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Section-II Questions With Answers

Q.1 Natural selection is random or systematic.
Explain your answer.

Ans. Natural selection is systematic because it favors individuals with advantageous traits that enhance survival and reproduction. This process leads to the gradual accumulation of beneficial traits within populations over generations. It is not random, as the traits that contribute to fitness are specifically selected based on their ability to confer reproductive success in a given environment.


Q.2 How is convergent evolution different from divergent evolution?

Ans. Convergent evolution results in species from different origins developing similar traits due to analogous environmental pressures. Divergent evolution leads to species diverging from a common ancestor, evolving distinct traits to adapt to diverse habitats. These processes illustrate the dynamic responses of organisms to environmental challenges and opportunities over time.

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MOLECULAR FEDERAL BIOLOGY  Subjective (HSSC - I)

539

Q.3 Explain the endosymbiont hypothesis.

The endosymbiont hypothesis proposes that eukaryotic organelles like mitochondria and chloroplasts originated from ancient symbiotic relationships between prokaryotic cells. Specifically, it suggests that a larger host cell engulfed smaller, free-living prokaryotes, which then evolved into organelles within the host. This theory is supported by evidence such as the similarities between organelles and free-living bacteria in terms of structure, DNA, and reproduction processes like binary fission.

Q.4 What are homologous structures? Explain them with an example.

Ans. Homologous structures are anatomical features in different species that share a common evolutionary origin, despite possibly serving different functions. They exhibit similar internal anatomy due to descent from a common ancestor, yet may appear different externally. For instance, the forelimbs of vertebrates like humans, horses, whales, and bats all share a common bone structure (humerus, radius, ulna), highlighting their homology despite varied functions.

Q.5 What are vestigial organs? Give a few examples from the human body.

Ans. Vestigial organs are remnants of once-functional

structures that have lost their original purpose through evolutionary processes. In humans, examples include the appendix, which no longer serves a clear function but may have aided digestion in ancestors; the coccyx or tailbone, a remnant of a tail; and muscles that once helped orient ears, now largely non-functional. These organs highlight evolutionary changes where adaptations rendered certain traits unnecessary.

Q.6 Enlist a few characteristics found only in mammals.

Ans. The following characteristics are found only in mammals:

- **Mammary glands:** Mammals possess specialized glands that produce milk to nourish their young.
- **Three middle ear bones (malleus, incus, stapes):** These bones are unique to mammals and transmit sound vibrations from the eardrum to the inner ear.
- **Fur or hair covering the body:** Mammals are typically covered with hair or fur, providing insulation and protection.
- **Neocortex:** Mammals have a well-developed neocortex, which is responsible for higher-order brain functions such as sensory perception, cognition, and language.