Foundation to Human Physiology

Year 1 Semester 1

Credits : 3

Responsible Department: Department of Physiology

Module Coordinator : Prof Tharaka Dassanayake

Topic / Concept	Objectives	Time (h)	T/L activity	Comments
1. Homeostasis **1.1 Introduction to body homeostasis**	1. Explain the term internal environment. 2. Explain the mechanisms by which the various systems of the body maintain homeostasis. 3. Explain what is meant by "feedback mechanisms" 4. Explain giving an example, how homeostasis is disturbed.	1h	Lecture	
1.2. Body composition, membrane transport mechanisms, fluid and electrolyte balance and pH				
a. **Body composition**	1. List the body fluid compartments and state the percentages of water and concentration of electrolytes in each compartment. 2. State the composition of the body in terms of body water, lean body mass and body fat and the variations in body composition (Introduce body mass index- BMI). 3. State the different methods available to measure body composition . 4. State the basis of estimation of body fat from	4h	Lecture (1 h) + PD (3 h)	

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	skin fold thickness. 5. Measure skin fold thickness in common sites and determine the body fat percentage. 6. Determine BMI from anthropometric measurements and state the basis of its use as an index of obesity.			
b. Membrane transport & Ion channels	1. Explain the following membrane transport mechanisms: simple diffusion, facilitated diffusion, active transport, phagocytosis, pinocytosis and osmosis. 2. Describe the functions of ion channels and transport proteins and explain how they contribute to selective permeability of the plasma membrane.	2h	Lecture	PD 2hours on membrane transport to be done with body composition practical
c. Resting membrane potential & Action potential	1. Explain the ionic basis of the resting membrane potential. 2. Explain the ionic basis of generation and propagation of an action potential along a nerve.	2h	Lecture	
d. Electrical and chemical basis of nerve, muscle, Neuromuscular junction, synapse, neurotransmitters and Neuromuscular junction blockers	1. Describe the functional anatomy of a neurone. 2. Explain the mechanism of synaptic transmission. 3. Explain the terms - excitatory postsynaptic potentials (EPSP) and inhibitory postsynaptic potentials (IPSP). 4. Describe the main components of the neuromuscular junction in a skeletal muscle and describe how it differs in smooth muscle. 5. Describe the sequence of events during neuromuscular transmission with special reference to acetylcholine release, acetylcholine receptors, ligand-gated ion channels, role of Ca 2+, cholinesterases and end-plate potentials. 6. Explain the actions of different substances that stimulate or inhibit neuromuscular transmission. 7. Explain the derangement in neuromuscular transmission in myasthenia gravis.	2h	lecture - synaptic transmission (1 hr) lecture - NMJ + Blockers (1 hr)	

2. Tissues of the musculoskeletal system: 2.1 Contraction and relaxation of muscle	1.Describe the process of excitation and contraction coupling and muscle relaxation. 2.In a muscle tracing, identify the following phenomena, muscle twitch, summation, tetanus, staircase phenomenon, muscle fatigue, effect of temperature on muscle contraction.	2h 3h	Lecture PD	
2.2 Effect of exercise on muscles Changes in muscle mass to meet the functional demand	1.Describe morphological (ultra-structural) biochemical and physiological adaptations of skeletal muscle that occur in response to exercise. 2.Describe the characteristics of different muscle fiber types. 3.Describe how these are adapted for activities requiring rapid, powerful movements or endurance events. 4.Describe the acute and chronic adaptations of muscles for exercise and training . 5.Explain how body's diverse energy systems interact to transfer energy during rest and different exercise intensities . 6.Describe the role of central and peripheral factors in development of fatigue in skeletal muscle fibers.	2h	Lecture	
2.3 Muscle disorders /dysfunctions	1.State the different types of muscle disorders /dysfunction. 2.Describe the physiological basis of muscle dysfunction in different muscle disorders.	2h	Lecture	
Round up session		2h	SGD– Any of the above areas	

3. **Autonomic Nervous System**	Compare and contrast the sympathetic and parasympathetic NS in terms of, 1. outflow from the CNS/ pre-ganglionic and postganglionic fibres/ neurotransmitters/ receptors. 2. stimulatory and inhibitory actions on different organs. 3. stimulatory and inhibitory drugs that act on the autonomic receptors (eg:- atropine, adrenaline, propranolol, salbutamol). 4. Describe the distribution of the different branches of the sympathetic and parasympathetic systems and their effects on each organ system. 5. Describe the autonomic reflexes concerned with different organ systems.	2h	Lecture	To be timetabled towards the end of the semester
4.Units & measurements	1. Identify basic units of length, mass, volume, temperature in the metric system.	1h	Lecture	To be timetabled towards the beginning of the semester
5. Thermoregulation **5.1Introduction**	1. Recognise that man is a homeothermic animal. 2. Explain what is meant by normal body temperature. 3. State the methods and the sites of measurement of core and superficial temperatures of the body. 4. Describe the routes of heat gain and heat loss. 5. Discuss the factors affecting heat gain and heat loss. 6. State the percentages of heat loss from the different routes in a thermo neutral environment and discuss the changes that take place in different thermal environments.	1h	Lecture	

5.2Mechanisms of regulation of body temperature	1. Explain the role of sweating, vasodilatation and shivering in maintaining body temperature. 2 Explain the role of non-shivering thermogenesis in heat balance. 3. Describe the role of behavioral factors in the control of body temperature. 4. Explain the role of the hypothalamus in body temperature regulation.	2h	Lecture	
5.3Measurement of body temperature	1. Measure oral and axillary temperature using a clinical thermometer. 2.Measure temperature at different sites (ear drum, axilla, skin).	3h	PD	
6.Composition of blood **6.1Blood components**	1. List the components of blood (RBC, WBC, platelets, plasma) and state their functions. 2. Describe the structure and function of red cells. 3. Identify different types of white cells. 4. Explain their role in immunity. 5. State the composition of plasma. 6. State the normal values, explain the basis of testing and interpret the results of PCV, Hb, WBC/DC,ESR. 7. Calculate and interpret red cell indices.	5h	Lecture (2h) PD (3h)	
6.2Anaemia and polycythaemia	1. Define the terms anaemia and polycythaemia. 2. explain the basis of different types of anaemias. 3. Describe the effects of anaemia and polycythaemia on blood flow dynamics. 4. Identify the laboratory tests used to diagnose the various types of anaemias.	2h 2h	Lecture SGD	
6.3Haemostasis	1. Describe the processes of haemostasis and fibrinolysis. 2. Describe basis of tests of haemostasis Note : Clinical focus- Thrombus, embolus	5h	Lectures (2h) PD (3 hrs)	

7.2Bleeding / haemostatic disorders	1. List the common haemostatic disorders and explain the derangements in each. 2. Explain the basis of treatment / control of these disorders.	2h	Lecture	
7.3Blood groups & transfusions	1. Explain the basis of blood grouping, cross-matching and incompatibility. Clinical focus: Transfusion; Transfusion reactions .	2h	Lecture	
7.4 Collection of venous blood	1.Explain the principles underlying venepuncture 2. Perform venepuncture on a model.		PD	Conducted with haemostasis practical