Book Name: NCERT Solutions

Question 1:

Mention the advantages of selecting pea plant for experiment by Mendel.

Solution 1:

Pea plants were having seven contrasting traits like tall and dwarf, yellow and green seeds. These contrasting characters helped a lot to Mendel and he also chosen true breeding pea plant varieties.

Question 2:

Differentiate between the following-

a) Dominance and Recessive
b) Homozygous and Heterozygous
c) Monohybrid and Dihybrid.

Solution 2:

a) **Dominance** – Trait which suppresses the effect of other trait.
E.g. tallness suppresses dwarfness.
Recessive – Trait which is suppressed by the effect of other trait.
E.g. dwarfness is suppressed by tallness.
b) **Homozygous** – Genotype comprising of similar allele.
E.g. t tor TT
Heterozygous – Genotype comprising contrasting allele. E.g. Tt
c) **Monohybrid** – When genes control only one factor.
Dihybrid – When one gene controls more than one factor.

Question 3:

A diploid organism is heterozygous for 4 loci, how many types of gametes can be produced?

Solution 3:

Loci are the place on the chromosome where genes lie. So, loci and genes are synonyms words. If a diploid organism is heterozygous for 4 loci then it will have four contrasting traits. Aa, Bb, Cc, Dd and during meiosis 16 different kinds of gametes will be formed.

Question 4:

Explain the Law of Dominance using a monohybrid cross.

Solution 4:

According to Mendel's law of dominance, Monohybrid cross the dominant allele suppresses the presence of recessive allele. But it doesn't mean that the recessive allele has lost its existence. It remains hidden in F1 generation and reappears in the next generation.

When Rr * rr

Rr --- F1

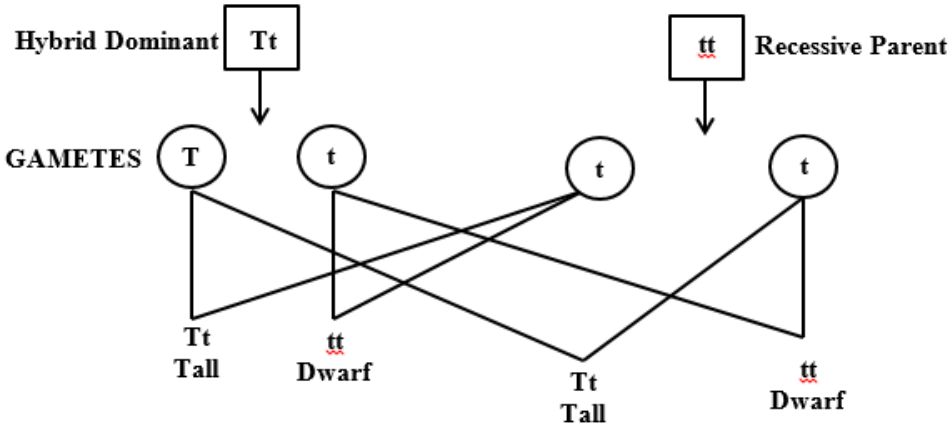
When Rr are self crossed recessive allele rr again reappears in F2 generation in 9:3:3:1 ratio.

Question 5:

Define and design a test – cross?

Solution 5:

When plant with unknown genotype is crossed with recessive parent to find out the genotype of plant with unknown genotype are called test cross.

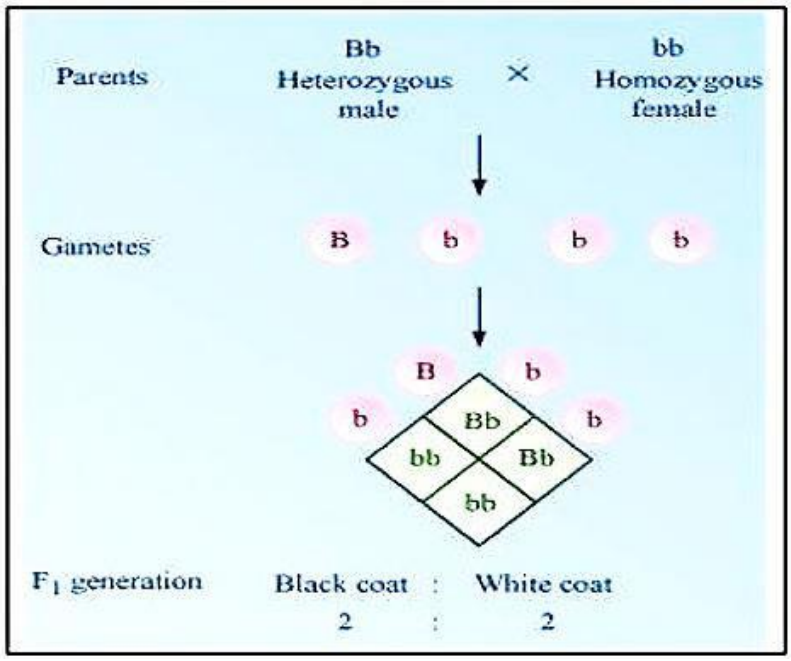


Question 6:

Using a Punnette square, work out the distribution of phenotypic features in the first filial generation after a cross between a homozygous female and a heterozygous male for a single locus.

Solution 6:

In the case of guinea pigs, when male guinea pigs with genotype Bb while female guinea pigs produces with genotype bb. Male produces two types of gametes B and b while female produces one kind of gamete b. Through punnette square we see genotypic and phenotypic ratio in F1 generation is same in the ratio 1:1



Question 7:

When a cross in made between tall plants with yellow seeds (TtYy) and tall plant withgreen seed (TtYy), what proportions of phenotype in the offspring could be expected to be

a) Tall and green.

b) Dwarf and green.

Solution 7:

When a cross in made between tall plants with yellow seeds (TtYy) and tall plant withgreen seed (TtYy), the phenotypic proportion in the offspring could be expected are three tall and green, one dwarf and green.

Question 8:

Two heterozygous parents are crossed. If the two loci are linked what would be the distribution of phenotypic features in F1 generation for a dihybrid cross?

Solution 8:

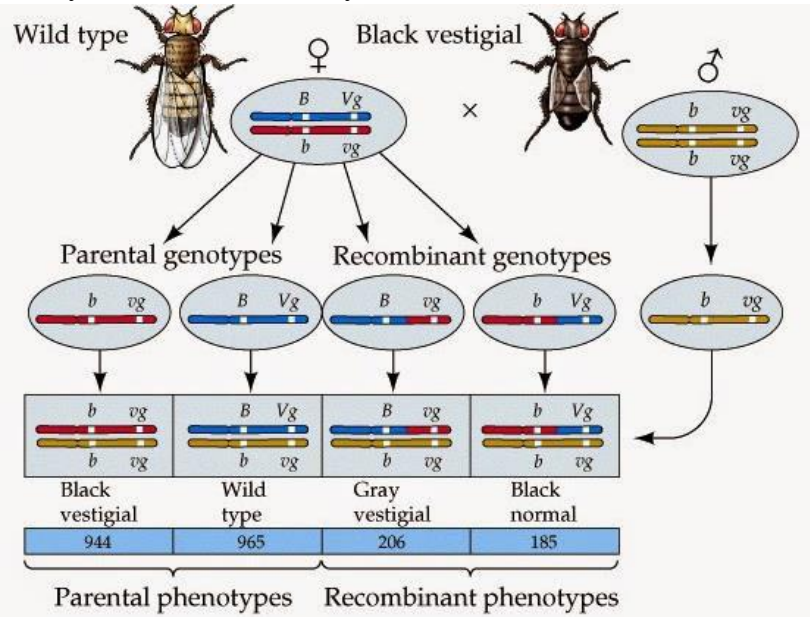
When two or more genes co-exist on the same chromosome is called linkage. Phenotypic ration in F1 generation for a dihybrid cross will be in the ratio 9:3:3:1 for F2 generation.

Question 9:

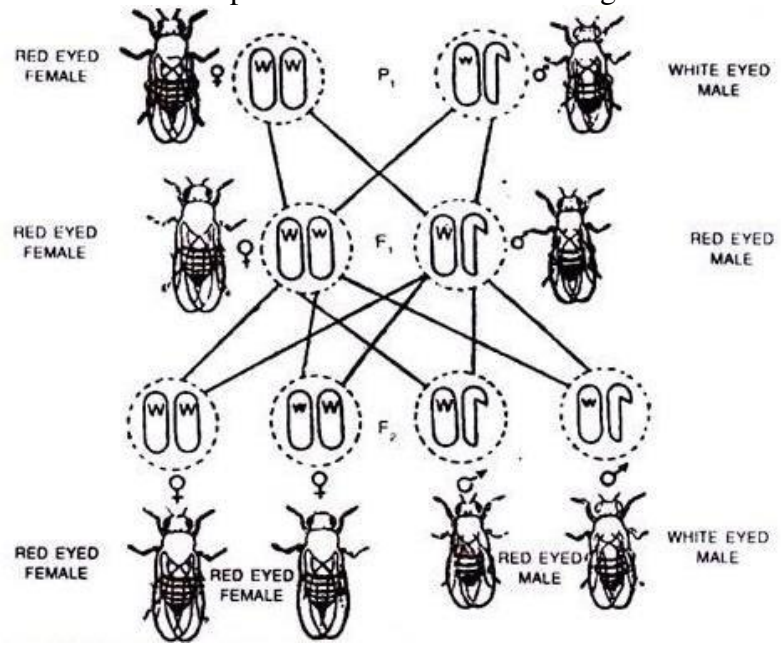
Briefly mention the contribution of T.H. Morgan in genetics.

Solution 9:

T.H. Morgan led to the discovery of chromosomal theory of inheritance. He carried out many dihybrid crosses on Drosophilla to study sex linked disease. These crosses were some hoe similar to dihybrid crosses made by Mendel.



After crossing between yellow-bodied white eyed females with brown-bodied red eyed males. He found that independent of each others in F2 generation have phenotypes in the ration 9:3:3:1.



Sex-Linked Inheritance in Drosophila. Cross between Red-Eyed Female and White-Eyed Male

The above ratio clears that the gene were located on X-chromosomes and if two genes are located on the same chromosome then these ratios 9:3:3:1 are formed. Morgan discovered this phenomenon was due to presence of two or more genes in a dihybrid cross and he coined the terms linkage and recombination to describe the origin of non-parental gene combination. Morgan also discovered that if the group of genes are on some chromosomes, then they are linked lightly while others were linked loosely.

Question 10:

What is pedigree analysis? Suggest how such an analysis, can be useful.

Solution 10:

A kind of genetic analysis by which inheritance of gene is traced in the family of a person.

Scientific chart of ancestors drawn with the help of certain specific symbols for pedigree analysis of a person is termed pedigree analysis. By studying these charts genetic counsellors can help in preventing certain genetic disorders like haemophilia, sicle cell anaemia in future generation of that family.

Question 11:

How is sex determined in human beings?

Solution 11:

In human being, sex chromosomes of female is while of male is XY. When Y chromosome of male fertilizes with either of female chromosome, foetus will be a male. When X chromosome of male fertilizes with either of female chromosome, foetus will be a female.

Question 12:

A child has blood group O. If the father has blood group A and mother blood group B, work out the genotypes of the parents and the possible genotypes of the other offsprings.

Solution 12:

Blood group in human is controlled by three kinds of alleles Ia Ib and Io and these alleles can express themselves independently. So, if the father has blood group A and mother blood group B then their progeny could have AB blood group.

Question 13:

Explain the following terms with example

a) Co-dominance

b) Incomplete dominance

Solution 13:

a) When both the contrasting alleles of a gene are independently expressed is called co-dominance. E.g. human blood group.

b) It is a condition when heterozygous produces intermediate phenotype. It happens because of partial suppression of one allele by other. E.g. Flower colour in snapdragon plant.

Question 14:

What is point mutation? Give one example.

Solution 14:

When mutation occurs in single base pair of DNA it is termed as Point mutation. e.g. Sickle cell anaemia.

Question 15:

Who had proposed the chromosomal theory of inheritance?

Solution 15:

Sutton and Baveri in 1902.

Question 16:

Mention any two autosomal genetic disorders with their symptoms.

Solution 16:

a) Sickle cell anaemia – When because of point mutation, the biconcave shape of Hb converts into sickle shape.

b) Phenylketonuria – Person affected from phenylketonuria lacks an enzyme which converts amino acid and phenylalanine into tyrosine. Then this phenylalanine accumulates and converts into phenyl pyruvic acid and other derivatives. This disease causes mental retardation.