

BIOLOGY

SHORT STUDY NOTES

**HUMAN
PHYSIOLOGY**

CLASS 11

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Human Physiology

Physiology is the study of the characteristics and mechanisms of the human body.

Human Physiology

Human physiology is the branch of science that deals with the study of the functionality of the organ systems of the human body. The complexity of the human body is understood as well as explored when you enter the world of human physiology. That is the reason it is not studied in one go but is divided into various topics, each correlating to the organ system in the human body. Not only the proper functioning but also the malfunctioning called diseases of various systems have been discussed under human physiology.

- It includes various physiological activities like digestion, respiration, spermatogenesis, oogenesis, excretion, all of which occur in a coordinated way between various organs and systems.
- Physiology includes the mechanical, physical, bioelectrical, and biochemical functioning of a healthy human body.
- A normal human body works as a result of the regulated system of networking between different systems. These interactions work towards maintaining homeostasis.
- The concept of homeostasis is important in human physiology as it explains that the internal environment of an organisms moves towards a direction to maintain an equilibrium.
- In the human body, homeostasis is maintained at the system level with each system trying to maintain its homeostasis.
- Human physiology, like human anatomy, describes the mechanisms from the molecular to the cellular level, integrating the working of the entire body.
- Based on the information obtained via studies done on human physiology, it is understood that the cells, tissues, organs, and systems together work to maintain a healthy human body.
- Besides, certain compounds or chemicals produced in the body like enzymes and hormones also aid in the process of human physiology.
- A slight change in the working of a single organ in the body might affect the working of the entire body overall.
- Human physiology is closely related to human anatomy where the anatomy of an organ or tissue plays a significant role in the physiology of the said organ or tissue.
- Human physiology is also interrelated with clinical medicine and microbiology where different microorganisms found within the body aid in different processes like bacteria in the gut producing acid and other enzymes that aid in digestion.
- During the life cycle of humans, the body undergoes multiple changes which are influenced by changes in anatomy and changes in the environmental factors. The physiology of the body thus adapts to such changes to maintain homeostasis.

Subdivision of Human Physiology

Digestive System

- Digestion is important for breaking down food into nutrients, which the body uses for energy, growth, and cell repair.
- The digestive system is not only uniquely constructed to perform its specialized function of turning food into energy but also responsible for packaging the residue for waste disposal.
- It is essential to good health because if the digestive system shuts down, the body cannot be nourished or rid itself of waste.

Respiratory System

- Nostrils are the first part of the respiratory system from where the air enters.
- Trachea also known as windpipe filters the air that is inhaled. Trachea is covered by a lid known as glottis at the time of swallowing of food. It prevents the food from entering into the trachea. It branches into bronchi.
- Bronchi also known as air tubes pass air into the lungs. Bronchi branches into bronchioles.
- Lungs are the respiratory organs of human beings. It is a place where exchange of oxygen and carbon-dioxide occurs. The lungs contain the bag-like structure known as alveoli where actual respiration occurs. Lungs are covered by a membrane known as pleural membrane.
- Respiration is also called 'internal respiration' as it is an internal process of breaking down complex organic compounds into carbon dioxide and water while releasing energy.
- Respiration, unlike breathing, occurs in all living organisms.
- It is an involuntary process that occurs automatically if all the reactants for the reactions are available.
- Respiration takes place in the mitochondria of all the cells throughout the body.
- Respiration is a metabolic process where glucose is oxidized in the presence of oxygen to form carbon dioxide and water.
- Respiration can occur either in the presence of oxygen or in its absence. Respiration in the presence of oxygen is aerobic respiration, whereas the respiration in the absence of oxygen is anaerobic.
- The reactions involved in cellular respiration are catabolic reactions which break down complex compounds into simple ones.
- The process of respiration is dependent on various enzymes that catalyze different steps in the metabolic pathway. These enzymes regulate the rate and direction of these reactions.
- Cellular respiration occurs through a number of cycles like glycolysis, Krebs's cycle and electron transport chain. All of these reactions together result in a large amount of energy and oxidation of organic compounds.
- The nutrients that are commonly used by organisms during respiration are carbohydrates, amino acids and fatty acids. The most common oxidizing agent is molecular oxygen, although other chemicals like sulphur and nitrogen can also be used.
- Although respiration is mostly associated with the release of carbon dioxide gas, other forms of respiration like fermentation are also equally important.
- Respiration is an important metabolic process as it is mostly a passive process, resulting in a large number of ATPs.

Circulatory System

- The heart's bottom right pumping chamber (right ventricle) sends blood that's low in oxygen (oxygen-poor blood) to the lungs. Blood travels through the pulmonary trunk (the main pulmonary artery).
- Blood cells pick up oxygen in the lungs.
- Pulmonary veins carry the oxygenated blood from the lungs to the heart's left atrium (upper heart chamber).
- The left atrium sends the oxygenated blood into the left ventricle (lower chamber). This muscular part of the heart pumps blood out to the body through the arteries.
- As it moves through your body and organs, blood collects and drops off nutrients, hormones and waste products.
- The veins carry deoxygenated blood and carbon dioxide back to the heart, which sends the blood to the lungs.
- Your lungs get rid of the carbon dioxide when you exhale.

Excretory System

- The excretory system is the system of an organism's body that performs the function of excretion, the bodily process of discharging wastes.
- The Excretory system is responsible for the elimination of wastes produced by homeostasis.
- There are several parts of the body that are involved in this process, such as sweat glands, the liver, the lungs and the kidney system.
- Every human has two kidneys.
- Each kidney is made up of three sections: the renal cortex, the renal medulla and the renal pelvis.
- The blood arrives at the kidney via the renal artery, which splits into many afferent arterioles.
- These arterioles go to the Bowman's Capsules of nephrons, where the wastes are taken out of the blood by pressure filtration.
- Peritubular capillaries also surround the nephron so substances can be taken in and out of the blood.
- The renal cortex is the outer layer of the kidney and the medulla is the inner layer of the kidney.
- The renal pelvis takes urine away from the kidney via the ureter.
- Both of the ureters lead the urine into the body's only urinary bladder, which expands and sends nerve impulses when full.
- From there, urine is expelled through the urethra and out of the body.

Nervous System

- The nervous system or the neural system is a complex network of neurons specialized to carry messages. The complexity of the nervous system increases as we move towards higher animals.
- For instance, cnidarians such as jellyfish have relatively simple nerve nets spread throughout their body. Crabs have a more complicated nervous system in the form of 2 nerve centers called dorsal ganglion and ventral ganglion.
- As we move further up the ladder, higher organisms such as vertebrates have a developed brain. Moreover, it is one of the most complicated structures in the animal kingdom, containing billions of neurons, all intricately connected.
- In the human body, the neural system integrates the activities of organs based on the stimuli, which the neurons detect and transmit. They transmit messages in the form of electrical impulses and convey

messages to and from the sense organs. Thus, the nervous coordination involves the participation of the sense organs, nerves, spinal cord, and brain.

Endocrine System

- The glands of the endocrine system are termed endocrine glands and are defined by the lack of ducts for the passage of their secretions.
- The endocrine system is considered to work together in coordination with the nervous system. However, the responses of the endocrine system are often slower, and the influence is much broader.
- The endocrine system also depends on the cardiovascular system for the distribution of their products. As a result, the endocrine glands are some of the most vascular tissues in the body.
- The hormones secreted by endocrine glands are effective in very small amounts; thus, the circulating levels of these hormones are typically low.
- The endocrine system also contains cells and tissues that are not exclusively classified as endocrine glands but contain cells that can secrete hormones.
- Some of such cells and tissues are the hypothalamus, thymus, pancreas, skin, heart, and adipose tissues.
- The study of the structure and function of the endocrine glands and the cells, along with the diagnosis and treatment of disorders involving the endocrine system, is termed endocrinology.
- Unlike most other systems in the body, the glands of the endocrine system are not grouped together and remain scattered throughout the body.
- Different hormone systems of the endocrine organs help in the regulation of all body functions like metabolism, growth, electrolyte balance, reproduction, and behavior.
- Most endocrine glands are regulated by a simple negative feedback mechanism, while the secretion is controlled by the nervous and immune systems.

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