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Syllabus for entrance examination. Human biology

Biology is the natural science concerned with the study of life and living organisms, including their structure, function, growth, origin, evolution, distribution, and taxonomy. Biology is a vast subject containing many subdivisions, topics, and theories. Five unifying principles form the fundamental axioms of modern biology: cell theory, evolution, gene theory, energy, and homeostasis.

These fields of human biology are further divided based on the scale at which the organisms are studied and the methods used to study them: human anatomy analyses the morphology of organs, organ systems and of the entire body; biochemistry examines the rudimentary chemistry of life; molecular biology studies the complex interactions of systems of biological molecules, the molecular organization of the cell; genetics analyses the main mechanism, the morphological substrate and the methods used to examine heredity and variability of genetic information; physiology examines the physical and chemical functions of the tissues, organs, and organ systems of an organism; human ontogenesis evaluates the steps of human beings development, from the zygote formation until death.

The main aim of the curricula:

To give the candidates the opportunity to understand the requirements which are necessary for passing the admission examination on Human Biology and successful study of medical topics.

Part I. Nervous system. Sense organs

1. Nervous system structure. Central nervous system, peripheral nervous system – morphological components.
2. Basic functions of the nervous system. Reflexes – formation, structural elements.
3. Principles of nervous impulse formation (receptors – types, location), transmission (afferent/efferent pathways - types, location), and processing (cortical centers of analysis).
4. Superior functions of the nervous system (memory, speech): processing centers location.
5. Sense organs. Location, structure, functions.

Part II. Cardiovascular system

1. Heart, blood vessels, lymphatic system structure.
2. Cardiovascular and lymphatic system main functions.
3. Blood clotting: steps, required blood and humoral elements.
4. Blood cells structure and functions.
5. The influence of the autonomic nervous system on the cardiovascular system.

Part III. Internal organs, endocrine system, metabolism

1. Endocrine system. Main endocrine glands (examples, functions). Exocrine glands (examples, functions).
2. Respiratory system. Structural components, functions, inspiration/expiration mechanisms.
3. Digestive system (mouth, esophagus, stomach, small and large intestines) - structure, functions.
4. Reproductive system. Female reproductive organs – ovaries, oviducts, uterus, vagina and mammary glands. Male reproductive organs – testes, seminal vesicles and penis. Structure, main functions.
5. Energy metabolism (pathways, main processes).

Part IV. Locomotor system

1. Skeletal system. Characteristics of human skeleton. Main human bones and junctions of the cranium, trunk, superior and inferior members.
2. Muscular system. Types of muscles. Main human muscles of the cranium, trunk, superior and inferior members.

Part V. Molecular biology

1. Molecular organization of the cell. Monomers and polymers. Main macromolecules of the cell: proteins, nucleic acids, lipids, carbohydrates – structure, functions.
2. Cell organization. Plasma membrane – structure, functions. Cytoplasm – molecular organization, functions. Cell organelles (Endoplasmic reticulum, Golgy apparatus, lysosomes, mitochondria, cell center, cytoskeleton) – structure, functions, classification. Nucleus – structure and functions.
3. Expression of genetic information – steps, responsible molecules.

Part VI. Mitosis. Meiosis

1. Cell division. Mitosis – stages, biological importance, responsible macromolecules.
2. Meiosis – stages, biological importance, responsible macromolecules.

Part VII. Ontogenesis

1. Human ontogenesis. Definition, steps, main events.
2. Gametogenesis. Peculiarities of gametogenesis in men and women.

Part VIII. Human genetics

- 1 Basic genetics. Heredity and variability. Genetic apparatus of the human cell. Human karyotype.
- 2 Genes. Structure and function of genes. Interaction between genes (allelic, non-allelic).
- 3 Combinative variability. Mutational variability.

Samples of tests. Human biology

1. A1. The ascending pathways of the spinal cord are represented by:
 - a) axons of neurons;
 - b) dendrites of neurons;
 - c) posterior roots;
 - d) anterior roots;
 - e) interneurons.

2. A1. How many pairs of cranio-cerebral nerves emerge from the brainstem?
 - a) 15;
 - b) 10;
 - c) 12;
 - d) 8;
 - e) 14.

3. A1. What blood vessel starts from the right ventricle?
 - a) pulmonary artery;
 - b) pulmonary veins;
 - c) aorta;
 - d) inferior vena cava;
 - e) superior vena cava.

4. A1. Select the endocrine glands:
 - a) salivary glands;
 - b) liver;
 - c) gastric glands;
 - d) sweat glands;
 - e) thyroid gland.

5. A1. Choose the trunk muscles:
 - a) neck muscles;
 - b) shoulder muscles;
 - c) femur muscles;
 - d) leg muscles;
 - e) abdomen muscles.

6. A1. Choose nucleic acids monomers:
 - a) nitrogenous bases;
 - b) nucleosides;
 - c) nucleotides;
 - d) triples;
 - e) amino-acids.

7. A1. Select the transcription description in eukaryotes:
 - a) synthesis of the polypeptide;
 - b) copying of genetic material;
 - c) starts at any place of the DNA molecule;
 - d) takes place in the cytoplasm;
 - e) occurs on both DNA strands.

8. A1. The processes that ensure genetic variability in meiosis occur during:
- prophase I and anaphase I;
 - prophase I and prophase II;
 - telophase I and telophase II;
 - metaphase I and metaphase II;
 - meiosis II.
9. A1. Select the ontogenesis definition:
- population development;
 - historical development of species;
 - development of each individual;
 - complete process of embryonic material movement with the formation of two - three embryonic layers;
 - complete cycle of individual development based on the genetic material realization.
10. A1. Choose the heredity definition:
- basic property of living being which ensure the evolution;
 - represents the genetic structure of organisms which explains the similarities and differences between parents and children;
 - property of organisms that determines similarity between parents and children;
 - the ability of organisms to transmit morphological, physiological, and biochemical traits, from parents to offsprings;
 - property of organisms to differ one from each other.
11. A2. Tactile receptors are located in the:
- arteries;
 - veins;
 - mucosa;
 - capillaries;
 - skin.
12. A2. The middle ear includes the following parts:
- the eardrum;
 - the external auditory canal;
 - bony labyrinth;
 - auditory ossicles;
 - the cochlea.
13. A4. Select the cardiovascular system functions:
- ensures the blood flow through vessels;
 - provides nutrients to the cells;
 - transports carbon dioxide to the cells;
 - carries oxygen to the cells;
 - transports metabolism waste from the cells.
14. A3. Select the endocrine glands:
- thyroid gland;
 - sweat glands;
 - thymus;
 - sebaceous glands;
 - adrenal glands.

15. A2. What bones form the pelvic girdle?
- bone pelvis;
 - femur;
 - leg bones;
 - clavicle;
 - sacrum.
16. A3. Choose the proteins characteristics:
- are biopolymers;
 - amino-acids are their monomers;
 - are macromolecules of globular and fibrillar shape;
 - are carriers of the genetic information;
 - nucleic acids are their monomers.
17. A3. Translation represents the:
- synthesis of the polypeptide;
 - process of digestion in the lysosomes;
 - process of gene activation;
 - process of decoding the genetic information;
 - process realized with tRNA use.
18. A4. Determine what processes occur during the prophase of the first meiotic division:
- chromosomes condensation;
 - conjugation of chromosomes;
 - assembling of homologous chromosomes pairs;
 - crossing-over;
 - movement of sister chromatids to the opposite ends of the cell.
19. A3. Select the embryo layers:
- blastoderm;
 - ectoderm;
 - nerve plaque;
 - endoderm;
 - mesoderm.
20. A4. Choose the variability characteristics:
- property to change the traits;
 - opposite to heredity property;
 - represents the driving force of evolution;
 - is realized by equal separation of chromosomes during mitosis;
 - is source of organisms diversity.