

UNDERGRADUATE PROGRAMME IN BIOCHEMISTRY

Human Physiology

THEORY

- 1. Homeostasis and the organization of body fluid compartments (4 lectures)**
Intracellular, extracellular and interstitial fluid. Homeostasis, control system and their components. Plasma as an extracellular fluid, RBC, molecular mechanism of blood coagulation, role of vitamin K in coagulation, anticoagulant and fibrinolytic systems. Anemias, polycythemia, haemophilia and thrombosis.
[Vander's Human Physiology (2008) Widmaier et al., p2-14, p425-437]
- 2. Cardiovascular physiology (8 lectures)**
Pressure, flow and resistance. Anatomy of heart. Physiology of the cardiac muscle, automaticity of the cardiac muscle contraction, excitation contraction coupling, relationship between cardiac cycle, heart sound, ventricular volumes and the ECG, control of cardiac function and output. The arterial system, venous system, the microcirculation and mechanics of capillary fluid exchange. Control of blood flow to the tissues. Portal circulations. Arterial pressure and its regulation. Hypertension, congestive heart disease, atherosclerosis and myocardial infarction.
[Vander's Human Physiology (2008) Widmaier et al., p360-362, p365-382, p384-422]
- 3. Respiration (5 lectures)**
Organization of the pulmonary system. Mechanism of respiration, pulmonary ventilation and related volumes, pulmonary circulation. Principles of gas exchange and transport. Regulation of respiration. Pulmonary oedema and regulation of pleural fluid. Hypoxia, hypercapnea, pulmonary distress, emphysema, ARDS.
[Vander's Human Physiology (2008) Widmaier et al, p443-478]
- 4. Renal physiology (6 lectures)**
Anatomy of the kidney and the nephron. Regulation of renal blood flow. Cell biology of the Bowmans' capsule. Physiology of glomerular filtration and GFR. Tubular processing of the glomerular filtrate. Micturition reflex and voluntary control of micturition. Regulation of ECF electrolyte and water content, blood volume and long term blood pressure. Blood buffer systems, renal and pulmonary control of blood pH, renal clearance. Assessment of kidney function. Acidosis and alkalosis. Glomerular nephritis, renal failure, dialysis and diuretics.
[Vander's Human Physiology (2008) Widmaier et al., p468, p486-498, p500-521, p523-524]
- 5. Gastrointestinal and hepatic physiology (6 lectures)**
Histology of the gastrointestinal tract. Propulsion and motility of food and digested material. Enteric reflexes, secretory functions of the gastrointestinal tract, digestion and absorption of macro and micronutrients. Peptic ulcer, Sprue,

celiac disease, IBD, regurgitation, diarrhoea and constipation. Anatomy of the hepatic lobule and blood flow into the liver. Formation and secretion of bile. enterohepatic cycle, reticuloendothelial system, metabolic importance of liver. Liver function tests. Jaundice, liver cirrhosis and fatty liver.

[*Vander's Human Physiology (2008) Widmaier et al., p530-561; Textbook of Medical Physiology (2011) Guyton and Hall p837-842; Harper's Biochemistry (2012) Murray et al, p676-682*]

6. Musculoskeletal system (4 lectures)

Bone structure and formation. Physiology of muscle contraction in striated and non-striated muscle.

[*Vander's Human Physiology (2008) Widmaier et al., p55-266, p280-290; Fundamentals of Anatomy and Physiology (2009), Martini and Nath, p189-198*]

7. Reproductive physiology (6 lectures)

Sex determination and differentiation. Development of female and male genital tracts. Spermatogenesis, capacitation and transport of sperm, blood testis barrier. Ovarian function and its control. Uterine changes, fertilization and implantation. Placenta as a feto- maternal unit, gestation and parturition.

[*Vander's Human Physiology (2008) Widmaier et al., p601-612, p615-639*]

8. Neurochemistry and neurophysiology (9 lectures)

Central Nervous system. Peripheral Nervous system. Blood brain barrier and CSF. Membrane potentials. Synaptic transmission. Neurotransmitters. Sensory receptors and neural pathways. Somatic sensation, EEG, sleep, coma, learning and memory.

[*Vander's Human Physiology (2008) Widmaier et al., p138-142, p174-186, p144-171, p192-201, p203-206, p233-237, p245-246*]

Essential Readings

1. Vander's Human Physiology (2008) 11th ed., Widmaier, E.P., Raff, H. and Strang, K.T., McGraw Hill International Publications (New York), ISBN: 978-0-07-128366-3.
2. Harper's Biochemistry (2012) 29th ed., Murray, R.K., Granner, D.K., Mayes and P.A., Rodwell, V.W., Lange Medical Books/McGraw Hill. ISBN:978-0-07-176-576-3.
3. Textbook of Medical Physiology (2011) 10th ed., Guyton, A.C. and Hall, J.E., Reed Elseviers India Pvt. Ltd. (New Delhi). ISBN: 978-1-4160-4574-8.
4. Fundamental of Anatomy and Physiology (2009), 8th ed., Martini, F.H. and Nath, J.L., Pearson Publications (San Francisco), ISBN: 10:0-321-53910-9 / ISBN: 13: 978-0321-53910-6.

PRACTICALS

1. Hematology.
 - a. RBC and WBC counting
 - b. Differential leucocyte count.

- c. Clotting time.
2. Estimation of haemoglobin.
3. Separation of plasma proteins.
4. Determination of total iron binding capacity.
5. Pulmonary function tests, spirometry and measurement of blood pressure.
6. Separation of isoenzymes of LDH by electrophoresis.
7. Histology of connective tissue, liver and/ brain permanent slides.
8. Case studies (Renal clearance, GFR, ECG).