



Mentor Guru

Class 12 – Biology

Chapter 4 – Principles of Inheritance and Variation

Very Short types question with answer

Q.1. What is the cross known as when the progeny of F1 and a homozygous recessive plant is crossed? State its advantage.

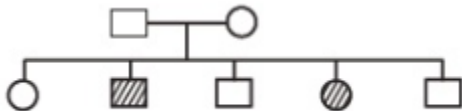
A.1. The cross is a test cross. It is advantageous to determine the genotype of the parent plant.

Q.2. What are the criteria for selecting organisms to perform crosses to study the inheritance of a few traits?

A.2. The following criteria are adopted for selecting organisms:

- The traits should be easily visible.
- The organisms should have different traits.
- They should have a short life span
- They must be true breeds
- The pollination procedure should be simple.
- The traits can be manipulated easily
- Random mating of gametes should take place

Q.3. The following pedigree shows a particular trait which is absent in the parents but found in the subsequent generation irrespective of the sexes. Analyze the pedigree and draw a conclusion.



A.3. The pedigree shows an autosomal recessive disorder. The parents are the carrier of the disease so the disease will be visible in only a few offsprings. The other offsprings will be either a carrier or non-carrier.

Q.4. Why did Mendel self-pollinate the tall F1 plants to get the F2 generation and crossed a pure breeding tall plant with a pure breeding dwarf plant to obtain the F1 generation?

A.4. The genotype of 50% of the offspring will resemble one parent and the rest 50% will resemble the other parent. The F1 generation obtained from the cross is heterozygous. So selfing the F1 generation is sufficient to obtain the F2 generation. It would also help to understand the inheritance of selected traits over generations.

Q.5. How are the alleles of a gene different from each other? What is its importance?

A.5. Alleles are the alternative forms of the same gene. For eg., a gene for height comprises of two alleles, one for tall (T) and the other for the dwarf (t). They differ in their nucleotide sequence due, which results in different phenotypes.

Importance:

- They are essential in studying the inheritance and behaviour patterns.
- They show variations in the population due to contrasting phenotypes of a character.

Q.6. How far are the genes and environment responsible for the expression of a particular trait?

A.6. The genes remain active throughout our lives, switching on and off their expression in response to the environment. The external factors such as light, temperature, nutrition, etc. are responsible for the gene expression exhibiting changes in the phenotype. Genes provide potentiality while the environment provides an opportunity for the expression of the traits.

Q.7. What is the genetic basis of the wrinkled phenotype of pea seed?

A.7. A single gene determines the shape of the seed. The (R) is for the round shape, which is dominant over (r) for the wrinkled seed. If homozygous alleles control the seed shape, it will depict the phenotype of same alleles, for eg., RR (round), rr (wrinkled). If the alleles are heterozygous, the phenotype of the dominant allele will be expressed, for eg., Rr (round).

Q.8. Why does an individual have only two alleles even if a character shows multiple allelism?

A.8. The multiple forms of an allele that occurs on the same gene locus are known as multiple alleles. But an individual carries only two alleles. This happens because a zygote is formed by the fusion of haploid sperm and egg. They have only one allele for each trait. When the zygote becomes diploid, it has two alleles for each trait.

Q.9. How is a mutation induced by the mutagen? Explain with examples.

A.9. The mutagen changes the base sequence by insertion, deletion or substitution and induces mutation.

Q.10. Differentiate between dominance, co-dominance and incomplete dominance.

A.10. Dominance is the phenomenon in which one variant of a gene masks the effect of a different variant of the same gene.

Co-dominance is the relationship between two alleles of a gene. In this none of the alleles are recessive and the phenotype of all the alleles are expressed.

Incomplete dominance is a form of intermediate inheritance in which one allele for a specific trait is not expressed completely over its paired allele.

Q11. Define the chromosomal theory of inheritance?

A11. The chromosomal theory of inheritance is defined as the fundamental theory of genetics, which recognizes chromosomes as the carriers of genetic material.

Q12. Define Linkage?

A12. In genetics, the linkage is defined as the tendency of genes to remain combined together during the inheritance. This phenomenon was first observed and reported by William Bateson and R.C. Punnet in the early 1900s.