

Reference Materials for HSE Global Scholarship Competition — 2022

Psychology 11th Grade

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Topic 1. Biology as Science

Biology as science. The role of biology in the practical activity of people. Variety of organisms. Distinctive features of representatives of different kingdoms of life. Living organism study methods — observation, measurement, experiment.

Topic 2. Plant Kingdom

Plants. Plant cells, tissues and organs. Vital functions — metabolism and energy transformation, nutrition, photosynthesis, breathing, removal of metabolic products, substance transportation. Regulation of vital functions. Movement. Growth, development and reproduction. The variety of plants, classification principles. Algae, mosses, ferns, gymnosperm and flowering plants. The importance of plants in nature and human life. Essential agricultural crops. Poisonous plants. Protection of rare and endangered plant species. Major plant communities. Complication of plants in the process of evolution.

Topic 3. Animal Kingdom

Animals. Animal body structure. Vital functions and their regulation in animals. Reproduction, growth and development. Behavior. Irritability. Reflexes. Instincts. Animal variety (types, chord classes), the role of animals in the nature and human life. Agricultural and domestic animals. Prevention of diseases caused by animals. Complication of animals in the process of evolution. Adaptation to various habitats. Protection of rare and endangered animal species.

Topic 4. Structure and Functions of Human Body

Support and movement. Musculoskeletal system. Prevention of injuries. The importance of exercises and labor culture for the skeleton and muscle formation. First aid for musculoskeletal system injuries.

Internal environment of the body, the importance of its stability. Substance transportation . Blood and lymphatic systems. Blood. Blood types. Lymph. Blood transfusion. Immunity system. Antibodies. Allergic reactions. Preventive vaccinations. Therapeutic serum.

The cardiovascular system. Structure and functioning of the heart. Heart diseases and prevention measures.

Breath. Respiratory system. The structure of respiratory organs. Gaseous exchange in lungs and tissues. Hygiene of respiratory organs. Diseases of respiratory system and their prevention. Examples of first aid in the case of carbon monoxide poisoning, drowning rescue. Infectious diseases and prevention measures. Health effects of tobacco smoking.

Nutrition. Digestion. Digestive system. Digestive system disorders and their prevention.

The metabolism and energy transformation in the body. Constructive and energy exchange. The exchange of water, mineral salts, proteins, carbohydrates and fats. Vitamins. Balanced diet. Norms and dietary regime.

Skin coverings. The structure and functions of the skin. The role of the skin in thermoregulation. Skin, hair, nail care. First aid techniques in the case of injuries, burns, frostbites and their prevention. Body conditioning.

Excretion. The structure and functions of the excretory system. Diseases of the urinary system organs and their prevention. Reproduction and development. Reproductive glands and germinal cells. Pubertal development. Sexually transmitted infections, their prevention. HIV and its prevention. Hereditary diseases. Medical and genetic counseling.

Fertilization, prenatal development. Pregnancy. Harmful effects smoking, alcohol, drugs on the development of the organism. Childbirth. Development after birth.

Topic 5. Sensory Organs and Perception

Sensory organs. The structure and functions of the vision and hearing organs. Sight and hearing deterioration and its prevention. Vestibular system. Muscular and skin senses. Sense of smell. Taste.

Topic 6. Nervous System

Neurohumoral regulation of vital functions of the body. Nervous system. Reflex and reflex arc.

Topic 7. Endocrine System

Endocrine system. Hormones, mechanisms of their action on cells. Violations of nervous and endocrine systems and their prevention.

Topic 8. Human Behavior

Human behavior and psyche. Unconditioned reflexes and instincts. Conditioned reflexes. Aspects of human behavior.

Topic 9. Psyche and Mental Processes

Speech. Thinking. Thinking and activity. Attention. Memory. Emotions and feelings. Sleep.

Topic 10. Individual and Social Human Aspects

Temperament and character. Aptitudes and talents. Interpersonal relationships. The role of training and education in the development of human behavior and psyche.

Man as a result of biological, social and cultural evolution. The concept of culture. Needs and interests. Worldview. The spiritual life of a person. Values and norms. Motives and preferences.

Public and individual consciousness. Socialization of the individual. Social role. Individual self-consciousness and social behavior. The concept of personality. Freedom and responsibility. Deviant behavior and its types.

Topic 11. General Properties of Living Matter

Distinctive features of living organisms. Aspects of the chemical composition of living organisms — inorganic and organic substances, their role in the body.

Cellular structure of organisms. Cell structure — nucleus, cell membrane, plasma membrane, cytoplasm, plastids, mitochondria, vacuoles. Chromosomes. Variety of cells. The metabolism and energy transformation as a trait of living organisms. The role of nutrition, breathing, substance transport, metabolic products removal in the vital functioning of cells and the organism.

Topic 12. Genetics

The structure and functions of chromosomes. Concentration of hereditary information in the cell. DNA is a carrier of hereditary information. DNA molecule multiplication in the cell. The importance of the consistency of the number and shape of chromosomes in cells. Gene. Genetic code. The role of genes in the biosynthesis of protein. Viruses. Aspects of the virus structure and reproduction. Importance in nature and human life. Virus spreading prevention measures. AIDS prevention.

Heredity and variation — the properties of organisms. Genetics — science studying the laws of heredity and variation. G. Mendel — founder of genetics. Genetic terminology and notation. The laws of inheritance defined by G. Mendel. Chromosomal basis of heredity.

Modern concepts about the gene and genome. Hereditary and non-hereditary variation. The impact of mutagens on the human body. The importance of genetics for health care and selective breeding. Inheritance of traits in humans. Sex chromosomes. Sex linkage. Hereditary human diseases, their causes and prevention. Genetics as a theoretical foundation of selective breeding.

Selective breeding. Biotechnology. The doctrine of N. I. Vavilov on the diversity centers and the origin of cultivated plants. Primary selective breeding methods — hybridization, artificial selection. Biotechnology, its advances, development prospects. Ethical aspects of the development of certain biotechnology studies (human cloning).

Topic 13. Evolutionary Theory

Growth and development of organisms. Reproduction. Asexual and sexual reproduction. Germinal cells. Fertilization. Heredity and variation — the properties of organisms. Hereditary and non-hereditary variation. The system and evolution of the organic world. Species as the basic unit of classification. Characteristic features of species. C. Darwin — the founder of the evolution doctrine. Driving forces of evolution — heritable variation, struggle for existence, natural selection. Evolution results — variety of species, fitness of organisms to the habitat.

The history of evolutionary concepts. The value of the work of C. Linnaeus, the teachings of J. B. Lamarck, the evolutionary theory of C. Darwin. The role of evolutionary theory in the formation of a modern image of the world according to natural sciences. Modern evolutionary doctrine.

Species, its criteria. Population as a basic unit of species, a unit of evolution. Driving forces of evolution, their impact on the gene pool of the population. Synthetic theory of evolution. Results of evolution. Preserving the variety of species as the basis for the sustainable development of the biosphere. Causes of extinction of species. Biological progress and biological regression.

The origin of life on Earth. Hypotheses about the origin of life. Distinctive features of living matter. The increasing complexity of living organisms on Earth in the process of evolution.

Topic 14. Ecology

Relations of organisms and the environment. The environment as a source of substances, energy and information. The impact of environmental factors on organisms. Ecosystem organization of wildlife. Environmental factors, their importance in the life of

organisms. Biological rhythms. Interspecies relations — parasitism, predation, competition, symbiosis. Ecosystem structure. Species and spatial structure of ecosystems. Food links, biogeochemical cycles and energy transformation in ecosystems. Causes of stability and conversion of ecosystems. Artificial communities of agricultural ecosystems.

Biosphere — global ecosystem. The doctrine of V. I. Vernadsky about the biosphere. The role of living organisms in the biosphere. Biomass. Biological cycle (on the example of carbon cycle). Biosphere boundaries. Distribution and role of living matter in the biosphere.

Biosphere evolution. Biosphere and human. Global environmental problems and ways to solve them. Consequences of human activity for the environment. Rules of behavior in the natural environment.

Topic 15. Human Origin

Human origin. Hypotheses about the human origin. Proof of mammals being ancestors of humans. Evolution of man. The origin of human races.

II. Recommended sources:

Primary sources

Kleinman P. *Psych 101: Psychology Facts, Basics, Statistics, Tests, and More!* (Adams 101), 2012.

Myers, D. G. (2010). *Social Psychology*. The McGraw-Hill Companies, New York.

Taylor, D. J.N., Green, P. O., Stout, G. W., Soper, R. (2008). *Biological Science*. Cambridge University Press, 992 pp.

Additional sources

Berne, E. (2012). *Games People Play*. Penguin Books Ltd.

Bloom, F. E., Lazerson, A. (2005). *Brain, Mind, and Behavior*. W.H. Freeman & Company, 457 pp.

Nicholls, J., Martin, A. R., Brown, D. A., Diamond, M. E., Cattaneo, A., De-Miguel, F. F. (2012). *From Neuron to Brain*. Sinauer Associates, 912.

Smith, C. (2008). *Biology of Sensory Systems*. John Wiley & Sons.