Long Answer Type Questions

[5 Marks]

Q. 1. Explain with reason why giraffe has long neck.

Ans. According to Lamarck's theory of use and disuse, giraffes had to stretch their necks and forelimbs for feeding on leaves of tall trees because of which these organs were elongated. But this theory has been completely discarded. It is now proposed that, the giraffe's neck evolved with time because of 'necking' battle with time and natural selection, only giraffes with long necks survived.

Q. 2. Give the basic features of the mechanism of inheritance.

Ans. (i) Characters are controlled by genes.

(ii) Each gene controls one character.

(iii) There may be two or more forms of gene.

(iv) One form may be dominant over the other.

(v) Genes are present on chromosomes.

(vi) An individual has two forms of gene whether similar or dissimilar.

(vi) The two forms separate at the time of gamete formation.

(vii) The two forms are brought together in the zygote.

Q. 3. A. Mention any two points of difference between acquired and inherited traits.
B. If the tail of a mouse is cut for twenty one generations, will the tail occur in the twenty second generation of that mouse? Give reason to support your answer.
C. Define the term-Natural Selection.

Ans. A.

Acquired Traits	Inherited Traits
1. These are traits acquired during one's lifetime. 2. These are not inheritable. 3. Not present in the genetic make up. 4. Change in DNA will not result in any change in Change such traits.	These are traits inherited from one's predecessors. These are inheritable. Present in the genetic makeup. Change is DNA will bring about change in such traits.

B. The mouse will continue to have information for presence of tail in its DNA. So, it will continue to have tail because absence of tail is an acquired trait.

C. Natural selection means that nature selects the best trait in a species, leading to survival of fittest and evolution of species.

Q. 4. In the following crosses write the characteristics of the progeny.

Cross	**Progeny**
(a) RR YY X RR YY	_____
Round, yellow and round, yellow	
(b) Rr Yy x Rr Yy	_____
Round, yellow and round, yellow	
(c) rr yy × rr yy	_____
Wrinkled, green and wrinkled, green	
(d) RR YY × rr yy	_____
Round, yellow and wrinkled, green	

Ans. (a) Round, yellow

(b) Round, yellow
Round, green
Wrinkled, yellow
Wrinkled, green

(c) Wrinkled, green
(d) Round, yellow

Q. 5. How do Mendel's experiments show that the

(a) traits may be dominant or recessive,
(b) traits are inherited independently?

Ans. (a) When Mendel cross pollinated pure tall pea plants with pure dwarf pea plants, only tall plants were obtained in F_1 generation. On self pollinating the F_1 progeny, both tall and dwarf plants appeared in F_2 generation in the ratio 3: 1.
Appearance of tall character in both the F_1 and F_2 shows that it is a dominant character. The absence of dwarf character in F_1 generation and its reappearance in F_2 shows dwarfness is the recessive character.

(b) When Mendel first crossed pure-breed pea plants having round-yellow seeds with pure-breed pea plants having wrinkled-green seeds, he found that only round-yellow seeds were produced in the first-generation. No wrinkled-green seeds were obtained in the F_1 generation.

From this, it was concluded that round shape and yellow colour of the seeds were dominant traits over the wrinkled shape and green colour of the seeds.

When the F_1 generation pea plants having round-yellow seeds were cross-bred by self-pollination, then four types of seeds having different combinations of shape and colour were obtained in second generation (F_2). These were round-yellow, round-green, wrinkled-yellow and wrinkled-green seeds.
Such a cross is known as dihybrid cross as two sets of corresponding characters are considered. Mendel observed that along with round-yellow and wrinkled-green, two new combinations of characteristics, round-green and wrinkled-yellow, had appeared in the F_2 generation. On the basis of this observation, Mendel concluded that though the two pairs of original characteristics (seed colour and shape) combine in the F_1 generation, they get separated and behave independently in the subsequent generation.

Q. 6. What are the various evidences in favour of evolution?

OR

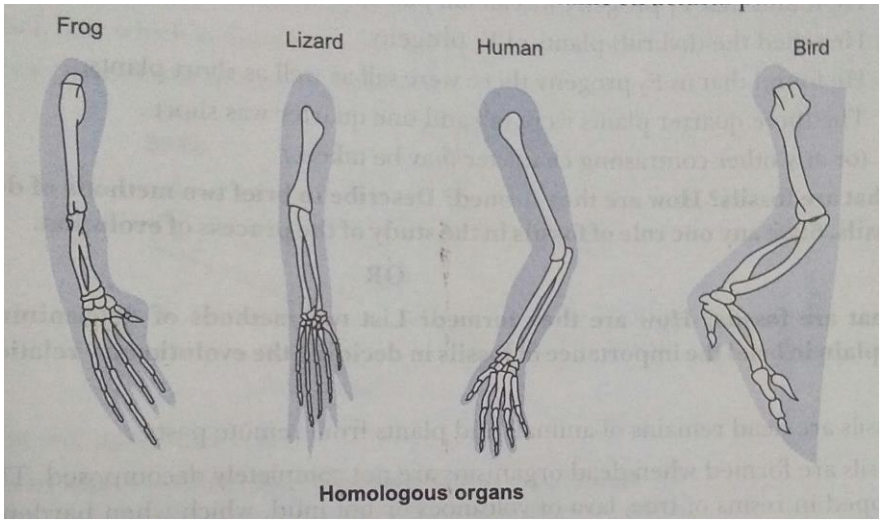
Explain with an example for each, how the following provides evidences in favour of evolution in organisms:

(a) Homologous organs (b) Analogous organs (c) Fossils

Ans. The following are the various evidences in favour of evolution:

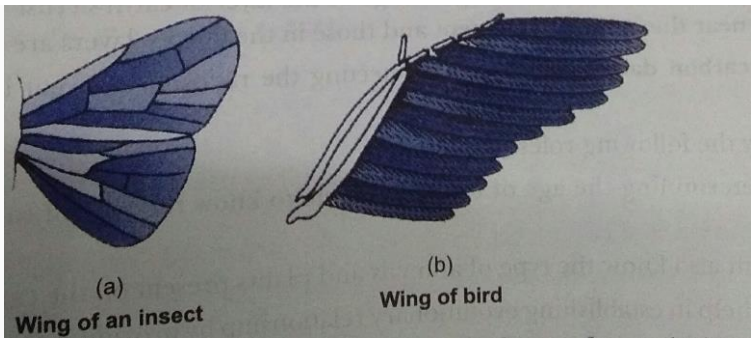
(a) Homologous organs: Organs with a common basic structural design but with different functions are said to be homologous organ. For example, forelimbs of a frog, lizard, bird and man.

The forelimbs of man are used for grasping, of lizard for running, of frog for propping up and bird for flying. They have different functions but have same structural pattern.



Homologous organs

(b) Analogous organs: The analogous organs have different basic structure but perform similar functions. For example, the wing of insects and the wing of birds, have a totally different anatomy and origin but they perform the same function of flying in air.



(c) Evidences from fossils: The fossils also provide evidences for evolution. For example, the fossil *Archaeopteryx* looks like a bird but it bears a number of other features, which are found in reptiles. This observation provides a clue that birds have evolved from reptiles.

Q.7. Describe Darwin's theory of evolution.

Ans. Following are the points of Darwin's theory of natural selection:

(i) Over-production: Every organism has enormous potential to reproduce.

(ii) Struggle for existence: Population size of an organism is limited due to struggle between the members of same species as well as the members of different species. It is due to struggle for food, space and mate.

(iii) Variation: Due to struggle, the fit organisms possess some variations which are favourable, and they can leave the progeny to continue the favourable variations.

(iv) Survival of the fittest: The fittest organism survive to continue the favourable variations.

(v) Formation of a new species: These variations when accumulated for long time, leads to the origin of a new species.

Q. 8. Explain Mendel's experiment with peas on inheritance of characters considering only one visible contrasting character.

Ans. Mendel conducted breeding experiments with garden peas:

(a) He studied plants (pure) of a tall/short varieties.

(b) He crossed them and obtained F_1 progeny.

(c) He found that F_1 progeny was all tall plants.

(d) He selfed the (hybrid) plants of F_1 progeny.

(e) He found that in F_2 progeny there were tall as well as short plants.

(f) The three quarter plants were tall and one quarter was short. or any other contrasting character may be taken.)

Q. 9. What are fossils? How are they formed? Describe in brief two methods of determining the age of fossils. State any one role of fossils in the study of the process of evolution.

OR

What are fossils? How are they formed? List two methods of determining the age of fossils. Explain in brief the importance of fossils in deciding the evolutionary relationships.

Ans. Fossils are dead remains of animals and plants from remote past.
Fossils are formed when dead organisms are not completely decomposed. The organisms may get trapped in resins of tree, lava of volcanoes or hot mud, which when hardens retains the animal's parts thus forming fossils.

Two methods of determining the age of fossils are:

(a) Relative method: By estimating the age of the layer of earth's crust where the fossil is found. Fossils near the surface are recent and those in the deeper layers are more ancient.

(b) Radio-carbon dating method: By detecting the ratios of different isotopes of carbon in the fossils.

Fossils play the following roles:

(i) By determining the age of fossils we come to know the type of earth strata present at that time.

(ii) We can also know the type of animals and plants present on the earth at that time.

(iii) They help in establishing evolutionary relationship by providing connecting links.
(Any one)

Q. 10. what is speciation? List four factors that could lead to speciation. which of these cannot be a major factor in the speciation of a self-pollinating plant species? Explain. Give reason to justify your answer.

Ans. Speciation is the formation of new species from the pre-existing population.
Factors responsible for speciation:

(i) Genetic drift (ii) Natural selection
(iii) Geographical isolation (iv) Mutation

Geographical isolation cannot be a major factor in the speciation of a self pollinating plant species because physical barrier cannot be created in self-pollinating plants.

Q. 11. A. How does speciation take place?
B. Define the term gene.
C. The gene for red hair is recessive to the gene for black hair. What will be the hair

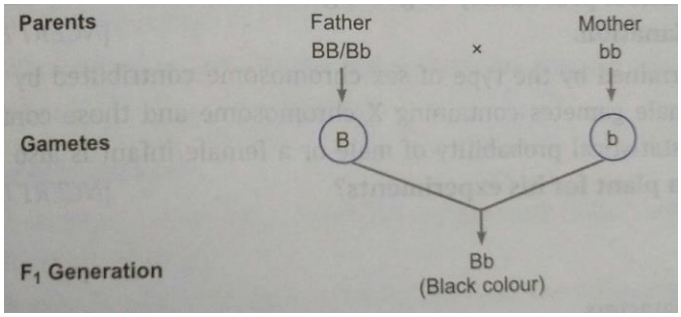
colour of a child if he inherits a gene for red colour from his mother and a gene for black hair from his father? Express with the help of flow chart.

Ans. A. Speciation may take place by

(i) Migration (ii) Natural selection
(iii) Mutation (iv) Genetic drift (Any two)

B. The segment of DNA which is functional and is made of nucleic acids and protein is called gene.

C. Given,
Mother has red hair which is recessive, i.e., bb
Father has black hair which is dominant, i.e., BB or Bb.
The inheritance pattern can be shown as follows:



Thus, the child will have black hair.

Q. 12. Explain the ways in which evolutionary relationships can be traced.

Ans. Evolutionary relationships can be traced in the following ways:

(i) Study of homologous organs: Some organs in different organisms are similar in structure and design because they are inherited from a common ancestor. For example, forelimbs of horse, wings of bird and arms of man may be functionally different, but because of their similarity in structure, origin and design, they indicate that horse, birds and man are closely linked and had a common ancestor.

(ii) Study of fossils: Fossils are the remains or impressions of organisms that existed in the past, allow us to study organ structure of organisms that are no longer alive. Comparing their organ structure with organ structure of present day organisms also enable us to trace evolutionary relationships.

(iii) Comparing DNA of different species: This will give us a direct estimate of how much the DNA has changed during the formation of these species. This, too, can be used as a criterion to trace evolutionary relationships.

Q. 13. How has the method of 'artificial selection' by humans helped in the evolution of different vegetables?

Ans. A wild variety of a plant may show different variations. Humans have selected some such variants and grown them for generations and during the course of time, they have become totally different species.

For example, variants in wild cabbage were selected on the basis of certain features to generate different vegetables.

(i) Short distances between leaves, led to formation of green leaf buds-the common cabbage.

(ii) Arrested flower development has bred broccoli.

(iii) The variant with sterile flowers has made the cauliflower.

(iv) Variant with swollen leaf parts-kohlrabi.

(v) Variant with larger leaves-kale.