheritance • Androgenetic alopecia • Testosterone and dihydrotestosterone and the gene for hair loss • Regulation of hair growth • Hormonal influences • Growth rate • Independent growth in each follicle • Factors that affect hair growth <ul style="list-style-type: none"> - Male and female sex hormones - Androgens - Miniaturisation - Use of chemicals on scalp

		<ul style="list-style-type: none"> - Illness and trauma - Therapeutic drug use - Physical damage to the scalp - Dietary influences • Shortened anagen phase • Greater number of hairs in telogen phase • Effects of shampooing and grooming • Miniaturisation • Reduced pigmentation
	2.9. Describe how MPHL progresses	<ul style="list-style-type: none"> • Patterns or streams of hair loss • Typical pattern • Anterior pattern • Vertex pattern • Seven stages of progression • Points of divergence
	2.10. Explain the causes of female and diffuse hair loss	<ul style="list-style-type: none"> • Anti-cancer drugs • Post-partum hair loss • Iron deficiency • High fever • Blood loss • Starvation and drastic dieting • Dental treatment and surgical operation • Certain medicines • Thyroid disorders • Severe or prolonged emotional stress
	2.11. Explain the ways in which hormones may cause MPHL	<ul style="list-style-type: none"> • Hierarchical pattern of hormone release • Hypothalamus • Pituitary • Testes and adrenals • Release of testosterone by testes • Testosterone and receptor complex in target cells • Binding to specific genes • Morphological changes • Spermatogenesis • Wolffian duct development • Sexual differentiation • Production of gonadotropin by target cells

	<ul style="list-style-type: none"> • Action of 5-α-reductase on testosterone to produce dihydrotestosterone (DHT) • DHT-receptor complex in target cells • Role of dihydrotestosterone in beard growth and MPHL • Gene for MPHL
2.12. Describe the ways in which MPHL is treated	<ul style="list-style-type: none"> • Enzyme inhibition • Active sites on an enzyme V substrate binding • Competitive inhibition (substrate binding and blocking) • Reduction of dihydrotestosterone production • Treatment of MPHL • Finasteride • Dutasteride • Surgical treatments • Follicular unit transplantation
2.13. Describe the effects of ageing on the skin	<ul style="list-style-type: none"> • Collagen loss • Decrease in subcutaneous tissue • Decreased number of melanocytes and Langerhans cells • Pigmented blotching due to increase in size of melanocytes • Atrophy of sebaceous glands • Diminished sweat production • Thinning of the skin (especially dermis) • Blood vessel thickening and decreased permeability • Poor healing capacity and increased susceptibility to illness • Slower migration of cells from the basal layer to the epidermal surface
2.14. Describe how superficial wounds heal	<ul style="list-style-type: none"> • Types of superficial wound • Abrasion and first or second degree burns • Enlargement and migration of basal epidermal cells • Contact inhibition of like cells • Cell division and replacement stimulated by epidermal growth factor • Healing time • 24-48 hours after wounding
2.15. Describe how deep wounds heal	<ul style="list-style-type: none"> • Inflammatory phase • Migratory phase • Maturation phase

	<p>2.16. Describe how the skin may become damaged by mechanical and chemical means</p>	<ul style="list-style-type: none"> • Mechanical damage • Trichotillomania • Obsessive compulsive disorder • Traction alopecia • Burns • Chemical damage • Chemical burns • Hypersensitivity reaction • Reactive chemicals • Hydrogen peroxide • Proteolytic enzymes • Skin irritants and inflammation • Solvents • Surgical alcohol • Methylated spirit • Acetone • Infections
	<p>2.17. Describe the common infections that may affect the skin and scalp</p>	<ul style="list-style-type: none"> • Dandruff • Malassezia furfur • Malassezia pachydermatis • Cicatrising cellulite • Contact irritant dermatitis • Contact allergy dermatitis • Alopecia areata • Psoriasis • Seborrhoeic dermatitis • Acne vulgaris • Keloid scarring • Folliculitis • Tinea • Urticaria • Trichotillomania • Traction alopecia • Burns • Eczema • Vitiligo

LO3 Understand the anatomy, physiology and pathologies of the cardiovascular system	3.1. Describe the composition and functions of plasma	<ul style="list-style-type: none"> • Water 91.5% • Plasma proteins 7% • Albumins • Globins • Fibrinogen • Other proteins • Solutes 1.5% • Inorganic ions • Nutrients • Waste • Gases • Hormones • Transport medium • Delivering oxygen • Carbon dioxide • Nutrients
	3.2. Describe the functions of each of the formed elements	<ul style="list-style-type: none"> • Red cells • Haemoglobin carries oxygen to tissues • Platelets • Clotting • White cells • Immune response • Inflammatory response
	3.3. Describe the cardiac cycle	<ul style="list-style-type: none"> • Upper chambers • Left atrium • Right atrium • Lower chambers • Left ventricle • Right ventricle • Atrioventricular valves • Mitral (bicuspid) • Tricuspid • Semilunar valves • Aortic • Pulmonary • Systole • Diastole

		<ul style="list-style-type: none"> • Stroke volume • Cardiac output
	<p>3.4. Explain how the conduction system coordinates the contractions of the heart's chambers</p>	<ul style="list-style-type: none"> • Nervous and hormonal influences • Autorhythmicity • Conduction system • Sinoatrial node • Atrioventricular node • Atrioventricular bundle (bundle of His) • Right and left bundle branches • Conduction myofibres (Purkinje fibres)
	<p>3.5. Describe the divisions of circulation to include the arterial system, venous return and the mechanism of capillary exchange</p>	<ul style="list-style-type: none"> • Divisions of circulation • Arteries • Arterioles • Capillaries • Venules • Veins • Systemic • Pulmonary • Hepatic portal and coronary circulation • The arterial system <ul style="list-style-type: none"> - Left ventricle - Elastic (conducting) arteries - Brachiocephalic - Common carotid - Subclavian - Vertebral - Pulmonary - Common iliac - Muscular (distributing) arteries - Axillary - Brachial - Radial - Intercostal - Femoral - Popliteal - Tibial • Capillary exchange

		<ul style="list-style-type: none"> - Hydrostatic pressure - Osmotic pressure - Capillary exchange at arterial end of capillary - Net flow of fluid into tissues - Capillary exchange at venous end of capillary - Net flow of fluid into capillary • Venous return <ul style="list-style-type: none"> - Route of venous return - Venules - Smaller veins - Major veins <ul style="list-style-type: none"> ▪ Inferior vena cava ▪ Superior vena cava - Venous sinuses - Right atrium - Pumping mechanisms - Skeletal muscle pump - Respiratory pump - Valves
	<p>3.6. Describe normal blood pressure and how it is measured</p>	<ul style="list-style-type: none"> • Blood pressure • Hydrostatic pressure exerted on the walls of a blood vessel • Measurement of blood pressure • Measured in millimetres of mercury (mm Hg) using a sphygmomanometer • Pulse rate
	<p>3.7. Describe the pathologies of the cardiovascular system</p>	<ul style="list-style-type: none"> • Anaemia • Angina • Aneurism • Arteriosclerosis • Atherosclerosis • Coronary thrombosis • Deep vein thrombosis (DVT) • Hypertension • Hypotension • Phlebitis • Varicose veins • Tachycardia • Bradycardia

LO4 Understand the anatomy, physiology and pathologies of the endocrine system	4.1. Describe the actions of the endocrine and nervous systems on the body	<ul style="list-style-type: none"> • Nervous system <ul style="list-style-type: none"> - Action potentials along neurons - Neurotransmitter release at axon terminals - Excitation or inhibition of other neurons - Muscle fibres or gland cells - Causes muscular contraction or glandular secretion - Occurs typically within milliseconds - Brief duration of action • Endocrine system <ul style="list-style-type: none"> - Releases hormones into blood stream - Blood delivers hormones to virtually all body cells - Causes changes to metabolic activities - Occurs typically within seconds, hours or days - Longer duration of action
	4.2. Describe the general functions of hormones on the body's tissues	<ul style="list-style-type: none"> • Regulation of: <ul style="list-style-type: none"> - Chemical composition of the internal environment - Metabolism - Contraction of smooth muscle - Cardiac muscle and glandular secretion - Activities of the immune system • Plays a role in: <ul style="list-style-type: none"> - Sequential integration of growth and development - Reproduction and fertilisation - Oocyte and sperm production - Nourishment of the embryo and foetus - Delivery and nourishment of the new-born
	4.3. Describe the main organs of the endocrine system and their hormone secretions	<ul style="list-style-type: none"> • Exclusive endocrine glands • Pituitary • Human growth hormone • Thyroid stimulating hormone • Follicle stimulating hormone • Luteinizing hormone • Prolactin • Adrenocorticotrophic hormone • Melanocyte stimulating hormone • Oxytocin • Anti-diuretic hormone (vasopressin)

- Thyroid
- Thyroxine (T4)
- Triiodothyronine (T3)
- Calcitonin
- Parathyroids
- Parathyroid hormone
- Adrenals
- Aldosterone
- Cortisol
- Androgens
- Epinephrine
- Norepinephrine
- Pineal
- Melatonin
- Non-exclusive endocrine glands
- Hypothalamus
- Releasing & inhibiting hormones
- Thymus
- Thymosin
- Pancreas
- Insulin
- Glucagon
- Somatostatin
- Pancreatic polypeptide
- Ovaries
- Oestrogens
- Progesterone
- Relaxin
- Inhibin
- Testes
- Testosterone
- Kidneys
- Erythropoietin
- Calcitriol
- Stomach
- Gastrin
- Liver

		<ul style="list-style-type: none"> • Calcitriol • Small intestine • Gastric inhibitory peptide • Secretin • Cholecystokinin • Skin • Heart • Atrial natriuretic peptide • Placenta • Human chorionic gonadotropin • Human chorionic somatomammotropin
	4.4. Explain the interaction of target cells, binding sites and compatible hormones	<ul style="list-style-type: none"> • Specific target cells and receptors • Recognition of a specific hormone • Up-regulation and down-regulation of hormone receptors • Lipid soluble hormones diffusing through plasma membrane and binding to receptors in the cytosol • Water-soluble hormones binding to a receptor on the target cell of the plasma membrane
	4.5. Describe the process of circulatory hormone action and process of local hormone action	<ul style="list-style-type: none"> • Circulating hormones (endocrines) • Free form carriage of water-soluble hormones in blood • Carriage of lipid-soluble hormones through attachment to transport proteins • Inactivation by liver and excretion by kidneys • Local hormones (paracrines and autocrines) • Eicosanoids (prostaglandins and leukotrienes)
	4.6. Describe the pathologies of the endocrine system	<ul style="list-style-type: none"> • Addison's disease • Cushing's syndrome • Diabetes insipidus • Diabetes mellitus • Goitre • Grave's disease • Hyperthyroidism • Hypothyroidism • Thyrotoxicosis • Polycystic ovarian syndrome • Myxoedema

		<ul style="list-style-type: none"> • Stress • Acromegaly • Gigantism • Hyperparathyroidism • Hypoparathyroidism
LO5 Understand the immune functions of the lymphatic system and skin	5.1. Describe the structures and functions of the lymphatic system	<ul style="list-style-type: none"> • Structures • Lymphatic vessels • Capillaries • Afferent vessels • Lymphatic nodes • Efferent vessels • Lymphatic trunks • Lymphatic ducts • Other lymphatic tissues • Thymus gland • Mucosa associated lymphoid tissue (MALT) • Spleen • Functions • Draining interstitial fluid • Transporting dietary lipids • Immune responses
	5.2. Describe pathogenic agents and non-pathogenic agents	<ul style="list-style-type: none"> • Non-pathogenic <ul style="list-style-type: none"> - Organisms considered as normal flora - Certain bacteria - Escherichia coli - Lactobacillus - Staphylococcus - Non-pathogenic fungi - Saprophytic fungi - Non-pathogenic yeasts • Pathogenic <ul style="list-style-type: none"> - Cellular forms of life - Pathogenic bacteria - Fungi and yeasts - Non-cellular life - Viruses

		<ul style="list-style-type: none"> - Chemical materials - Toxic - Carcinogenic - Teratogenic
	5.3. Describe the ways in which the sebaceous glands and Langerhans cells defend the body against foreign invasion	<ul style="list-style-type: none"> • Sebaceous glands • Sebum secretion • Creating hydrophobic layer that excludes hydrophilic bacteria • Yeasts and viruses • Langerhans cell • Outposts of the immune system • Migratory from red bone marrow to epidermis • Attacks invading agents if sebaceous barrier is breached
	5.4. Describe how allergens and haptens cause a hypersensitive skin reaction	<ul style="list-style-type: none"> • Haptens • Partial antigen with reactivity not immunogenicity • Binds to larger carrier molecule to stimulate an immune response • Allergens • Antigen with reactivity and immunogenicity • Provokes immune responses • Triggers an allergic (hypersensitive) reaction • Produces specific antibodies or proliferation of specific T-cells
	5.5. Describe the internal and external lines of defence in combating the potential for foreign invasion	<ul style="list-style-type: none"> • External line of defence <ul style="list-style-type: none"> - Skin - Sebaceous secretions - Langerhans cells - Closely packed keratinised cells - Perspiration and lysozymes - Hyaluronic acid - Mucous membranes - Mucous secretions trapping microbes - Cilia propelling dust and microbes • Internal line of defence <ul style="list-style-type: none"> - Antimicrobial proteins - Transferrins - Interferons - Complement system - Killer cells - Natural killer cells attacking bacterial and viral infection

		<ul style="list-style-type: none"> - Phagocytes - Neutrophils and macrophages
	5.6. Explain the 'triggers' that may cause an inflammatory response	<ul style="list-style-type: none"> • Infection by micro-organisms • Bacteria • Fungi • Viruses • Cuts • Abrasions • Twisting and stretching of skin • To epidermis • To dermis • Contact with reactive chemicals • Acids • Alkalis • Bases • Oxidising and reducing agents • Extremes of temperature • Scalds and burns
	5.7. Describe the cardinal signs of inflammation	<ul style="list-style-type: none"> • Redness • Pain • Heat • Swelling • Loss of function
	5.8. Describe the stages of inflammation	<ul style="list-style-type: none"> • Vasodilation and increased permeability of blood vessels • Emigration of phagocytes • Tissue repair
	5.9. Define and describe the 4 classes of allergic reaction	<ul style="list-style-type: none"> • Type I (anaphylactic) reactions • Type II (cytotoxic) reactions v Type III (immune complex) reactions • Type IV (cell-mediated) reactions
	5.10. Describe the interaction of allergens and antibodies in creating an anaphylactic reaction	<ul style="list-style-type: none"> • Substances that may trigger anaphylactic reactions • IgE antibodies and antigens • Mast cells in areolar connective tissue • Circulating basophils • Interaction of allergens with IgE antibodies • Mediators of anaphylaxis • Histamine

		<ul style="list-style-type: none"> • Prostaglandins • Leukotrienes • Kinin • Effects of anaphylactic mediators • Vasodilation • Increased blood capillary permeability • Increased smooth muscle contraction in airways • Increased mucous secretion • Localised anaphylactic reactions • Hives • Eczema • Swelling of lips and tongue • Abdominal cramps • Diarrhoea • Systemic anaphylactic reactions • Respiratory problems • Cardiovascular failure
	5.11. Explain how certain chemicals in hair products trigger cell-mediated (type IV) reactions	<ul style="list-style-type: none"> • Introduction of artificial chemicals to the skin such as: <ul style="list-style-type: none"> - Paraphenyline diamine (PPD) - Toluene – 2.5 diamine - Resorcinol - Glyceryl thioglycolate • Presentation of symptoms - 12 to 72 hours • Preventative clinical strategies • Patch testing • Migration of Langerhans cells to lymph nodes and role of T-cells • Sensitisation • Proliferation and migration of T-cells to site of allergen entry

Assessment	
MCQ	

Guide to taught content

The content contained within the unit specification is not prescriptive or exhaustive but is intended to provide helpful guidance to teachers and learners with the key areas that will be covered within the unit, and, relating to the kinds of evidence that should be provided for each assessment objective specific to the unit learning outcomes.

Document History

Version	Issue Date	Changes	Role
v1	08/08/2019	First published	Qualifications and Regulation Co-ordinator