

Heredity and Evolution: In-Text Questions

[Page – 142]

Q.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?

Sol. Trait B is likely to have arisen earlier because this trait is present in a larger population.

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

Sol. Variations in a species take place due to the changes in the environment. Such variations enable a species to cope with the new changes. Most of the variations not only give survival advantage but also contribute to genetic drift in an individual. Thus, variations help a species in survival.

[Page – 147]

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

Sol. During monohybrid cross of Mendel's experiment, one of the pair of traits did not visible in the F₁ generation. But that trait visible in the F₂ generation. From this observation, Mendel explained that a trait could be dominant or recessive.

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

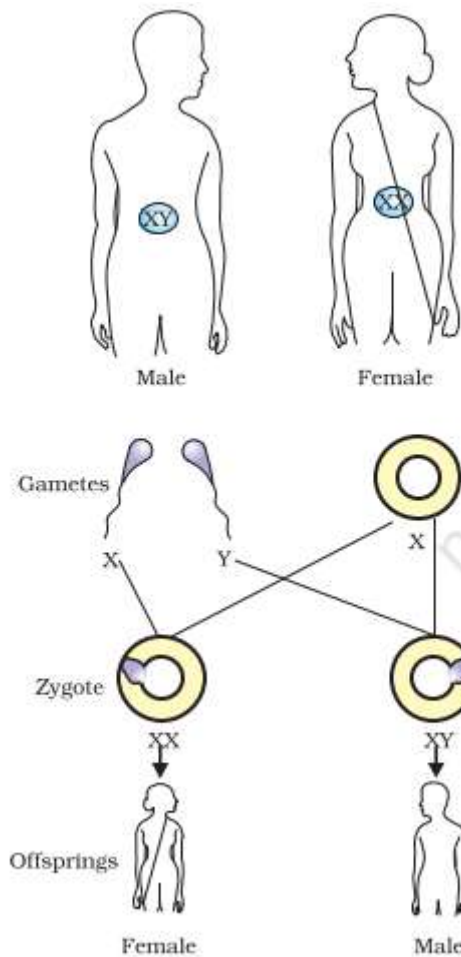
Sol. Mendel's experiments show that traits are inherited independently by the dihybrid cross experiment. In this experiment, he took two traits seed shape and seed colour. The yellow colour (YY) was dominant over the green colour (yy), while the round shape (RR) is dominant over the wrinkle shape (rr). In F₂ generation of dihybrid cross, he got the phenotypic ratio of 9:3:3:1. In this ratio, 9 plants with round yellow (RRYY) seeds, 3 plants with round green (RRyy) seeds and 3 plants with wrinkled yellow (rrYY) seeds and one with wrinkled green seeds (rryy). From this result, it was observed that when two pairs of traits were crossed, each trait expressed independent of the other. Thus, Mendel proposed the Law of Independent Assortment which says that traits are inherited independently.

Q.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 trait – blood group A or O – is dominant? Why or why not?

Sol. This information is not enough. For determining, a trait as dominant or recessive, we require the data of at least three generations. Here, data is about only two generations.

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

Sol. Somatic cells in humans keep 23 pairs of chromosomes. Out of them the 23rd pair is composed of different types of chromosomes. The 23rd pair contains one X and one Y chromosome in a male. While, the 23rd pair in a female contains only X chromosomes. It means that all the eggs would have X chromosomes, while a sperm may have either X or Y chromosome. When a sperm with X chromosome fertilizes with the egg, fertilised egg (zygote) would develop into a female child. When a sperm with Y chromosome fertilizes the egg, fertilised egg (zygote) would develop into a male child.



[Page – 150]

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

Sol. By the variation, natural selection and genetic drift are the ways in which individuals with a particular trait may increase in a population. When a beneficial trait appears, it will increase in a population naturally.

Q.2 Why are traits acquired during the lifetime of an individual not inherited?

Sol. Acquired traits do not change in the genotype of an individual. Therefore, acquired traits do not get inherited.

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

Sol. Small numbers of surviving tigers means that there is a small gene pool of tigers left. A smaller population decrease the probability of variations. A time may come when tigers may extinct due to lack of useful variations.

If a natural disaster strikes and kills these small numbers of living tigers, they can become extinct resulting in some genes being destroyed forever.

Hence, a small number of surviving tigers is a cause of worry from the point of view of genetics.

[Page – 151]

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

Sol. Speciation can occurs if two groups of the same species are prevented from interbreeding for several generations.

Genetic variations, natural selection and genetic drift are the factors could lead to the rise of a new species.

Q.2 Will geographical isolation be a major factor in the speciation of a self-pollinating plant species? Why or why not?

Sol. In a self-pollinating plant species, geographical segregation will not be a major factor in speciation, because new trait cannot be a part of the genotype in self-pollination plant species. However, some changes in environmental conditions can lead to some variations.

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

Sol. In case of an asexually reproducing organism, geographical isolation will not be a major factory in speciation because meiosis does not occurs during asexual mode of reproduction.

[Page – 156]

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

Sol. We take the example of humans and apes. Both of them have similar characteristics like similar body design, body hair and mammary glands. Hence, these two animals are closely related in evolutionary term. Now we take some common characters between a fish and a man. These characters are vertebral column, brain box and jaws are present in both of them. But fish and man have entirely different body structure from each other. Therefore, they are not very closely related in evolutionary term.

Q.2 Can the wing of a butterfly and the wing of a bat be considered homologous organs? Why or why not?

Sol. Wings of a butterfly are made up of chitinous membrane, on the other hand wings of a bat are composed of bony skeleton with blood vessels. Both organs is used for flying but they have different structure. Hence, these are analogous organs. Therefore, the wing of a butterfly and the wing of a bat cannot be considered homologous organs.

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

Sol. Fossils are the preserved remains or impression of animals, plants or other organisms from the distant past. These fossils tell us about many extinct animals and also give information about how evolution can occur.

[Page – 158]

Q.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?

Sol. Human are differences in size, colour and looks, due to interaction of genes with environment. In spite of wide differences human beings can interbreed. Hence, all of them are kept in one species.

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

Sol. It depends on our notation of 'better' design. If complexity of body structure is the criterion, then chimpanzee is better than among bacteria, spider, and fish. But if we take the criterion, ability of survival in almost all kinds of habitat then bacteria are far better than any other group of organisms.