

Kaunas University of Medicine

Topics Required for the Entrance Examination MCQ

Academic Year 2008/2009

BIOLOGY

1. Cell Biology

Levels of biological organization. Biologically important elements. Biopolymers.

Microscope (optic, electron).

Heterotrophy, autotrophy. Prokaryotes and eukaryotes. Multicellularity.

Cell structure. Cell membrane. Cytoplasm. Endoplasmic reticulum. Golgi complex.

Mitochondria. Ribosomes. Lysosomes. Vacuoles. Cytoskeleton. Cilia, flagella.

Centrioles.

Basic life functions: ingestion, digestion, secretion, absorption, respiration, excretion, transport, regulation, synthesis, assimilation, reproduction, irritability, movement.

Nucleus. Nuclear envelope. Diffusion through a cell membrane. Active transport.

Endocytosis. Phagocytosis. Exocytosis. Energy production.

Cell division. Mitosis. Cell cycle. Simple organisms (ameba, paramecium, bacteria, viruses).

2. Genetics

Meiosis and sexual reproduction. Fertilization. Diploidy. Haploidy. Polyploidy.

Zygote. Comparison of meiosis and mitosis. Spermatogenesis and oogenesis.

Mendel's laws. Mutations. Mutations and evolution.

Genes and gene interactions. Autosomes. Sex chromosomes. Gene linkage. Crossing over. Recombination. DNA. DNA replication.

Human karyotype. Human karyotype abnormalities.

3. Human Anatomy and Physiology

Tissues: epithelial, nerve, muscle, connective. Digestive tract: oral cavity, pharynx, esophagus, stomach, small intestine, large intestine. Liver, pancreas. Nutritional requirements.

Respiration. Lungs. Hemoglobin and its function. Inspired and expired air.

Blood circulation. Heart. Blood vessels. Lymphatic system.

Blood, plasma, red blood cells, white blood cells. Blood clotting, platelets.

Immune system, immune response. B lymphocytes, T lymphocytes.

Endocrine system. Hypophysis, adrenal, thyroid, parathyroid glands. Hormones.

Kidney, excretion. Glomerulus.

Nervous system. Evolution. Nerve impulses. Cerebral cortex. Response to sensory information. Muscle contraction.

Reproduction. Male and female reproductive system.

EXAMPLE OF MULTIPLE CHOICE QUESTIONS

1. Sex chromosomal pattern in mammals is:

A) XY – female, XX – male

B) YY – female, XX – male

C) XX – female, YO – male

D) XX – female, XY - male

RECOMMENDED TEXTBOOK

Curtis H., Barnes N.: BIOLOGY 5th edition, World Publishers, Inc. New York, 1989

ISBN: 0-87901-394-X or a more recent edition

CHEMISTRY

1. General and Inorganic Chemistry

1. Structure of the atom
2. Electronegativity. Oxidation numbers. Types of chemical bonds.
3. Nomenclature of inorganic and organic compounds.
4. Types of chemical reactions.
5. Chemical equations and their balancing. Stoichiometry.
6. Definition of oxidation and reduction. Oxidizing and reducing agents. Balancing oxidation-reduction equations.
7. Chemical equilibrium and equilibrium constant. Le Chatelier's principle.
8. Reaction rate. Factors influencing the rate of a chemical reaction.
9. States of matter.
10. Solutions and solubility. Concentration and related calculations.
11. Electrolytes and nonelectrolytes. Ionization. Arrhenius and Bronsted-Lowry definitions of acid and base.
12. Ionization of water. pH. Calculations of pH of a strong acid or base.
13. Hydrolysis of salts.
14. Electrolysis. Electrolytic cells.
15. Periodic table of elements. General characteristic of the groups.
16. The utilization of the periodic table for predicting oxidation numbers. Properties, chemical formulas and types of bond within the compounds.

2. Organic Chemistry

1. Classification of organic compounds. Isomers.
2. Saturated, unsaturated and aromatic hydrocarbons.
3. Organic halides.
4. Alcohols, phenols and ethers.
5. Aldehydes and ketones.
6. Carboxylic acids (mono- and polyfunctional).
7. Functional and substitutional derivatives of carboxylic acids.
8. Amines. Nitro compounds.
9. Monosaccharides, disaccharides, and polysaccharides.
10. Triglycerides. Fats and oils.
11. Amino acids. Peptides. Proteins.

EXAMPLE OF MULTIPLE CHOICE QUESTIONS

1. Which of the following compounds is produced when fatty acid reacts with sodium hydroxide?
 - A) soap
 - B) ester
 - C) aldehyde
 - D) alcohol

RECOMMENDED TEXTBOOKS

Hill J.W., Feigl D.M.: CHEMISTRY AND LIFE Macmillan Publishing Company, New York, ISBN: 0-02354970-X or a more recent edition

Seese W.S., Baub G.H.: BASIC CHEMISTRY Prentice-Hall, Inc. Englewood Cliffs, N. Jersey ISBN: 0-13-057811-8 or a more recent edition

PHYSICS

3. Physical Quantities and Units. SI system.

4. Structure and Properties of Matter

Atoms and molecules. Atomic shell structure. Nuclear transformations. Interactions of particles. Forms of energy. States of matter and their alterations. Gas dynamics. Surface tension. Humidity.

5. Mechanics

Mechanical motion and its graphic representation. Centripetal acceleration. Basic forces in nature. Equilibrium. Vibrational motion. Simple harmonic motion and its characteristics (frequency, period, energy).

6. Electricity

Electric fields. Electric circuits. Passive and active components of the electric circuit. Combinations of resistors and capacitors: conductors, semiconductors and insulators. Electric current and its forms. Impedance, capacitance, inductance. Electricity and heat.

7. Magnetism

Magnetic induction. Magnetic, fields.

8. Wave Motion

The representation of waves in various media. Wave interference. Phase and path differences of two waves. The velocity of waves. Properties of sound. Measuring of sound. Ultrasound.

9. Light and Radiation

Electromagnetic spectrum. Visible light. Laws of geometric optics. Image formation by lenses and mirrors. X-rays, ultraviolet radiation, infrared radiation. Types of ionizing radiation, alpha emission, beta emission, gamma ray emission.

EXAMPLE OF MULTIPLE CHOICE QUESTIONS

1. The intensity of buoyant force acting on an object fully immersed in a fluid depends on:
 - A) the object volume and density of the fluid
 - B) the density of the fluid
 - C) the volume and density of the object
 - D) the object volume, object density and fluid density

RECOMMENDED TEXTBOOK

Sternheim M.M., Kane J.W.: GENERAL PHYSICS J. Wiley, N.Y., 1991 ISBN: 0-471-52278-3 or a more recent edition

For all three subjects SAT II and MCAT books are recommended
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