

## Physiology Syllabus for the GSSE

In preparation of the Generic Surgical Sciences Exam (GSSE), prospective surgical trainees should have a thorough understanding of human physiology as it relates to homeostasis and to the pathophysiological states applicable in clinically relevant diseases/disorders of the human body system. This includes diseases/disorders that may be managed medically, but may also impact upon surgery. Exam candidates should be able to integrate knowledge of the body's systems and functions, and contrast normal physiology with the effects of disease/disorders of function and degeneration.

The following syllabus is intended as a guide to the breadth and depth of topics to be covered in preparation for the GSSE exam and candidates are encouraged to read widely around these topics to gain a full understanding of human physiology. There are a number of resources available to assist in the preparation of the exam, available on the College website.

The Pathology/Physiology paper consists of 60 Physiology question, and 65 Pathology questions. Candidates are required to achieve a minimum pass standard for each component (ie Physiology AND Pathology AND Anatomy), and failure to achieve the minimum pass standard in any component will result in a failure of the entire examination.

Trainees should be able to demonstrate an understanding of the relevant basic principles of physiology as applied to surgical presentations and conditions in children and adults including:

### Physiology of Specific Organ Systems

#### **Cardiovascular System (10 questions)**

- Electrical activity of the heart
  - ✓ Structure of conduction system
  - ✓ Generation and interpretation of EEG in normal and pathological states
    - Arrhythmias
    - Infarction
    - Systemic electrolyte imbalance
- Function of the heart as a pump
  - ✓ Normal pulsatile blood flow
  - ✓ Assessment and regulation of cardiac output and blood flow in normal, exercising, shock and diseased states
- Anatomy and haemodynamics of the circulatory system
  - ✓ Regulation of blood flow in normal, exercising and diseased states
  - ✓ Foetal and paediatric circulation
  - ✓ Regional specific circulation in healthy and disease states
    - Brain, Heart, Lungs, GIT (including liver), kidneys, skeletal muscle, skin
- Assessment and management of fluid balance in the perioperative period

#### **Endocrine System (5 questions)**

- Basic concepts of endocrine regulation
  - ✓ Hormone control, secretion, transport, action and feedback mechanisms
  - ✓ Understanding and interpretation of test of endocrine function
  - ✓ Understanding of the consequences of depletion or excess of hormones on body systems
    - Pituitary hormones
    - Thyroid hormones
    - Parathyroid hormones, Vitamin D and control of calcium homeostasis
    - Adrenocortical hormones
    - Pancreatic hormones
    - Renal and cardiac hormones
    - Reproductive hormones
- Pathophysiological conditions of the endocrine system
  - ✓ Disorders of the Pituitary gland
  - ✓ Disorders of Thyroid and Parathyroid glands
  - ✓ Disorders of the Adrenal glands
  - ✓ Diabetes
- Principles of management of disorders of the endocrine systems

### **Gastro-intestinal System (10 questions)**

- Understand gastrointestinal physiology and motility, including
  - ✓ General principles of blood supply and circulation of the GIT,
  - ✓ Nervous and hormonal control mechanisms of the GIT,
  - ✓ Motility of specific segments of the GIT such as
    - Mouth, oropharynx, oesophagus
    - Stomach
    - Small intestine
    - Colon
- Ingestion/swallowing mechanisms and regulation
- The regulation of digestion and absorption of the following substances in the GIT
  - ✓ Protein
  - ✓ Lipids
  - ✓ Vitamins
  - ✓ Minerals
- Secretory function and regulation within specific regions of the GIT
  - ✓ Saliva
  - ✓ Gastric secretions
  - ✓ Bile
  - ✓ Pancreatic secretions
  - ✓ Small Bowel
  - ✓ Colon
- Physiological functions of the liver including
  - ✓ Fluid balance and disorders of the GIT
  - ✓ Acid base regulation in the GIT
- Application of physiology knowledge towards disorders which include (but not limited to):

- ✓ Diarrhoea
- ✓ Cystic Fibrosis
- ✓ Cholelithiasis
- ✓ Hirschsprung's disease etc
- Application of physiology knowledge towards disorders following surgery which include (but not limited to):
  - ✓ Post gastrectomy
  - ✓ Surgery for Chron's disease
  - ✓ Short Gut Syndrome
  - ✓ Vagotomy etc

### **Metabolism & Nutrition (5 questions)**

- Understand the principles of
  - ✓ Energy metabolism & metabolic rate
  - ✓ Carbohydrate metabolism
  - ✓ Protein metabolism
  - ✓ Lipid metabolism
  - ✓ Calcium and bone metabolism
  - ✓ Vitamin + dietary balances
  - ✓ Thermoregulation
  - ✓ Metabolic response to injury
- Understand the control and maintenance of nutrition
  - ✓ Effects of malnutrition
  - ✓ Effects of vitamin deficiencies
  - ✓ Principles of enteral and parenteral feeding methods

### **Neurophysiology (5 questions)**

- Understand the basic physiological principles of nerve conduction as they relate to
  - ✓ Maintenance of resting potentials and transmission of action potentials
  - ✓ Neurotransmitters at the neuromuscular junction.
  - ✓ Smooth and striated muscle contraction.
- Define monosynaptic spinal reflex arc, complex reflex arc.
  - ✓ Discuss the physiological factors affecting muscle tone.
- Understand the role of the autonomic nervous system in homeostasis
- Understand the physiological principles of the
  - ✓ Blood Brain Barrier
    - Its physiological significance in control of drug delivery, respiration and glucose metabolism
  - ✓ Cerebral Blood Flow
    - Auto regulation of cerebral blood flow
    - Cerebral perfusion pressure and its clinical significance
  - ✓ Cerebrospinal fluid and Intracranial pressure
    - CSF production, circulation, regulation and absorption
- Understand the neurophysiology of the special senses
  - ✓ Vision, perception of light & colour, visual accommodation
  - ✓ Taste and smell

- ✓ Hearing
- Understand the functions of the hypothalamic pituitary axis.
  - ✓ List the hormones released by the pituitary and their functions on the end organs.

### **Physiology of blood (5 questions)**

- Understand the role of bone marrow and spleen in haemopoiesis
- Define the components of blood and their role in health and disease
- Understand the mechanisms of haemostasis
- Understand common disorders of coagulation (both pro and anticoagulant states)
- Understand the effects of drug therapies on coagulation
- Be able to interpret of tests of haemostatic function
- Understand the options available for fluid replacement and fluid resuscitation and their appropriate use
- Understand the role of blood type and blood transfusion in the management of surgical patients
- Understand how transfusion related reactions occur and their management

### **Respiratory System (10 questions)**

- Pulmonary Ventilation
  - ✓ Mechanics of pulmonary and alveolar ventilation
  - ✓ Ventilation-Perfusion relationships
  - ✓ Physiological anatomy of the circulatory system of the lungs
- Gas exchange and pH balance
  - ✓ Diffusion of gasses across differing body tissues
  - ✓ Oxygen exchange mechanisms
  - ✓ Carbon dioxide exchange mechanisms
- Regulation of respiration
  - ✓ Central and peripheral control mechanisms
  - ✓ Chemical control mechanisms
- The role of the upper respiratory tract in respiration
  - ✓ Nose and paranasal sinuses, oropharynx, larynx and trachea
- Understanding and interpretation of tests of respiratory function
- Understanding of the differences in neonatal, paediatric and adult respiratory function as it relates to surgical conditions
- Understand impact of pathophysiological conditions on respiratory function
  - ✓ Obstructive conditions
  - ✓ Restrictive conditions
  - ✓ Traumatic injury
  - ✓ Pulmonary oedema
  - ✓ Hypoxia
  - ✓ Hypercapnia and respiratory causes of pH imbalance
  - ✓ Obstructive sleep apnoea

### **Urinary Tract (10 questions)**

- Fluid homeostasis within the body

- ✓ Intracellular and extracellular fluids, regulation and excretion of water
- ✓ Influence of electrolytes/glucose etc on fluid homeostasis
- ✓ Control of blood volume and cardiovascular function
- Physiological anatomy of the kidneys
  - ✓ Renal blood flow in health and disease
  - ✓ Glomerular filtration, renal tubular reabsorption and secretion
  - ✓ Urine concentration and dilution
  - ✓ Control of micturition and urine storage
- Renal control of electrolyte balance
- Renal control of acid-base homeostasis
- Renal impairment
  - ✓ Acute and chronic renal impairment and its effects on homeostasis
  - ✓ Changes to drug metabolism as a result of renal impairment AND of drugs on renal function
  - ✓ Principles of haemodialysis
  - ✓ Management in the surgical patient