**Phase 1 syllabus (PTS-approved)**

# Introduction

Dear Phase 1s,

Welcome to Sheffield Medical School!

Below is a checklist of key topics covered in Phase 1 which was written by Jon Emberey, and edited by several Phase 1 coordinators since, on behalf of the Sheffield Medical School Peer Teaching Society. This was written as a rough guide for your learning and covers most topics which are broken down into systems. DO NOT PANIC and feel like you must know everything perfectly- we have colour-coordinated the topics in order of importance. Green means you should know the topic well, yellow requires slightly less in-depth knowledge but it’s still important to know, and red means you should only have a vague idea about the topic. Your lecturers will also often stress key points they think are likely to come up in your exams and these should therefore be focused on.

Please also use the Peer Teaching Website ([https://www.peerteaching.co.uk](https://www.peerteaching.co.uk/)) for useful resources, revision aids and information or for contact information.

Good luck and enjoy every minute of your time here!

Peer Teaching Society Committee 2021/2022

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| **Module** | **Topic** |
| Introduction to Medical Sciences | *Anatomy*All of the anatomy taught in this module is taught again in-depth later in the year so don’t stress about any of it. Focus on the biochem and socializing ☺ *Cells** Organelles
* Cell membrane (structure/function)
* Membrane protein types
* Movement across membranes

*Homeostasis** Cell communication method
* Positive and negative feedback
* Water distribution
* Water homeostasis
* Electrolyte imbalances (BASICS)
* Oedema types

*Molecular building blocks** Carbs+glycosidic bonds
* AAs + peptide bond
* Protein structures (primary/secondary/tertiary/quaternary)
* Enzyme function

*DNA/RNA** DNA replication
* Transcription
* Translation
* DNA structure

*Mitosis/Meiosis** Cell cycle stages + appearance on microscopy
* Gonadal mosaicism
* Gametogenesis
* Mitotic abnormalities

*Genetic Diseases* * Phenotype vs genotype
* Examples of autosomal dominant/recessive, sex-linked diseases
* Definitions: penetrance, variable expression, sex limitation
* Karyotypes (interpretation e.g. male/female/trisomy 21)
* Mendelian vs multifactorial disease
* Knudson 2-hit hypothesis

*Metabolism* * Definition of metabolism
* Energy storage in carbs, protein, lipids, alcohol
* BMR & factors changing it

*Energy* * Glycolysis
* Krebs cycle
* Oxidative phosphorylation + electron transport chain
* Fatty acid oxidation (beta oxidation)
* Ketogenesis + when ketones are used
* ATP-ADP cycle

*Acid-base balance** pH
* H+ control
* Buffers examples
* Metabolic+respiratory acidosis/alkalosis
* Henderson-Hasselbach equation
* Anion gap

*Oxygen toxicity* * Reactive oxygen species & their use
* Reactive oxygen species formation
* Defense against oxygen toxicity (catalase, glutathione peroxidase, antioxidant vitamins)
* Haber-Weiss and Fenton’s reaction

*Histology* * Types of stains & their use/appearance
* Epithelium types and where they can be found
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| Cardiovascular | *Heart + vessels anatomy* * Anatomy of the heart (chamber and vessels)
* Heart valves + papillary muscles
* Heart surfaces
* Valve auscultation (location in relation to ribs not sounds)
* Coronary arteries and what they supply
* Cardiac conduction system
* Referred heart pain
* Pericardium (structure, sinuses)
* Vagus and phrenic nerves path (in relation to the hilum + diaphragm)
* Aorta branches
* Superior vena cava
* Aortic arches

*Cardiac cycle** What occurs during systole
* What occurs during diastole
* Starling’s law of the heart
* Duration of systole and diastole
* How sympathetic and parasympathetic nervous systems affect the heart rate

*Circulation* * Pulmonary vs systemic circulation (BP differences, etc)

*Equations* * Stroke volume
* Ohm’s law
* Pulse pressure
* Poiseuille’s and blood flow
* Mean arterial pressure

*Central and peripheral circulation control* * Local, neural, and hormonal vasodilators and vasoconstrictors
* Baroreceptors and chemoreceptors, their location and how they function

*Electrical conduction* * Basic ECG (PQRST) interpretation/understanding
* Calculating the heart rate
* Conduction pathway of the heart
* Difference between skeletal muscle and heart muscle
* Action potential stages in a heart muscle cell

*Blood* * Composition (WBC/RBC/platelets/soluble proteins)
* Platelet function and clotting cascade (brief overview)
* RBC function
* WBC function
* Awareness of blood cell disorders: sickle cell, low haemoglobin, low platelets e.t.c

*Histology** Muscle types and their defining features
* Intercalated discs
* Cell types: different WBCs, RBC, platelets
* Structure of arteries, veins, different capillary types, and how this all relates to their function

*Embryology* * Stages of heart formation
* Foetal circulation and changes that occur at birth
* Aortic arches
* Heart fields
* Vasculogenesis
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| Respiratory | *Anatomy** Muscles of the anterior chest
* Sternum
* Intercostal muscles
* Lungs (fissures, lobes, borders, surfaces,) – bronchial tree
* Hilum (contents, differences between right and left)
* Pleura
* Larynx + cartilages (paired vs unpaired)
* Pharynx + pharyngeal constrictors
* Airways – trachea to alveoli
* Thyroid – structure and innervation + blood supply
* Diaphragm – openings, hiatuses, innervation, function
* Physical process of breathing (pump handle and bucket handle movements)
* Axillary fold
* Anterior triangle of the neck
* Killian’s dehiscence
* Laryngeal muscles + ligaments
* Nasal sinuses – nasal anatomy\*
* Waldeyer’s ring
* Azygous and hemiazygous veins
* Kiesselbach’s plexus\*

\*Taught randomly at the end of GI but fits better here*Respiratory pump* * Muscles involved, nerves involved, pleura
* Inspiration and expiration steps

*Control of respiration* * Pontine and medullary respiratory sensory
* Mechanical and chemical receptors (C-fibres, J-fibres, RASR, SASR)
* Respiratory drive
* Alveolar recruitment

*Gas exchange* * Surface area of lungs
* 7 layers of gas exchange
* Ventilation/perfusion mismatch

*Oxygen dissociation curve* * Haemoglobin saturation and how different factors shift it to the left/right

*Equations* * Dalton’s law
* Boyle’s law
* Henry’s law
* Alveolar gas equation
* Laplace’s law and the importance of surfactant

*Acid/base balance* * Acid/base dissociation curve
* Henderson-hasselbach equation
* Respiratory acidosis/alkalosis

*Hypoxia and hypercapnia* * Causes of hypoxia
* Causes of hypercapnia
* Differences between T1 and T2 respiratory failures

*Spirometry* * Flow/volume curve
* Volume/time curve
* Airway obstruction vs restriction and example of disease causing each

*The ageing lung* * Effect of age on the lung, gas exchange, immunity, etc.

*Hypersensitivity* * Types of hypersensitivity and their characteristics (Gell and Coombs)
* Cells involved in hypersensitivity and their roles
* Effect of histamine in T1 reaction
* Mechanism of anaphylaxis

*Airway tone** Bronchoconstriction vs dilation
* Nicotinic and muscarinic receptors
* Sympathetic stimulation
* Parasympathetic stimulation

*Host defense* * Mechanisms – innate vs adaptive immunity
* Respiratory/alveolar epithelium
* Mucus composition

*Extreme conditions** Effect of diving/altitude on respiration

*Histology** Respiratory epithelium
* Nose and olfactory epithelium
* Type 2 pneumocyte
* Differentiating between airway types

*Embryology* * Respiratory diverticulum and lung buds
* Foetal circulation and effect of first breath
* Type 2 pneumocyte production and premature babies
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| GI | *Anatomy* * Surface markings (lines +. Reference points such as transpyloric plane and McBurney’s point)
* Anterior abdominal wall muscles
* Rectus sheath
* Bowel nerve supply (splanchnics)
* Anatomy of the stomach
* Anatomy of the duodenum (4 sections)
* Anatomy of the small + large intestines with differences in blood and nerve supply
* Coeliac truck + branches
* Peritoneum
* Retroperitoneal organs (SAD PUCKER)
* Greater and lesser omentum
* Epiploic foramen
* Spleen

*Diet and fuels* * BMR definition
* Factors affecting BMR
* Vitamins (sources and deficiency)
* Malnutrition definition
* Calculating BMI

*Swallowing and defaecation* * Stages of swallowing (voluntary, involuntary, involuntary)
* Muscles involved in swallowing
* Stages of defaecation
* Gag reflex

*Saliva** Salivary glands – innervation, location, structure
* Acinar and duct cells
* Function of saliva

*Physiology of stomach* * Cell types within the stomach
* Gastric acid secretion and its regulation (cephalic, gastric, intestinal)
* Gastric motility, peristalsis, emptying
* Defense against acid secretion

*Intestinal physiology* * Water distribution in the body
* Ion transport in the intestines
* Where are different vitamins absorbed in the body
* Where is bile absorbed in the intestines

*Digestion and absorption* * Carbohydrate and starch digestion
* Proteins – digestion and absorption
* Lipids – cholesterol, bile salts, micelles

*Histology* * Epithelia of the GI tract (mouth, oesophagus, stomach, small intestine & large intestine, rectum, anus)
* Taste buds and their distribution on the tongue
* Types of salivary glands and how they stain
* Stomach-specific cells: parietal and chief cells
* Differences between parts of the small intestine (villi, crypts etc), and the large intestine

*Embryology* * Stages of oesophageal development
* Division of foregut/midgut/hindgut and their innervation
* Development and innervation of the stomach
* Midgut development stages: elongation, herniation, rotation, retraction
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| Liver  | *Anatomy* * Liver anatomy (lobes, ligaments)
* Impressions on the liver
* Calot’s triangle
* Portal system
* Liver lobules, acini, sinusoids,
* Structure of the gallbladder + biliary tree

*Liver storage* * Fat soluble vitamins
* Vitamins and iron storage

*Liver detoxification* * Xenobiotics (definition and examples)
* Phase 1 and phase 2 reactions
* Oxidation, reduction, hydrolysis, glucuronidation
* Cytochrome P450 function

*Production of protein* * Albumin – function, production, deficit
* Clotting factors
* Complement factors

*Fat metabolism* * Energy reserves in the body
* Differences between white and brown fat
* Enzymes – lipoprotein lipase, hepatic lipase
* Beta oxidation

*Nitrogen balance* * Urea cycle
* Glucose/alanine cycle

*Gall bladder** Production and contraction of bile
* Bilirubin and enterohepatic secretion of bile salts

*Exocrine pancreas* * Phases of secretion
* Secretion of bicarbonate
* Control of secretion – stimulation and inhibition

*Embryology* * Liver bud formation
* Formation of liver and gallbladder
* Formation of the pancreas

*Histology* * Sinusoids and sinusoidal macrophages
* Portal triad
* Exocrine vs endocrine pancreas
* Pancreatic ducts
* Gallbladder structure
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| Neuro | *Anatomy of the brain* * Lobes and their function (frontal, parietal, occipital, temporal), gyri, sulci
* Location of primary areas (motor cortex, visual cortex, Broca’s area, Wernicke’s area, somatosensory cortex)
* Forebrain, midbrain, hindbrain
* Meninges
* Blood brain barrier
* Ventricles and CSF outflow
* Cerebellum structure and function, communication fibers (mossy, climbing, purkinje)
* Symptoms of cerebellar damage

*Cerebral vasculature* * Circle of Willis
* Venous drainage + sinuses
* Which lobes are supplied by which arteries
* Cavernous sinus & structures passing through it
* Berry aneurysms and stroke

*Anatomy of the skull** Bones of the face
* Cranial foramen and structures passing through them

*Cranial nerves** Function, origin, motor/sensory/both
* Be able to interpret what damage to a cranial nerve would present as based on your knowledge of their function

*Anatomy of the spine** Differences between different vertebrae (cervical, thoracic, lumbar)
* Structure of the intervertebral discs
* Ascending and descending pathways (motor and sensory) 🡪 spinothalamic, corticospinal, DCML, etc.
* Muscles of the spine
* Conus medularis, spina equina

*Axons and transmission** Structure of different axons
* Axons sheath differences in CNS and PNS
* Types of synapses (excitatory, inhibitory, modulatory)
* Axonal and synaptic impulse
* Stages of axonal transmission

*Pain* * Types of pain
* C and A delta nerve fibres
* Substance P
* Action of opioids
* Descending pain pathway
* Anaesthetics and analgesics
* Periaqueductal grey
* Melzack-wall pain gate

*Neuromuscular junction, muscle spindles, tendon golgi bodies** Motor unit
* Tendon golgi apparatus
* Muscle spindle
* Stretch, withdrawal, clasp knife reflexes
* Differences between upper and lower motor neuron weakness

*Vision* * Visual fields
* Ocular muscles and their innervation and function
* Anatomy of the eye
* Layers of the retina

*Auditory systems* * Auditory conduction
* Vestibulo-choclear system and its function
* I’M AUDITORY (auditory pathway)

*Basal ganglia* * Anatomy, location, structure
* Function
* Limbic system + Papez circuit
* Interaction with striatum and substantia nigra

*Embryology* * Neurulation
* Prosencephalon, mesencephalon, rhombencephalon and their divisions
* Formation of the ventricles
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| SUGER | *Anatomy** Inguinal canal (borders, structures passing through)
* Anatomy of female genitalia: ovaries, vagina, uterus, external
* Anatomy of male genitalia: testicles, penis, prostate, ejaculatory duct, urethra
* Differences between male and female urethra
* Anatomy of kidney and adrenal glands
* Ureteric narrowing sites (where kidney stones can get stuck)
* Anatomy of the urogenital triangle (and structures)
* Pelvic floor muscles

*Renal physiology* * GFR
* Filtration and pressures at the glomerulus
* Filtration barrier
* Concepts of osmolality and osmolarity
* Structure of a nephron
* Ion and water transport at the nephron
* Hormones and their function: angiotensin 2, parathyroid, aldosterone, ANP, vasopressin
* Metabolic/respiratory acidosis/alkalosis

*Renal endocrinology* * RAAS
* Structure of adrenal gland and hormone production
* Function of cortisol, adrenaline
* EPO
* Hormone receptor locations, secondary messenger theory

*Skin** Layers of the skin
* Skin as a barrier 🡪 brick wall model
* Junctions and adhesions molecules
* Effect of increased/decreased adhesion
* Stages of acne formation

*Pituitary gland** Negative and positive feedback loops
* Differences between anterior and posterior pituitary gland
* Axis of anterior and posterior pituitary gland (oxytocin, vasopression, ACTH, TSH, LH, GH, prolactin)

*Pancreas** Cell types in islet of Langerhans
* Function of insulin
* Physiological response to high/low glucose
* Mechanism of insulin secretion

*Thyroid gland* * Anatomical structure – innervation, division, etc
* Production of thyroid hormone
* Differences between T3 and T4
* Function of thyroxine
* Parathyroid gland – structure, function, etc.

*Reproduction* * SRY gene and its importance
* Meiosis (already done in IMMS)
* Oogenesis, spermatogenesis
* Spermiogenesis – know the difference between spermiogenesis and spermatogenesis
* Hypothalamic-pituitary-gonadal axis
* Changes at menopause
* Changes at puberty
* Blood-testes barrier

*Pregnancy and menstrual cycle* * Stages of menstrual cycle – hormones involved, changes to the lining, etc.
* Be able to identify hormones involved in the menstrual cycle off of a graph (based on levels in certain
* Fertilization and implantation
* Follicular development
* Layers of the uterus and cervical ripening
* Maternal adaptations during pregnancy
* Stages of labour & hormones involved in its initiation
* Placenta: hormones, function, structure

*Micturition* * Control of micturition (nerve supply to muscles in the bladder) 🡪 mnemonic “Parasympathetic makes you Pee”
* Mechanisms of voiding and storage

*Histology* * Histology of the kidney
* Histology of the nephron, urethra, prostate
* Histology of the spermatic cord
* Histology of vaginal epithelial squames
* Leydig cells
* Corpus luteum
* Anterior and posterior pituitary gland, pineal gland, parathyroid gland
* Pancreatic islets
* Layers of the skin
* Breast tissue

*Embryology* * Genital development
* Mullerian and Wolffian ducts
* Development of the kidneys
* Primordial germ cell migration
* Development of external male and female genitalia
* Uterine development
* Development of bladder and urethra
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| MSK | *Anatomy** Muscles and innervations of the anterior/medial thigh
* Gluteal region and posterior thigh + pelvis
* Anterior and lateral leg – including blood supply, patella, tibia, fibula
* The foot – bones, innervation
* Lower limb blood supply
* Shoulder and back – rotatory cuff etc
* Axilla and the brachial plexus
* Brachial Plexus Injury – muscle supply
* Anterior aspect of the arm
* Forearm and the cubital fossa (and things passing through it)
* Hand – carpal bones, innervation, superficial palmar arch, carpal tunnel, muscles)
* Myotomes of the arms and legs
* Joints of the upper limb – elbow wrist, fingers

*Bones: types, functions, etc.** Function of bones
* What are the types of bones (primary/secondary/short/flat)
* Endochondrial ossification
* Intramembranous ossification
* Stages of vitamin D absorption + production
* Calcium haemostasis

*Fractures and healing** Stages of healing (hematoma, inflammation, repair, remodeling)
* Types of fractures

*Ligaments and tendons** Hierarchy of ligament structure
* Compare/contrast ligaments and tendons
* Types of joints (functional classification as well)
* Types of synovial joints
* Hyaline cartilage composition
* Collagen types and where they can be found
* Collagen synthesis

*Cells inside the bone** Osteoclasts, osteoblasts, osteocyte – function and maturation
* Bone remodeling – how it functions and what cells&mediators are involved
* RANK signaling system and its function
* Coupling in osteoclast-osteoblast communication

*Histology* * Types of muscle: smooth, skeletal, cardiac, and their structure
* Skeletal muscle terminology (from the sarcomere to the epimysium)
* Skeletal muscle fibre types (1, 2a, 2b)
* Muscle spindle
* Types of cartilages (hyaline, elastic, fibrous)
* Structural differences between primary and secondary bone
* Haversian canals
* Differences between osteoblasts and osteoclasts
* Endochondrial ossification and zone of hyperplasia
* Developing membrane bone
* Sharpey’s fibres
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| Public Health | There is a public health document on the drive already which is a great guide for what you need to know. Make sure to remember specific case studies (such as the Black Report).  |