

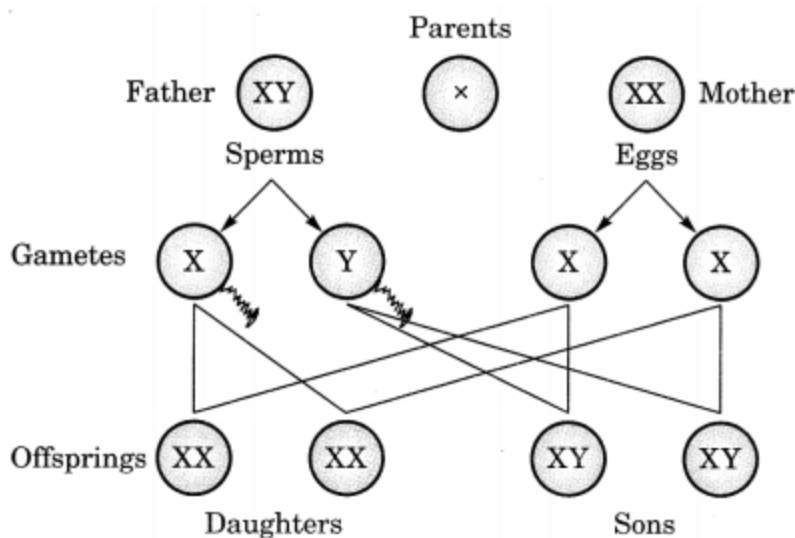
LONG QUESTION ANSWER

Question 1.

Can you justify the statement that “Human males are responsible for determining the sex of the baby and not females”?

Answer:

The sex in human beings or the sex of the individual is largely genetically determined. A male cell has two types of sex chromosomes i.e., X – chromosome and Y – chromosome because of which male produces two types of sperms with genotype A + X and A + Y. Female cells have two X – chromosomes so the genotype of eggs produced by her is A + X. During the fertilization chances are:



- If a sperm carrying Y – chromosome fertilizes the egg, then the child born will be a male i.e., AA + XY.
- If a sperm carrying X – chromosome fertilizes the egg then the child born will be a female i.e., AA + XX.

Thus, we can infer that the sperm of the male determines the sex of the child.

Question 2.

“Red beetles live in a bush with green beetles. Eventually, the number of green beetles increases as compared to red beetles”.

(a) Give a reason for the increased number of green beetles.

(b) State two advantages of variations.

Answer:

(a) The crows are unable to spot the green colored beetles in the green colored bushes, so the number of green colored beetles increases.

(b) Variations are advantageous as they:

- Enable the survival of the organism under adverse conditions.
- Leads to evolution.

Question 3.

Name the scientist who gave the 'Theory of Natural Selection'. State and explain the theory briefly.

Answer:

The theory of evolution by natural selection, first formulated in Darwin's book "On the Origin of Species" in 1859, is the process by which organisms change over time as a result of changes in heritable physical or behavioral traits. Changes that allow an organism to better adapt to its environment will help it survive and have more offspring.

The four steps in the process can be summarized as:

1. Large numbers: The parent produces more offspring than that can survive.
2. Competition: There is a limited amount of resources, so competition occurs among the offspring and also with the other members of the population.
3. Survival of the fittest: Only the members who have favorable variations survive the competition.
4. Natural selection: The surviving members reproduce and pass on the variations to their progeny.

Question 4.

Define the term 'Evolution'. "Evolution cannot be equated with progress". Justify.

Answer:

The process by which the new types of organisms are formed from the pre-existing organisms through variations and modifications is called evolution.

Natural selection and genetic drift cause evolution but that does not mean that

- One species is eliminated to form the new one, or

- The new species is better than the older one. So, evolution should not be equated with progress as multiple branches are possible at each and every stage of evolution.

Example: Human beings have not evolved from chimpanzees. Both have evolved in their own separate ways from a common ancestor a long time ago.

Question 5.

“Our teeth and elephant’s tusks are homologous organs”. Justify this statement. What do the analogous organs indicate?

Answer:

Our teeth and elephant’s tusks are homologous organs because they have the same basic structure and origin but perform different functions.

Analogous organs are those organs which perform the same function but have different structure.

Question 6.

How and why did human race spread from Africa to other parts of the world?

Answer:

Earliest members of human species (Homo sapiens) came from Africa. Some of our ancestors stayed back in Africa while others moved and spread across to West Asia, Central Asia, Eurasia, South Asia, and East Asia.

They moved from the islands of Indonesia and the Philippines to Australia, and some crossed the Bering land bridge to reach America. They did not go in a single line but went forwards and backwards, with groups sometimes separating from each other, sometimes coming back to mix with each other, even moving in and out of Africa.

Question 7.

Give reasons why acquired characters are not inherited.

Answer:

No change in the DNA of germ cells is produced by the acquired characters, so they cannot be inherited. Only those characters are inherited which have a gene for them.

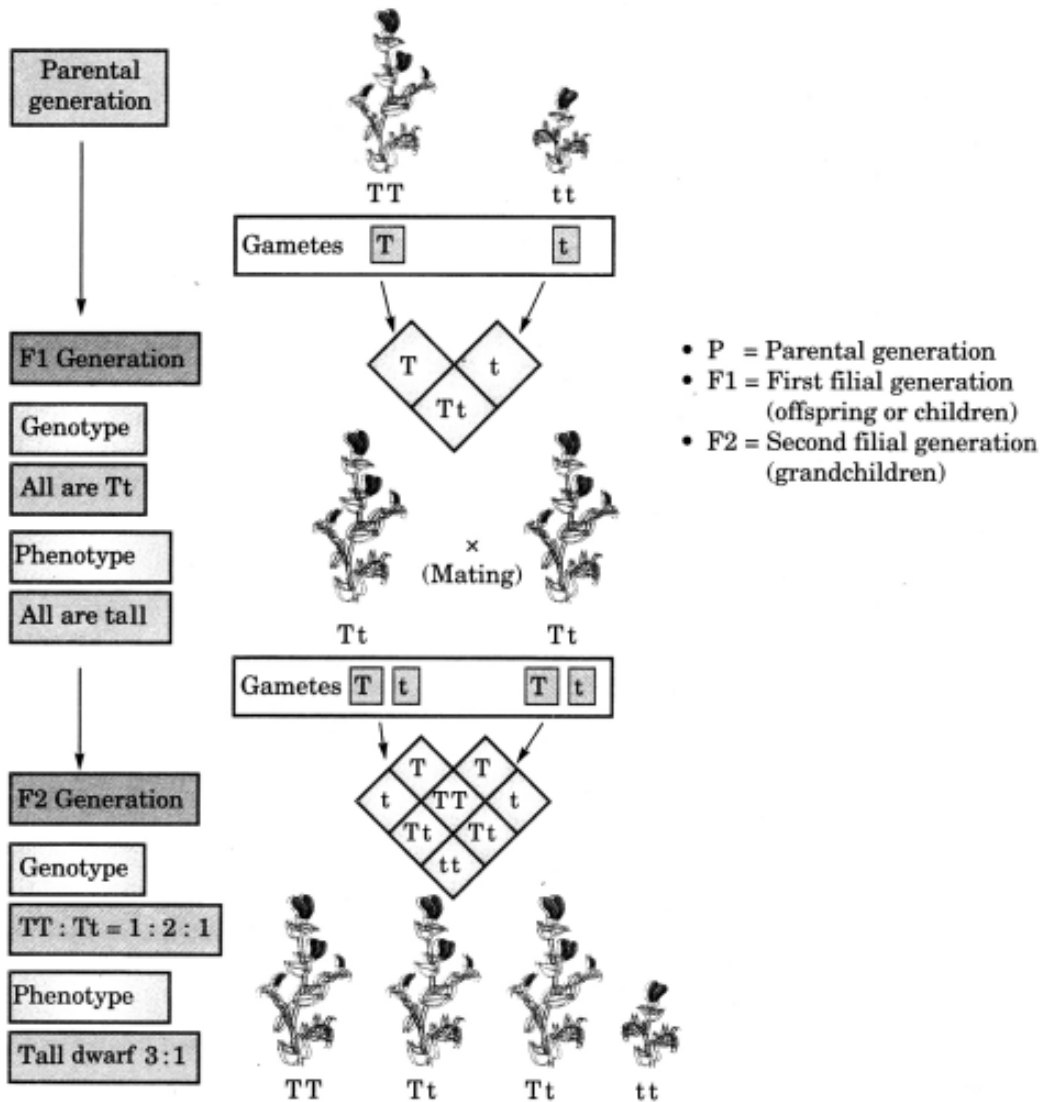
Question 8

Demonstrate with an example that traits may be dominant or recessive. Write down

Mendel's law related to it.

Answer:

The cross shown below demonstrates that the traits may be dominant or recessive.



The law related to it is the Mendel's first law of inheritance i.e., Law of dominance, which states that:

- Characters are controlled by discrete units called factors.
- Factors occur in pairs.
- In a dissimilar pair of factors one member of the pair dominates (dominant) the other (recessive).

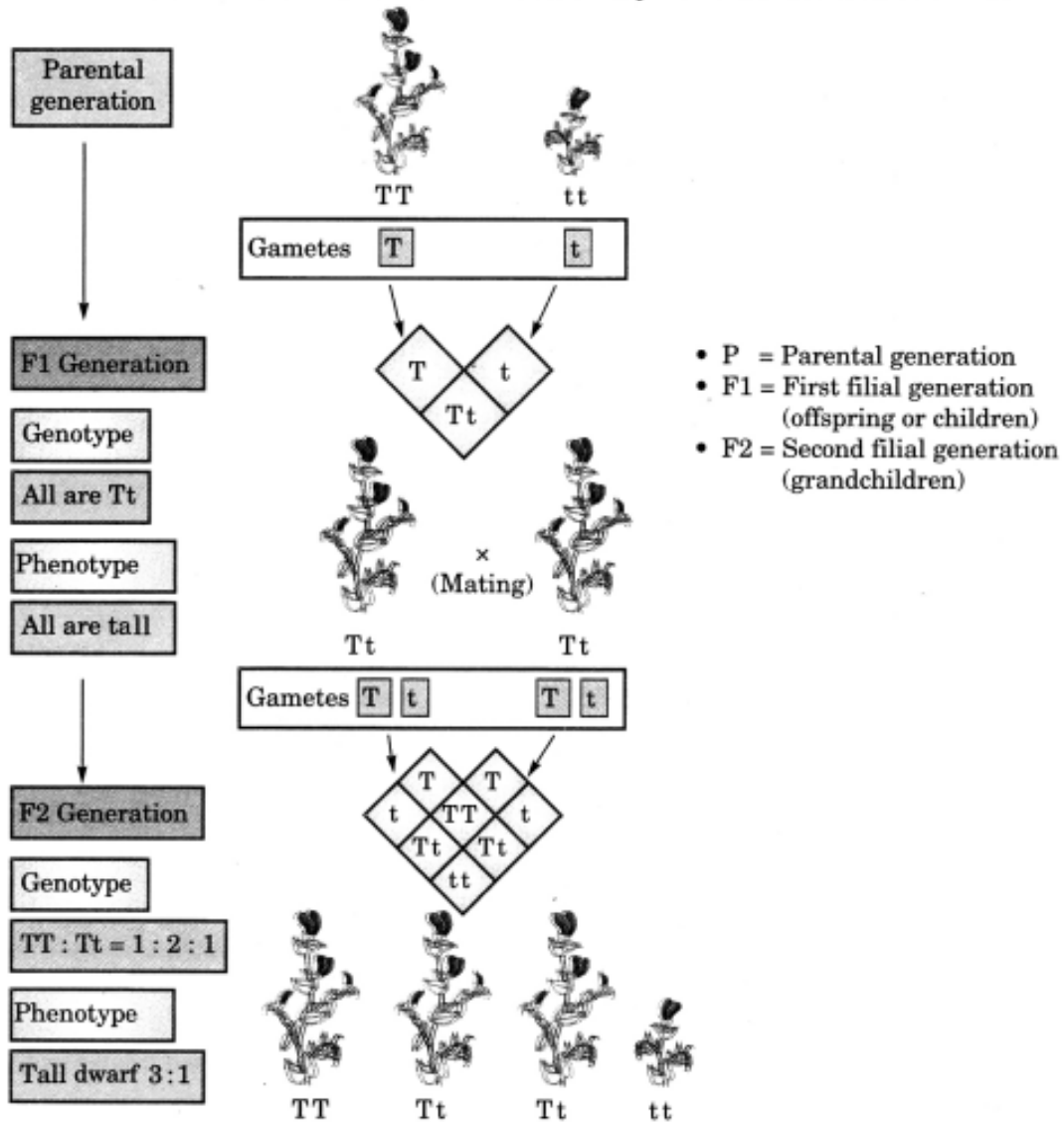
Question 9.

In a monohybrid cross between tall pea plants denoted by TT and short pea plants

denoted by tt , Preeti obtained only tall plants denoted by Tt in the F1 generation. However, in F2 generation she obtained both tall and short pea plants. Using the above information, explain the law of dominance.

Answer:

The cross shown below demonstrates that the traits may be dominant or recessive.



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Question 9.

Define speciation. What are the factors which lead to speciation?

Answer:

The process of formation of new species from the existing species is called speciation. The factors which lead to the formation of new species are:

(i) Reproductive Isolation:

(a) Allopatric speciation: Caused by the various types of barriers like mountain ranges, rivers, seas, etc. It leads to reproductive isolation between members of the species and this is also called geographical isolation.

(b) Sympatric speciation: It occurs when populations of a species that share the same habitat become reproductively isolated from each other.

(ii) Genetic Drift: It is caused by change in the frequency of a particular genes by accident or by chance alone.

(iii) Natural Selection: The process by which a group of organisms adopts to fit their environment in a better way.

(iv) Migration: When movement of a section of population to another place and population occurs.

(v) Mutation: Sudden changes in the sequence of DNA.

Question 10.

In a cross between plants with purple flowers and plants with white flowers, the F₁ had all white flowers. When F₁ generation was self-bred, the F₂ generation gave rise to 100 individuals, 75 of which had white flowers. Make a cross and answer.

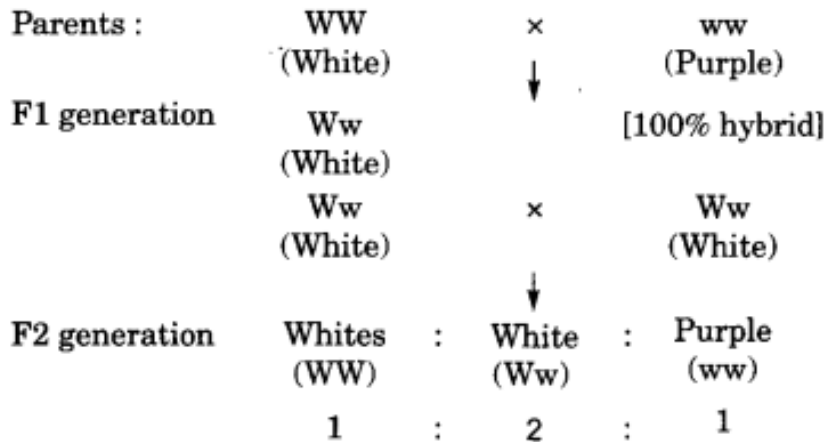
(a) What are the genotypes of F₂ individual?

(b) What is the ratio of purple flowered plants in F₂ generation?

Answer:

W = White.

w – Purple.



- (a) Genotypes of F2 individuals are 1(WW) : 2(Ww) : 1(ww)
 (b) Ratio of white to purple flowers = 3 : 1, i.e., 3 white : 1 purple

Question 11.

Does geographical isolation of individuals of a species lead to formation of a new species? Provide a suitable explanation.

Answer:

Yes, geographical isolation gradually leads to genetic drift. It leads to productive isolation between members of the species as it imposes limitations to sexual reproduction of the separated population.

Slowly new variations arise as the separated individuals reproduce among themselves. Accumulation of the variations which arise through a few generations may ultimately lead to the formation of a new species.

Question 12.

Bacteria have a similar body plan when compared with human beings. Does it mean that human beings are more evolved than bacteria. provide a suitable explanation.

Answer:

It depends on the perspective which we consider while assessing whether humans are more evolved than the bacteria because, if appearance of complexity is concurrent with evolution, then human beings are certainly more evolved than bacteria.

But if we take the totality of life characteristics into account, then it is hard to label either organisms are evolved.

Question 13.

Give the basic features of the mechanism of inheritance.

Answer:

The basic features of the mechanism of inheritance are:

- Characters are controlled by genes.
- Genes are present on the chromosomes.
- Each gene controls one character.
- There may be two or more forms of the same gene.
- One form of the gene may be dominant over the other.
- Two forms of the gene whether similar or dissimilar are present in an individual.
- The two forms of the gene separate at the time of gamete formation.

The two forms of the gene are brought together in the zygote

. Question 14.

A man who has four sons and one daughter believes that he produces more of sperms with Y as a chromosome. With suitable reasons, justify whether he is right or wrong in thinking this way.

Answer:

A man produces 50% sperms with Y chromosome and 50% with X chromosome whereas a female produces 100% ovum with X chromosome. So, it's just a matter of chance which sperm fertilizes the ovum. If sperm with Y chromosome fertilizes the ovum the progeny will be son and if sperm with X chromosome fertilizes the egg, then the progeny will be daughter. So, the man is not right in his thinking that he is producing more sperms having Y chromosome.

Question 15.

Akshat and his wife have attached earlobe (recessive trait) and are professional dancers. They told their colleagues that their offspring would also have attached earlobe and will be a good dancer. Is their notion, right? Support your answer with suitable reasons.

Answer:

Attached earlobe or free earlobe is an inherited trait. Also, both parents have attached earlobe which is a recessive trait, so the progeny produced will have attached earlobe. But, the ability to dance or being a good dancer is an acquired trait which an individual

acquires during its lifetime. So, there is no certainty that the offspring produced will be a good dancer or not. Therefore, the notion they perceive is not right.

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