

Challenging Biology Fundamentals

Biology · Answer Key · 10 Questions

1. Which organelle is responsible for synthesizing proteins in eukaryotic cells, and what is the primary molecule it reads to perform this function?

- A) Mitochondrion; DNA
- B) Ribosome; mRNA**
- C) Golgi apparatus; tRNA
- D) Endoplasmic reticulum; rRNA

2. The process of cellular respiration, crucial for energy production in most organisms, begins with which stage and where does it primarily occur within the eukaryotic cell?

- A) Krebs Cycle; mitochondrial matrix
- B) Electron Transport Chain; inner mitochondrial membrane
- C) Glycolysis; cytoplasm**
- D) Oxidative Phosphorylation; nucleoplasm

3. What is the fundamental unit of heredity, and what are the four nitrogenous bases that comprise its structure in DNA?

- A) Allele; Adenine, Guanine, Cytosine, Uracil
- B) Chromosome; Adenine, Guanine, Cytosine, Thymine
- C) Gene; Adenine, Guanine, Cytosine, Thymine**
- D) Nucleotide; Adenine, Guanine, Thymine, Uracil

4. During photosynthesis, light-dependent reactions occur in the thylakoid membranes and produce ATP and NADPH. What is the primary role of these energy-carrying molecules in the subsequent stage?

- A) They are used to directly split water molecules.
- B) They provide the energy and reducing power for the Calvin Cycle.**
- C) They are incorporated into chlorophyll pigments.
- D) They are released as waste products into the atmosphere.

5. What is the process by which a cell divides its nucleus and cytoplasm to produce two daughter cells, and in which phase of the cell cycle does DNA replication occur?

- A) Meiosis; G2 phase
- B) Mitosis; M phase
- C) Cytokinesis; G1 phase
- D) Mitosis; S phase**

6. The diversity of life on Earth is a result of evolution, driven by natural selection. What is the key concept that Charles Darwin's theory of natural selection is based upon?

- A) Inheritance of acquired characteristics
- B) Random mutation and genetic drift
- C) Differential survival and reproduction of individuals with advantageous traits**
- D) Creation of new species through sudden, large changes

7. Enzymes are biological catalysts that speed up biochemical reactions. What is the specific region on an enzyme where the substrate binds and the reaction takes place?

- A) Allosteric site
- B) Cofactor binding site
- C) Active site**
- D) Regulatory subunit

8. Cells communicate with each other through various signaling pathways. What type of signaling molecule binds to a specific receptor protein on the surface or inside a target cell, triggering a response?

- A) Neurotransmitter
- B) Hormone
- C) Growth factor
- D) All of the above**

9. The circulatory system in mammals transports oxygen, nutrients, and waste products. What is the primary function of red blood cells (erythrocytes) within this system?

- A) To fight infections
- B) To transport oxygen using hemoglobin**
- C) To clot blood
- D) To produce antibodies

10. A population's gene pool refers to the total collection of genes in that population. What term describes the process by which allele frequencies in a population change over generations due to random chance, particularly significant in small populations?

- A) Gene flow
- B) Mutation
- C) Natural selection
- D) Genetic drift**