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## NCERT Class 10 Chapter 9 Heredity and Evolution CBSE Board Sample Problems Short Answer (For CBSE, ICSE, IAS, NET, NRA 2022)

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### Question

**Describe any three ways in which individuals with a particular trait may increase in population.**

### Solution

- Different ways in which individuals with a particular trait may increase in population are variation, natural selection and genetic drift.
- Variation: Variation is defined as the occurrence of differences among the individuals.
- No two individuals are exactly alike. Variations arising during the process of reproduction can be inherited and lead to increased survival of the individuals. Natural selection: It results in adaptations in population to fit their environment better. Thus, natural selection directs evolution in the population of a particular species.
- Genetic drift: The change in the frequency of certain genes in a population over generations is called genetic drift.

### Question

**Tabulate two distinguishing features between acquired traits and inherited traits with one example of each.**

### Solution

#### Acquired traits

- i. The acquired traits are the traits which are experienced by an individual during his life time.
- ii. These involve changes in non-reproductive tissues (or somatic cells) , which cannot be passed on to the germ cells or progeny.
- iii. Example- cut-tail of mice, learning to dance etc.

## Inherited traits

- i. Inherited traits are the characteristics which one acquires from his/her ancestors.
- ii. These involve changes in the DNA. Hence, they are transmitted to the progeny.
- iii. Example- height, eye colour, skin color etc.

## Question

**Define the term 'evolution' . 'Evolution cannot be equated with progress' . Justify this statement.**

## Solution

- Evolution is a gradual change in the characteristics of a population of animals or plants over successive generations. Evolution cannot be equated with progress. There is no real progress' in the idea of evolution.
- Evolution is simply the generation of diversity and the shaping of the diversity by environmental selection. The only progressive trend in evolution seems to be that more and more complex body designs have emerged over time.
- However again, it is not as if the older designs are inefficient! One of the simplest life forms, bacteria inhabits the most inhospitable habitats like hot springs, deep-sea thermal vents and the ice in Antarctica.

## Question

**What are fossils? How are they formed? Describe in brief two methods of determining the age of fossils.**

## Solution

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

## Question

**(a) Will geographical isolation be a major factor in the speciation of a self-pollinating plant species? Why or why not?**

**(b) Will geographical isolation be a major factor in the speciation of an organism that reproduces asexually? Why or why not?**

### Solution

- Geographical isolation will not be a major factor in the speciation of a self-pollinating plant species because it does not have to look for other plants to carry out its process of reproduction.
- Geographical isolation will not be a major factor in the speciation of an organism that reproduces asexually because it does not require any other organism to carry out reproduction.

### Question

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

### Solution

Factors that would lead to the rise of a new species are as follows:

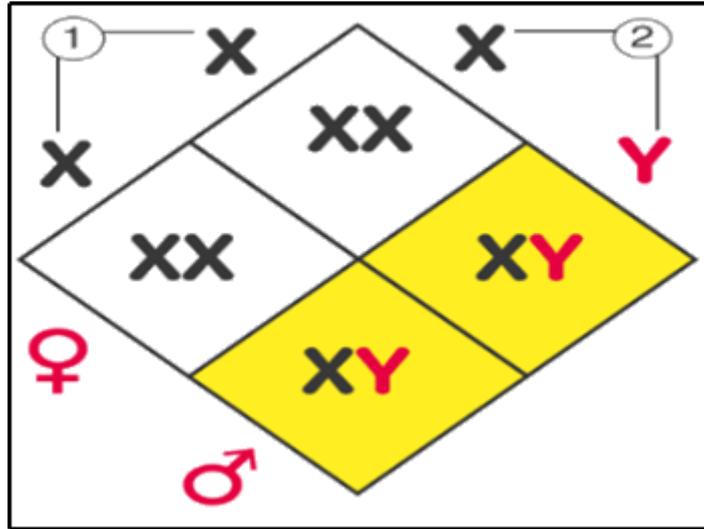
- Natural selection
- Genetic variation
- Genetic drift
- Mutation
- Geographical isolation and reproductive isolation

### Question

**How is the sex of the child determined in human beings?**

### Solution

- In human beings, sex of the child depends upon which kind of male gamete fertilizes the female gamete. If sperm carrying X chromosomes fertilizes the ovum carrying X chromosome, then the child born will be a girl.
- If a sperm carrying Y chromosome fertilizes the ovum which carries X chromosome, then the child born will be a boy.



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## Question

**Can the wings of a butterfly and the wings of a bat be considered homologous organs? Why or why not?**

## Solution

- Homologous organs perform completely different functions and look differently, however share common basic structure and origin.
- Wings of a butterfly are composed of polysaccharide membrane, whereas wings of a bat are composed of bony skeleton.
- Hence, these aren't homologous organs rather analogous organs.

## Question

**Mention the total number of chromosomes along with the sex chromosomes that are present in a human female and a human male. Explain how in sexually producing organisms the number of chromosomes in the progeny remains the same as that of the parents.**

## Solution

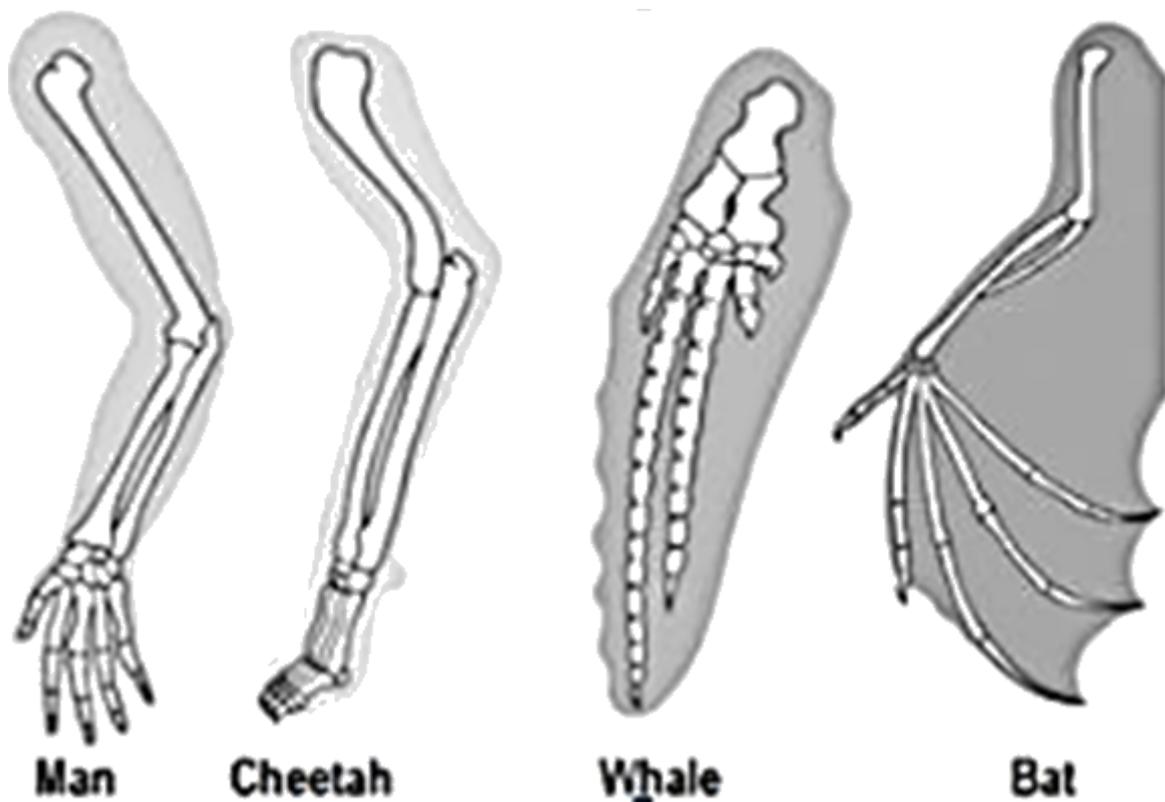
- Human male has 22 pairs of chromosomes along with XY sex chromosome. Human female has 22 pairs of chromosomes along with XX sex chromosome.
- The original number of chromosomes (the amount of DNA) becomes half during gamete formation.
- When the gamete fuse, the original number of chromosomes (the amount of DNA) is restored in the progeny.

## Question

**What do you think is depicted in the figure below?**

What information do they give us about evolution?

Both butterfly and birds have wings for flight. Are they closely related to each other with? Why?



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**Solution**

- Homologous organs. (1)

- These animals are closely related to each and have a common ancestor. (1)
- No, are analogous organs as their origin/structural design is different (0.5 + 0.5)

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