

**Time: 60min****Heredity and Evolution****Marks: 20****Q.1(A) Choose the correct alternative. (2)****i Which of the following nitrogenous base is NOT present in DNA?**

- ☐ (A) Thymine ☒ (B) Uracil  
☐ (C) Adenine ☐ (D) Guanine

**Ans:****Explanation:**

Uracil is present in RNA instead of thymine of DNA.

**ii Connecting links suggest that amphibians have evolved from**

- ☐ (A) mammals ☐ (B) reptiles  
☒ (C) fishes ☐ (D) aves

**Ans:****Explanation:**

Lungfishes are connecting links between fishes and amphibians.

The lungfish performs respiration with lungs even though it is a fish.

**Q.1(B) Answer the following. (3)****i \_\_\_\_\_: Sudden changes in genes :: Evolution : Gradual changes in specific characters****Ans:** Mutation**Explanation:**

Gradual changes in specific characters results in evolution, whereas sudden changes in genes results in mutation.

**ii *Peripatus* : Connecting link :: Wisdom tooth : \_\_\_\_\_****Ans:** Vestigial organ**Explanation:**

Peripatus is an example of connecting link, whereas wisdom tooth is an example of vestigial structure.

**iii DNA: Thymine :: RNA: \_\_\_\_\_****Ans:** Uracil**Explanation:**

Thymine present in DNA is replaced by uracil in RNA.

**Q.2(A) Give scientific reasons. (Attempt any 1) (2)****i Duck billed platypus is a connecting link.**

i. Connecting links are some plants or animals that show morphological characters by which they can be related to two different groups of organisms.

- ii. The duck-billed platypus is a connecting link between mammals and reptiles as it shows similarity with mammals due to the presence of mammary glands and hairs. It lays eggs indicating similarity with the reptiles.

**ii Explain carbon dating method.**

- i. Carbon consumption of animals and plants stops after death and only the decaying processes of C-14 takes place continuously.
- iii. The ratio of C-14 to C-12 changes constantly in dead plants and animals with time, as C-12 is non-radioactive.
- iv. The time passed since the death of a plant or animal can be calculated by carbon dating i.e., by measuring the radioactivity of C-14 and ratio of C-14 to C-12 present in the remains of the dead organism.
- iv. This is known as carbon dating method. It is used for determining the age of fossils.

**Q.2(B) Answer the following. (Attempt any 1) (2)**

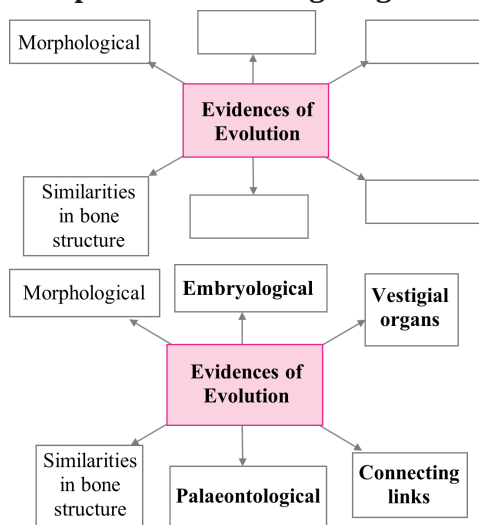
**i(a) What is the function of the appendix of our digestive system?**

The appendix of our digestive system is a vestigial organ. It does not perform any function in human beings.

**(b) What is morphological evidence of evolution?**

Morphological evidence is based on the similarity of size, shape or structure of organs among a group of organisms proving that they evolved from the same ancestor.

**ii Complete the following diagram.**



**iii Explain Darwin's theory of natural selection.**

- i. Darwin's theory of natural selection is based on the concept of survival of the fittest.
- ii. Organisms can reproduce prolifically.
- iii. Under limited resources, organisms compete with each other in a life-threatening manner for their survival.
- iv. According to this theory, only those organisms survive which show modifications for winning the competition. The selected organisms then give rise to new species with their specific set of characters.

**Q.3 Answer the following. (Attempt any 2) (6)**

i Fill in the blanks by selecting the correct word from the bracket and complete the given paragraph.

(two, *Ramapithecus*, modern sciences, seven, Neanderthal man, lemurs, agriculture, orangutans)

The last dinosaurs disappeared approximately \_\_\_\_\_ crore years ago. Monkey-like animals are said to have evolved from some ancestors who were similar to modern \_\_\_\_\_. The first human-like animals with erect posture evolved about \_\_\_\_\_ crore years ago. The first record of this human-like ape is \_\_\_\_\_ from East Africa. \_\_\_\_\_ can be considered as the first member of the class – wise-man. About 10 thousand years ago, wise-man started to practice

The last dinosaurs disappeared approximately **seven** crore years ago. Monkey-like animals are said to have evolved from some ancestors who were similar to modern **lemurs**. The first human-like animals with erect posture evolved about **two** crore years ago. The first record of this human-like ape is ***Ramapithecus*** from East Africa. **Neanderthal man** can be considered as the first member of the class – wise-man. About 10 thousand years ago, wise-man started to practice **agriculture**.

ii(a) Write a note on ‘transcription’.

- i. Transcription is the process of synthesis of mRNA from DNA. It takes place in the presence of RNA polymerase.
- ii. During transcription, mRNA is produced as per the sequence of nucleotides present on the DNA.
- iii. This mRNA sequence is always complementary to the DNA strand that is used for its synthesis.
- iv. The thymine in DNA molecule is replaced by uracil in RNA, during the process of transcription.

(b) What are vestigial organs?

Vestigial organs are degenerated or underdeveloped useless organs of organisms.

iii Embryological evidences provide proof of evolution. Explain.

- i. Embryological evidences arise from comparative study of embryonic developmental stages of various vertebrates.
- ii. Embryos of different vertebrates appear similar during the initial stages of development and these similarities gradually decrease as the embryo develops.
- iii. Embryology can be used as evidence of evolution as similarities in the initial stages of development indicate the common origin of the animals.

**Q.4 Answer the following. (Attempt any 1)**

**(5)**

i(a) Define fossil. Explain importance of fossils as proof of evolution.

- i. Fossils are remnants and impressions of organisms that remain preserved underground.
- ii. Studying fossils help the scientists learn about the features of the organisms that lived in the past.
- iii. The oldest fossils are buried deep in the Earth’s crust, while the younger ones occupy the upper surfaces. Hence, fossils of invertebrates are found buried deep as they are very old and belong to the Palaeozoic era. The fossils of Pisces, Amphibians and Reptiles were

obtained from the consecutive layers. The Mesozoic era was dominated by reptiles, while the Cenozoic era showed presence of mammals and birds.

iv. Thus, study of fossils is an important aspect of evolution since it can be used in palaeontology and anthropology for determining age of the fossils and deducing information about their ancestors.

**(b) Write a short note on embryology.**

- i. Embryology is a branch of biology that deals with the study of development of an embryo.
- ii. It enables us to compare the developmental stages of various animals.
- iii. Embryos of different vertebrates appear similar during the initial stages indicating common origin of these animals.
- iv. Similarities decrease gradually as the embryos develop.

**(c) First living material formed in ocean.**

Protoplasm

**ii Read the given passage and answer the following questions.**

**When we observe the features such as the structure of the mouth, position of the eyes, nostrils, ear pinnae, and thick hair on the body, similarities become apparent. Likewise, plants show resemblances in characteristics such as leaf shape, venation, and petiole structure. These similarities suggest that both animals and plants may share a common origin. Additionally, while the human hand, foreleg of ox, flipper of whale, and patagium of bat serve different functions, their underlying bone structures are remarkably similar.**

- i. Which type of evidence is demonstrated by the similarities in the structure of the mouth, position of the eyes, nostrils, ear pinnae, and thick hair on the body, with respect to evolution?**
- ii. What type of evolutionary evidence is indicated by the similarity in bone structures of the human hand, foreleg of an ox, flipper of a whale, and patagium of a bat?**
- iii. What do the similarities in some external and internal characteristics of organisms indicate about their evolutionary relationships?**
- iv. Besides the evidence of evolution mentioned in the given paragraph, what are two other types of evidence that support the theory of evolution?**
- v. What does "organizational progressive development of plants and animals from ancestors with distinct structural and functional characteristics" mean?**
  - i. Features such as the structure of the mouth, position of the eyes, nostrils, ear pinnae, and thick hair on the body are classified as morphological evidence.
  - ii. The similarity in bone structures of the human hand, foreleg of an ox, flipper of a whale, and patagium of a bat indicates anatomical evidence for evolution.
  - iii. The similarities in external and internal characteristics of different organisms indicate that they may share a common ancestry, indicating that they may have evolved from a common ancestor.
  - iv. Two other types of evidence that support the theory of evolution are vestigial organs, palaeontological evidence, connecting links and embryological evidences.

[Any two]

- v. The phrase "organizational progressive development of plants and animals from ancestors with distinct structural and functional characteristics" refers to evolution.