

Evolution — Assignment 2

Class 12 Biology · Higher-difficulty challenge set + integrated problems · Answer key included · Narayan Gurukul Academy

Instructions: (1) Attempt all questions; start with the topic-wise challenge set, then attempt the integrated (multi-topic) problems.
(2) Give all answers with correct SI units. $g = 10 \text{ m/s}^2$ unless stated.
(3) A final answer key is provided at the end — try the full set before checking it.

Part A — Topic-wise challenge questions

Origin of Life and Chemical Evolution

1. What is biogenesis?
2. Describe the Miller-Urey experiment.
3. Describe the origin of life by chemical evolution.

Evidences of Evolution

1. Differentiate between homologous and analogous organs.
2. What is a connecting link? Give an example.
3. Describe the evidences of evolution.

Darwin's Theory and Natural Selection

1. What is natural selection?
2. State Darwin's theory of evolution.
3. Explain Darwin's theory of natural selection.

Adaptive Radiation and Modern Synthetic Theory

1. What is adaptive radiation?
2. What is the role of mutation in evolution?
3. Describe adaptive radiation with reference to Darwin's finches.

Hardy-Weinberg Principle and Changing Allele Frequencies

1. State the Hardy-Weinberg principle.
2. What is genetic drift?
3. Describe the factors that change allele frequencies.

Speciation, Isolation and Coevolution

1. What is speciation?
2. Give one example of coevolution.
3. Explain the process of speciation.

Human Evolution

1. Who was Homo habilis?
2. Trace the sequence of human evolution.
3. Describe the evolution of humans.

Part B — Integrated problems (multi-topic)

1. Describe the various evidences of evolution.
2. Explain the Hardy-Weinberg principle and the factors that affect it.
3. Describe the origin and evolution of life on Earth.
4. Explain Darwin's theory of natural selection and the types of natural selection.
5. Describe the process of speciation and the role of isolation.
6. Trace the major stages in human evolution.

Answer Key

Origin of Life and Chemical Evolution

Biogenesis: life from pre-existing life (Pasteur). Chemical evolution: simple inorganic molecules formed organic monomers, then polymers, then protobionts; the Miller-Urey experiment synthesised amino acids.

Evidences of Evolution

Palaeontological (fossils), anatomical (homologous/analogous/vestigial organs), embryological, biochemical and adaptive radiation; connecting links such as Archaeopteryx.

Darwin's Theory and Natural Selection

Overproduction, variation, struggle for existence and survival of the fittest; natural selection types: stabilising, directional and disruptive.

Adaptive Radiation and Modern Synthetic Theory

Adaptive radiation: one ancestral form diversifies into many (Darwin's finches). Modern synthetic theory combines natural selection with mutation, genetic drift and gene flow.

Hardy-Weinberg Principle and Changing Allele Frequencies

$p^2 + 2pq + q^2 = 1$; changes by mutation, gene flow, genetic drift, non-random mating and natural selection.

Speciation, Isolation and Coevolution

Speciation via reproductive isolation; allopatric (geographic) and sympatric (within an area). Coevolution is mutual evolutionary influence (flower-pollinator).

Human Evolution

Dryopithecus → Ramapithecus → Australopithecus → Homo habilis → Homo erectus → Homo neanderthalensis → Homo sapiens.

Integrated problems

1: Fossils and organ comparison. 2: Equilibrium maintained without evolutionary forces. 3: Chemical origin in water. 4: Variation + selection. 5: Isolation blocks interbreeding. 6: Successive hominid stages with increasing brain size and bipedalism.