# GENETICS

1. Genetics - a branch of biology that deals with the heredity and variation of organisms.

2. Heredity - passing of genetic factors from parents to offspring or from one generation to the next.

3. Variation - small differences among the individual of the same species.

4. Character - heritable feature that varies among individuals.
An example would be flower color, height of the plant

5. Trait a variant for character, such as white or purple colors for flowers.

6. Locus is the specific physical location of a gene on a chromosome.

7. Gene/Factor -A gene is the fundamental, physical, and functional unit of heredity present on a specific location on a chromosome. The genes are made up of a sequence of nucleotides.

**8. Allele/Allelomorph** - are variants of the same gene that occur at the same place on homologous chromosomes or alleles are pair of genes on
Homologous chromosome that determine the hereditary characteristics.

**9. Homozygous condition/Pure breeding** - A condition in which factors or genes controlling the character are similar.

**10. Heterozygous condition/Hybrid:** A condition in which the factors or genes controlling the character are dissimilar.

**11. Phenotype:** Physical expression of character due to genetic constitution.

**12. Genotype** : Genetic constitution of an organism.

**13. Dominant gene/allele:** Factor or gene which expresses itself phenotypically in heterozygous condition.

**14. Recessive gene/allele:** Factor or gene which remains unexpressed in
heterozygous condition.

15.Monohybrid cross: A cross between two pure breeding individuals with a pair of contrasting traits resulting in a generation that is hybrid for that character.

16. Dihybrid cross: A cross between two pure breeding individuals with two pairs of contrasting traits resulting in a generation that is hybrid for those characters.

17. F-1 generation(First Filial generation) : The hybrid generation formed in monohybrid and dihybrid cross.

18. F-2 generation (Second filial generation) : The generation formed on self pollinating F-1 generation.

19. Mutation: Sudden spontaneous change genetic constitution of an organism which may or may not be inherited.

Ex: **Sickle cell anemia**- is a genetic disease of the RBCs which are disc
shaped (which gives them the flexibility to travel through even the smallest blood vessels) become crescent shape resembling a sickle due to which they get trapped in small vessels. This blocks blood from reaching different parts of the body which causes pain and tissue damage.

**Thalassemia** is an inherited blood disorder that causes the body to have

less hemoglobin than normal causing anemia, leaving the person fatigued.

Gregor Mendel is called ‘Father of Genetics’

Mendel used garden pea plants [Pisum sativum] to perform expts on genetics.

Reason for using pea plants:

- Annual plants
- Flowers are large and bisexual
- Plants exhibited contrasting traits
- He could carry on artificial pollination

**Law of Unit character:**

Every character in an individual is controlled a pair of genes/factors, one of which is shared by male parent and the other by female parent.

**Law of Dominance:**

In a heterozygous condition, the factor/gene which expresses itself phenotypically is called Dominant and the other which remains unexpressed is called Recessive.

For ex: When a pure breeding tall plant is crossed with a pure breeding dwarf plant

**Law of Segregation/ I Law of Inheritance:**

The factors or genes controlling a character segregate or separate without influencing each other during the formation of gametes in such a way that each gamete gets one gene for that character.

**Law of Independent Assortment/II Law of Inheritance:**

The factors/genes controlling different characters assort themselves independently without influencing each other during the formation of gametes.

Ex:

| Character | Dominant trait | Recessive trait |
|---|---|---|
| **Colour of the seed** | **Yellow colour (YY)** | **Green colour (yy)** |
| **Shape of the seed** | **Round (RR)** | **Wrinkled (rr)** |

**Sex linked diseases**

In case of humans, females have similar sex chromosomes- XX whereas the males have two different sex chromosomes -XY.

X chromosome is longer than Y chromosome. A part of the X chromosome has corresponding allele on Y chromosome. That part of X chromosome is called HOMOLOGOUS **region of X chromosome.** The remaining part of X chromosome is called **NON-HOMOLOGOUS region of X chromosome.**

In the **non-homologous region of X chromosome**, if a **defective(recessive) gene** is present, it expresses itself, especially in males due to the absence of corresponding allele on Y chromosome. This is called **Hemizygous condition**

**Hemizygous condition** is a condition, **especially seen in males**, where certain characters are controlled by a single gene in the absence of its allele. Ex: Hemophilia, Color blindness

**Haemophilia:** is a condition in which the blood fails to clot normally even if there is a minor wound.
**Reason:** Gene for clotting of blood is present in the **non -homologous region of X chromosome.**

Gene for normal clotting of blood is a **dominant allele**

Gene for haemophilia is a **recessive allele**.

Therefore, this condition is seen more often in males than in females.

**Colour blindness**: is a condition in which the person is not able to distinguish primary colours.

**Reason**: Gene for vision is present in the **non-homologous region of X chromosome.**

Gene for normal vision is a **dominant allele**

Gene for colour blindness is a **recessive allele.**

Therefore, this condition is seen more often in males than in females.

**Holandric genes** - Genes present on **Y chromosome** and are passed on from father to son. Ex: Hypertrichosis – hair on pinna