New Uzbekistan University

1. Introduction

This document contains vital information, structural details, and topical guidance for candidates preparing for the New Uzbekistan University (NewUU) Admissions Test in Biology for Medical School.

The examination is rigorously designed to evaluate candidates' foundational knowledge, quantitative problem-solving skills, and analytical reasoning in biology—traits essential for success in a demanding medical curriculum.

2. Core Examination Topics

The biology examination covers the following comprehensive subject areas:

The Chemical and Cellular Basis of Life

- **The Chemical Foundation of Life:** Atomic structure, isotopes, ions, chemical bonding, properties of water (hydrogen bonding, polarity), and the structural importance of carbon.
- **Biological Macromolecules:** Monomer-to-polymer structures, synthesis, and functions of proteins (peptide bonds, folding levels), carbohydrates (monosaccharides, polysaccharides), lipids (triglycerides, phospholipids, steroids), and nucleic acids.
- **Cell Structure and Organelles:** Compartmentalization, structural differences between prokaryotic and eukaryotic cells, and the specialized functions of cellular organelles.
- **Structure and Function of Plasma Membranes:** Fluid mosaic model, selective permeability, mechanisms of passive transport (diffusion, facilitated diffusion, osmosis), and active transport.

Cellular Energetics and Metabolism

- **Energy and Metabolism:** Principles of thermodynamics, forms of energy (potential, kinetic, activation, and Gibbs free energy), and the central role of ATP in coupled reactions.
- **Enzyme Kinetics and Regulation:** Mechanisms of enzyme catalysis, activation energy lowering, active site, and factors altering enzyme activity (pH, temperature, competitive/non-competitive inhibitors).
- **Photosynthesis and Cellular Respiration:** Glycolysis, the citric acid (Krebs) cycle, oxidative phosphorylation (electron transport chain and chemiosmosis), and anaerobic fermentation pathways.

Cell Division and Molecular Biology

- **The Cell Cycle and Division:** Phases of the cell cycle, stages and mechanics of Mitosis versus Meiosis, and the cytological variations in chromosome and DNA counts.
- **DNA Structure and Replication:** Watson-Crick double-helix architecture, semi-conservative replication mechanisms, and proofreading enzymes.
- **The Central Dogma (Gene Expression):** Mechanisms of Transcription and Translation, and molecular genetics.

Genetics and Inheritance Patterns

- **Classical Genetics:** Mendelian principles, monohybrid and dihybrid crosses, testcrosses, and probability metrics.
- **Non-Mendelian and Population Genetics:** Sex-linked inheritance, gene linkage and chromosomal mapping, polygenic inheritance, codominance, and mathematical applications of the Hardy–Weinberg Principle.
- **Genetic Engineering:** Recombinant DNA technology.

Organismal Biology (Botany & Human Systems)

- **Botany:** Distinct plant cell structural elements, tissue systems, plant anatomy and external morphology, and plant physiology.
- **Human Anatomy & Physiology:**
    - Nutrition and Digestive System
    - Nervous System & Sensory Organs
    - Muscular & Skeletal Systems
    - Circulatory & Respiratory Systems (cardiac cycle, gas exchange dynamics, hemoglobin)
    - Urinary & Endocrine Systems (nephron function, hormone)
    - Immune System (innate vs. adaptive immunity, B and T cell kinetics)

Evolutionary Biology

- **Mechanisms of Evolution:** Core principles of natural selection, genetic drift, gene flow, and speciation.
- **Evidence for Evolution:** Homologous, analogous, and vestigial structures, and molecular/fossil record correlations.

3. Structure of the Examination

Candidates should familiarize themselves with the design, timing, and formatting of the examination to optimize their performance:

- **Format:** The examination consists of a total of **20 multiple-choice questions (MCQs)**. Each question features four options with a single correct answer.
- **Duration:** Candidates are allocated exactly **60 minutes** to complete the exam. Efficient time management is critical, as questions will include analytical problems.
- **Quantitative Focus:** Candidates should expect mathematical and calculated applications embedded within the questions, specifically targeting:
    - **Genetics:** Population metrics using the Hardy–Weinberg equilibrium.
    - **Cellular Metrics:** Tracking and counting chromosome and DNA numbers across various cellular division states.
    - **Enzyme Kinetics:** Interpreting and calculating catalytic rates and enzymatic properties.
- **Scoring Policy:** There is **no penalty for incorrect answers** (no negative marking). Candidates are highly advised to attempt all questions on the paper.

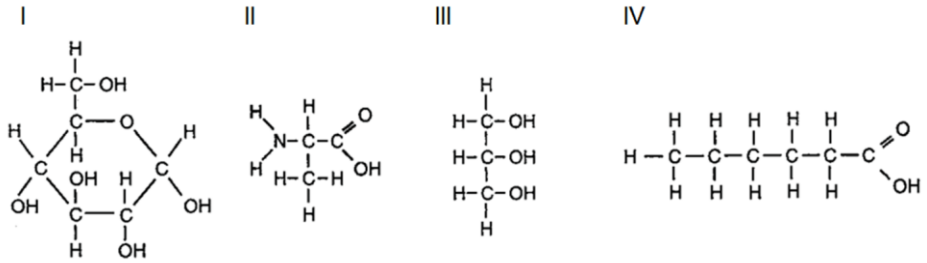
Permitted Materials

- **Calculators:** The use of standard, **general scientific calculators** is fully permitted to assist with the quantitative sections of the exam.
- **Prohibited Devices:** Programmable calculators or any electronic devices with communication features are strictly prohibited in the examination hall.

Sample questions

1. Which of the following lists represents the chemical components of a nucleotide?
   A) A nitrogenous base, an amino acid, and a pentose sugar.
   B) A nitrogenous base, an amino acid, and a phosphate group.
   C) A nitrogenous base, a phosphate group, and a pentose sugar.
   D) A nitrogenous base, a fatty acid, and an amino acid.

2. Which of the following is an amino acid?



   A) I
   B) II
   C) III
   D) IV

3. Which of the following structures is found in eukaryotic but NOT prokaryotic cells?
   A) Cytosol
   B) Ribosomes
   C) DNA
   D) Mitochondria

4. For the DNA strand 5'-A-C-C-G-T-G-A-C-A-T-T-G-3',
   the correct compliment DNA would be _____.
   A) 3'-T-G-G-C-A-C-T-G-T-A-A-C-5'
   B) 5'-T-G-G-C-A-C-T-G-T-A-A-C-3'
   C) 3'-U-G-G-C-A-G-U-G-U-A-A-C-5'
   D) 5'-A-C-C-G-U-G-A-C-A-U-U-G-3'

5. In a human population, the ability to develop freckles is controlled by a dominant allele (F), while the absence of freckles is controlled by a recessive allele (f).
   According to the Hardy–Weinberg principle, the frequency of the dominant allele (F) is 20%. If the population consists of 1,000 individuals, how many individuals are expected to not have freckles?

   Use the Hardy–Weinberg equation:

$$p^2 + 2pq + q^2 = 1$$

   where:
   p= frequency of the dominant allele (F)
   q= frequency of the recessive allele (f)

   A) 160
   B) 360

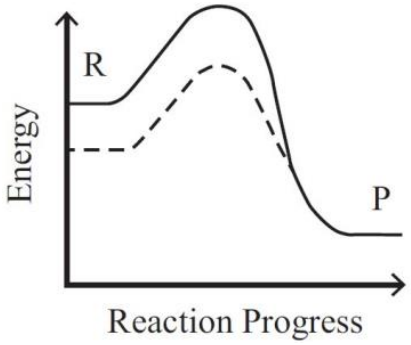
C) 640
D) 800

6. A group of cells is assayed for DNA content immediately following mitosis and is found to have an average of 8 picograms of DNA per nucleus.
   Those cells would have _____ picograms at the end of the S phase and _____ picograms at the end of G2.
   A) 16; 16
   B) 16; 8
   C) 8; 16
   D) 8; 8

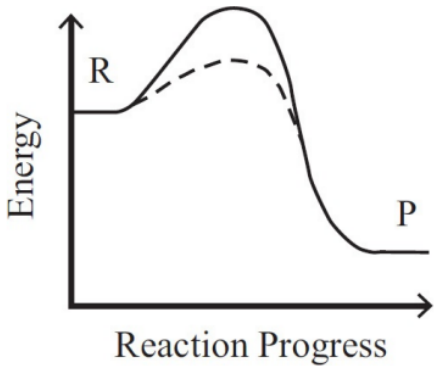
7. In a species of mammal, the allele for short hair (H) is dominant, and the allele for long hair (h) is recessive.
   A heterozygous short-haired individual is crossed with a long-haired individual.
   What is the expected phenotypic ratio of the offspring?
   A) 3 short-haired : 1 long-haired
   B) 1 short-haired : 1 long-haired
   C) All short-haired
   D) All long-haired

8. A single-step chemical reaction is catalyzed by the addition of an enzyme.
   Which of the reaction diagrams accurately shows the effect of the added enzyme (represented by the dashed line) to the reaction?

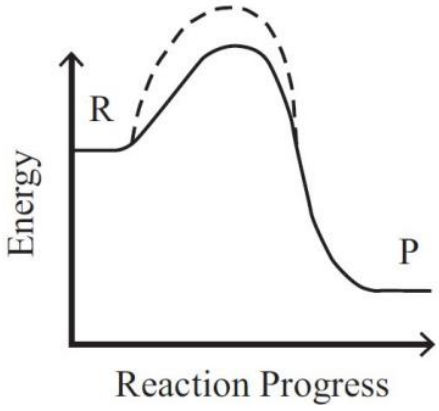
A)



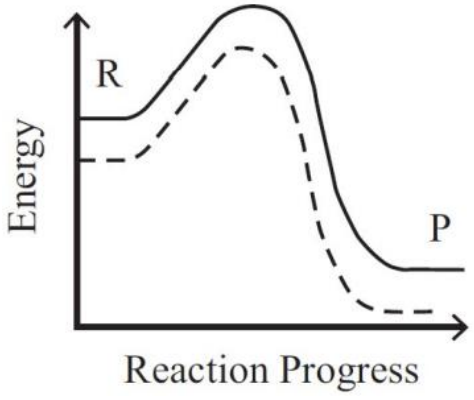
B)



C)

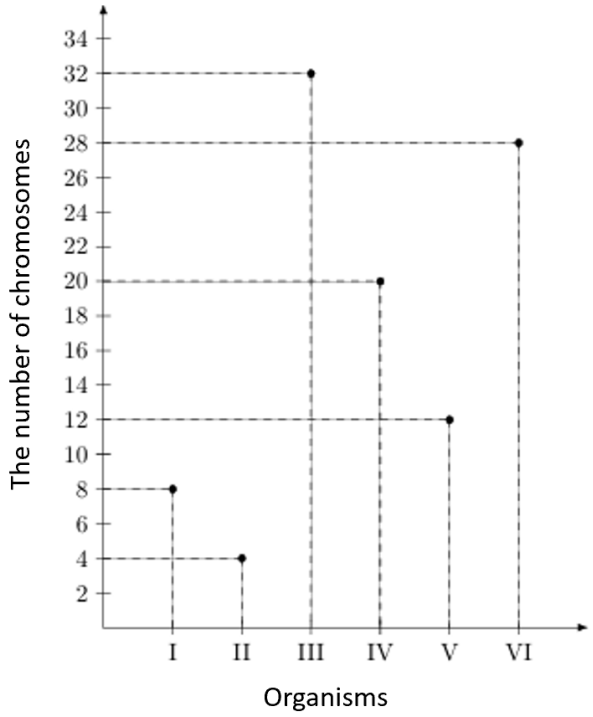


D)



9. The graph below shows the values for six organisms (I–VI), representing either the number of chromosomes or the DNA amount in different cells during mitosis or meiosis.

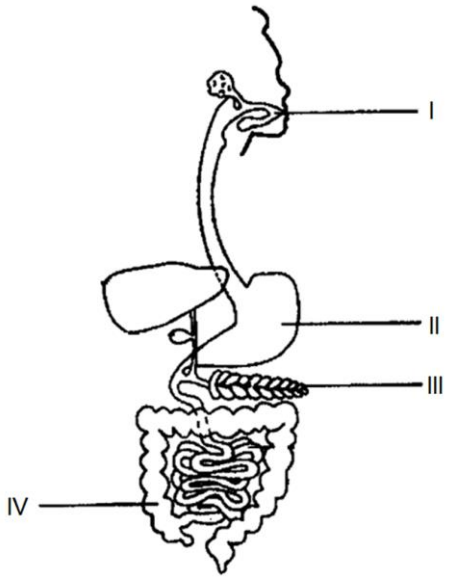
   Using the graph, determine the correct correspondence between organisms (I–VI) and the descriptions below.



   a) Number of chromosomes in the microspores of a diploid maize (corn) plant (2n = 20) at the end of mitotic anaphase.
   b) Number of chromosomes in the microspores of a tetraploid wheat plant (4n = 28) at the end of mitotic anaphase.
   c) Number of chromosomes in the microsporocytes of a diploid tobacco plant (n = 12) during metaphase II of meiosis.
   d) Amount of DNA in cherry microsporocytes at the end of anaphase II of meiosis.
   e) Number of chromosomes at each pole in megasporocytes of blackthorn (2n = 16) at the end of anaphase I of meiosis.
   f) Number of chromosomes in a Drosophila cell (2n = 8) at the end of the second meiotic division during spermatogenesis.

   Which of the following is the correct correspondence?
   A) I–e; II–f; III–d; IV–a; V–c; VI–b
   B) I–c; II–f; III–d; IV–e; V–a; VI–b
   C) I–d; II–e; III–b; IV–a; V–c; VI–f
   D) I–e; II–c; III–a; IV–b; V–f; VI–d

10. The figure below shows a human body.
The initial digestion of carbohydrates takes place in _____.



A) I
B) II
C) III
D) IV