

CBSE Class 10 Science
NCERT Solutions
Chapter - 9
Heredity and Evolution

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1. If a trait A exists in 10% of a population of an asexually reproducing species and a trait B exists in 60% of the same population, which trait is likely to have arisen earlier?

Ans. Trait B.

2. How does the creation of variations in a species promote survival?

Ans. Depending on the nature of variations different individuals would have difference kinds of advantage to adjust in particular habitat. Variation help the individual to have different traits that may develop the organisms more tolerable.

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1. How do Mendel's experiments show that traits may be dominant or recessive?

Ans. In Monohybrid cross of Mendel between tall and dwarf pea plant, all progeny in F_1 generation are tall and in F_2 generation, 75% of pea plants are tall but 25% are dwarf. This shows that traits are dominant or recessive.

2. How do Mendel's experiments show that traits are inherited independently?

Ans. When a pea plant having round green seeds is crossed with a pea plant having wrinkled yellow seeds in F_1 generation all the plants have round yellow seeds. But in F_2 generation two new traits that is round yellow and wrinkled green appear. This shows that traits are inherited independently.

3. A man with blood group A marries a woman with blood group O and their daughter has blood group O. Is this information enough to tell you which of the traits-blood

group A or O- is dominant? Why or why not?

Ans. No, the information is not enough because the blood group is determined by a pair of gene. One inherited from mother and other from father. In this case, the child inherited gene for O blood group from mother as well as father.

4. How is the sex of the child determined in human beings?

Ans. A child which inherits X chromosome from her father will be a girl and one who inherits Y chromosome from him will be a boy.

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1. What are the different ways in which individuals with a particular trait may increase in a population?

Ans. The different ways in which individual with a particular trait may increase are:

- (a) Natural selection- Certain variations give survival advantage to individuals in a population in a changed situation resulting in increase of their population.
 - (b) Genetic drift- Accidents in small population even if they give no survival advantage also lead to increase to certain individual in population.
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2. Why are traits acquired during the life-time of an individual not inherited?

Ans. Any change in non-reproductive tissues cannot be passed on to the DNA of the germ cells. Therefore, the traits acquired during life-time on an individual are not inherited.

3. Why are the small numbers of surviving tigers a cause of worry from the point of view of genetics?

Ans. Small number of surviving tigers will affect the frequency of selection which is essential for survival. For effective selection, the population must consist of an infinitely large number of individual in population.

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1. What factors could lead to the rise of a new species?

Ans. Following factors could lead to the rise of new species:

- (a) Changes in gene frequency in small breeding isolated populations.
 - (b) Natural selection
 - (c) Changes in number of chromosome.
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2. Will geographical isolation be a major factor in the speciation of self-pollinating plant species? Why or why not?

Ans. No, because geographical barrier do not allow breeding between such individuals of a population which reproduce sexually. Moreover, asexually reproducing organism pass on the parental DNA to offspring which gives no chance of speciation.

3. Will geographical isolation be a major factor in the speciation of an organism that reproduces asexually? Why or why not?

Ans. Yes, due to geographical isolation, the two populations are separated. The levels of gene flow between them will decrease. The isolated population will breed with local population resulting in entry of isolated population into new population.

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1. Give an example of characteristics being used to determine how close two species are in evolutionary terms.

Ans. Analysis of the organ structure in fossils allows us to make estimates of how far evolutionary relationships go. For example, presence of feather in some fossils dinosaurs indicate the birds are closely related to reptiles.

2. Can the wing of a butterfly and the wing of the bat be considered homologous organs?

Ans. No, though the function of wing in both the cases is same but their structural plan and origin in different.

3. What are fossils? What do they tell us about the process of evolution?

Ans. Preserved traces of living organisms are called fossils found under the surface of earth the more recent in origin than the fossils we find in deeper layers.

Fossils also help us to find evolutionary relation between organisms.

Page No. 158

1. Why are human beings who look so different from each other in terms of size, colour and looks said to belong to the same species?

Ans. All humans are a single species *Homo sapiens* which originated in Africa. Some of our ancestors left Africa, while others stayed on. Those who migrated slowly spread across the planets.

2. In evolutionary terms, can we say which among bacteria, spiders, fish and chimpanzees have a 'better' body design? Why or why not?

Ans. Bacteria have better body design because it has so much variation to adjust in different climatic condition.

TEXTBOOK EXERCISES

1. A Mendelian experiment consisted of breeding tall pea plants bearing violet flowers with short pea plants bearing white flowers. The progeny all bore violet flowers but almost half of them were short. This suggests that the genetic make-up of the tall parent can be depicted as

- (a) TTWW
- (b) TTww
- (c) TtWW
- (d) TtWw

Ans. (c) TtWW

2. An example of homologous organs is

- (a) Our arm and a dog's fore-leg.
- (b) Our teeth and an elephant's tusks.
- (c) Potato and runners of grass.
- (d) All of the above.

Ans. (d) all of the above

3. In evolutionary terms, we have more in common with

- (a) A Chinese school-boy.
- (b) A chimpanzee
- (c) A spider
- (d) A bacterium

Ans. (a) a Chinese school boy.

4. A study found that children with light-coloured eyes are likely to have parents with light-coloured eyes. On this basis, can we say anything about whether the light eye colour trait is dominant or recessive? Why or why not?

Ans. No, since two copies of traits are inherited from parents, one from mother and the other from father. Unless we know the nature of these two variants of traits we cannot tell which is dominant and which is recessive. Recessive traits appear when both the parents contribute recessive allele. From this statement we can only presume that both parents are contributing recessive allele.

5. How are the areas of study- evolution and classification interlinked?

Ans. When we classify organism we look for similarities among organism which allows us to group them. Based on these principles we can work out the evolutionary relationship of the species.

6. Explain the terms analogous and homologous organs with examples.

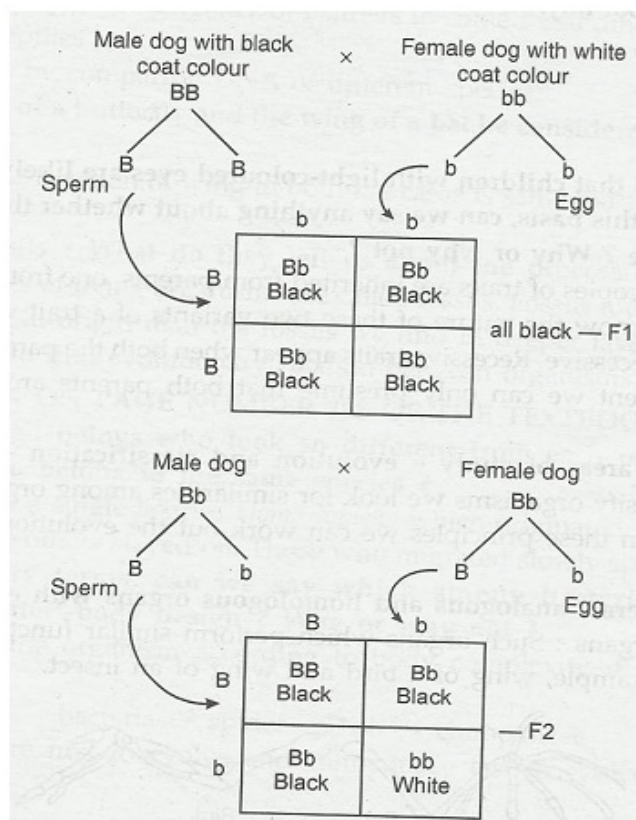
Ans. Analogous organs: Such organs which perform similar function but are different in

structure and origin are called analogous organs. Example- Wings of birds and wings of insects.

Homologous organs: Such organs which may have different functions but similar structure and origin are called homologous organs. Example- fore arm of frogs, lizards and birds.

7. Outline a project which aims to find the dominant coat colour in dogs.

Ans.



8. Explain the importance of fossils in deciding evolutionary relationship.

Ans. (i) Study of fossils allow us to make estimates of how far back evolutionary relationship go between organisms.

(ii) Study of age of fossils allows us to know which organisms evolved earlier and which later.

9. What evidence do we have for the origin of life from inanimate matter?

Ans. The evidence was given by Stanley L. Miller and Harold C. Urey in 1953. They assembled an atmosphere similar to that thought to exist on early earth over water. This was

maintained by them at a temperature just below 100 degree Celcius and sparks were passed through the mixture of gases to stimulus lightening. At the end of week, they found that 15% of the carbon had been converted to simple compounds of carbon including amino acids which make up protein molecules.

10. Explain how sexual reproduction gives rise to more viable variations than asexual reproduction. How does this affect the evolution of those organisms that reproduce sexually?

Ans. Variations arise either because of errors in DNA copying or as a result of sexual reproduction. Due to sexual reproduction genetic variability increases in the population from one generation to another. This happens due to the fact that sexually reproducing organism inherits half the genes from each parent. These variations are very important for the process of evolution.

11. Only variations that confer an advantage to an individual organism will survive in a population. Do you agree with this statement? Why or why not?

Ans. No, depending on the nature of variations different individuals have been different kinds of advantages. However, when a drastic change occurs in environment, only those organisms in the population will survive which have an advantageous variation in that population to survive in changed environment.

12. How is the equal genetic contribution of male and female parents ensured in the progeny?

Ans. Equal contribution of male and female parents is ensured in progeny during sexual reproduction. Each trait of progeny is determined by a pair of alleles and gametes of male and female contain one allele. Each allele pairs during fertilisation combine together to determine traits. Thus, the traits of progeny are determined by equal genes from male and female.