

HEREDITY

General Terminology

Heredity

Heredity is the passing of characters from parents to offspring or one generation to next

Variation

The differences in the characters among the individuals of a species are called Variations.

Genetics

Genetics is a branch of biology which deals with the study of Heredity and variation.

- ★ **Importance of Variations** ✓
- ★ 1. The great advantage of variation to a species is that it increases the chances of its survival in a changing environment.
 - ★ 2. Variations helps in evolution and development of new species.
 - ★ 3. They form basis of heredity.
 - ★ 4. New characters are produced in the organisms by variations.

Types of traits

1. Inherited Traits
2. Acquired Traits

Inherited traits

These traits can be inherited as well as transmitted to the next generation

These traits are inherited from parents during reproduction

Example – Attached or free earlobe, curly hair, eye colour

Acquired traits

These traits are neither inherited nor transmitted to the next generation

These traits are acquired after birth

Example – Piercing of ear and nose, dancing, singing, driving skills, muscular body



✓ Face Tattoo

Free Earlobe

✓ Ear piercing

→ Hair Colour

→ fair Skin tone

→ Eye Colour

→ Nose Shape

• Nose Piercing ✓

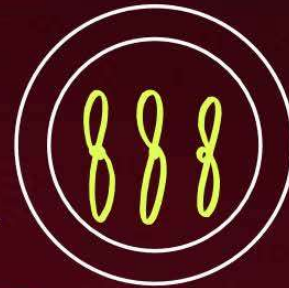
→ Driving & Swimming Skill ✓

Some important terms

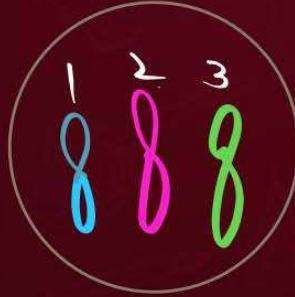
- DNA ✓
- Chromosome
- Genes
- Diploid and Haploid
- Allele ✓
- Dominant allele/trait
- Recessive allele/trait
- Homozygous / pure condition
- Heterozygous / hybrid condition
- Phenotype and Genotype ✓



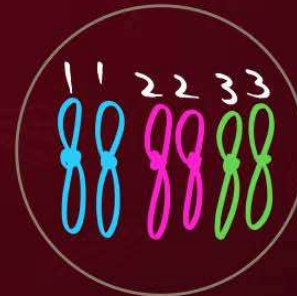
Chromatin



Chromosome

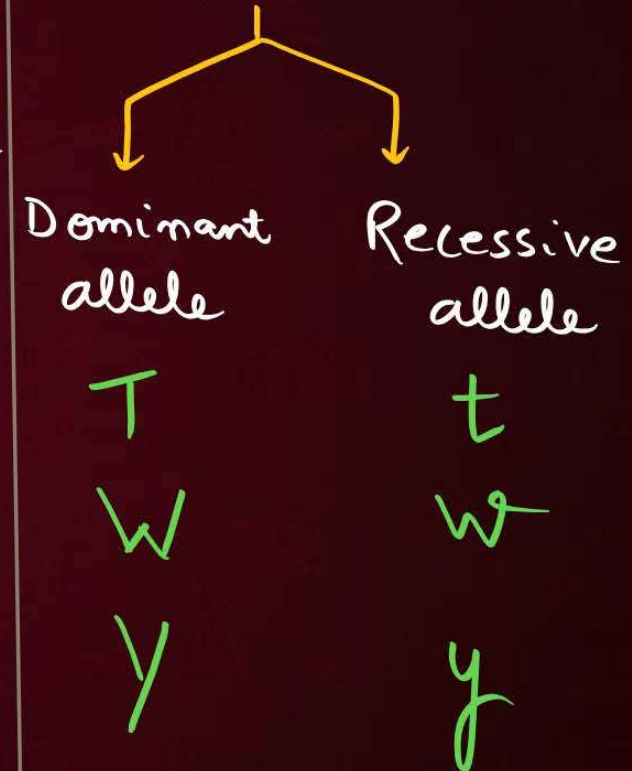


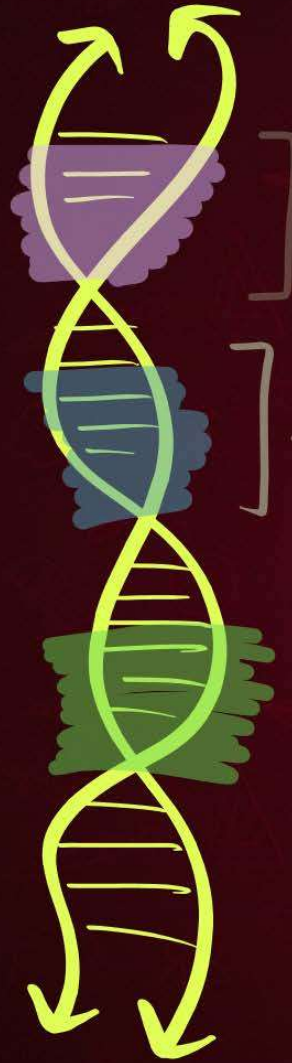
Haploid
(Gametes)



Diploid
↓
2

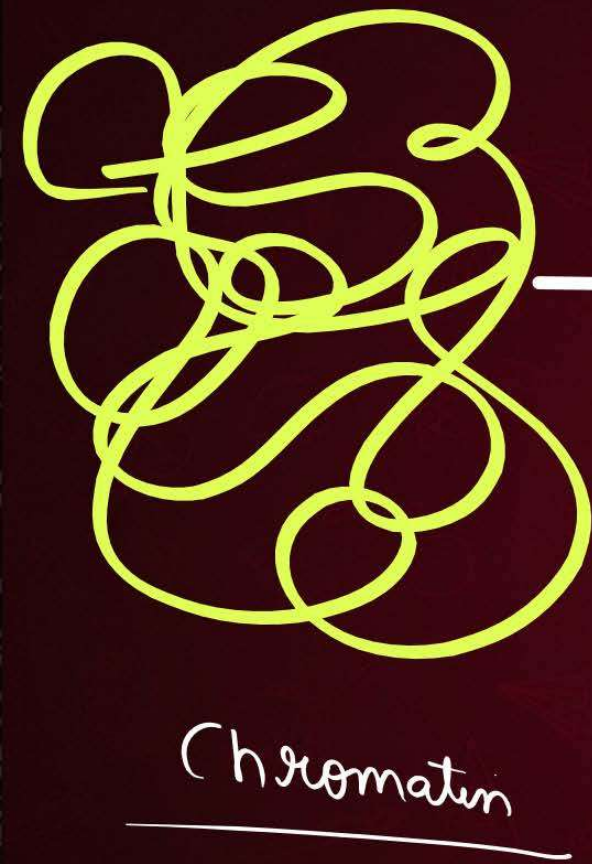
Genes





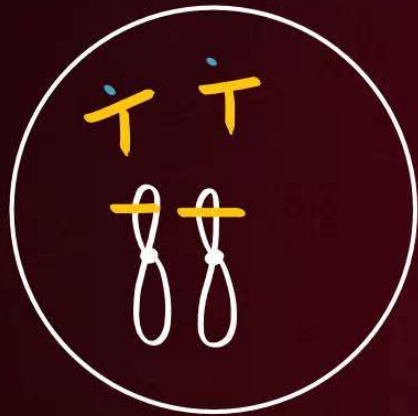
→ Gene for eye colour

→ Gene for blood group.



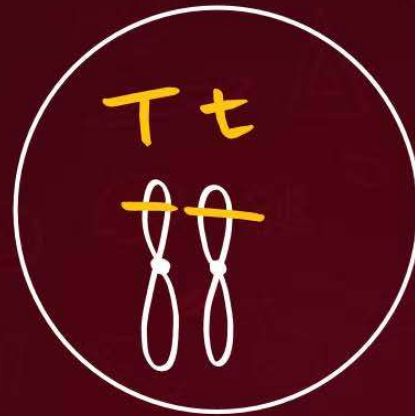
Chromosomes

Homozygous
dominant condition
(pure condition)



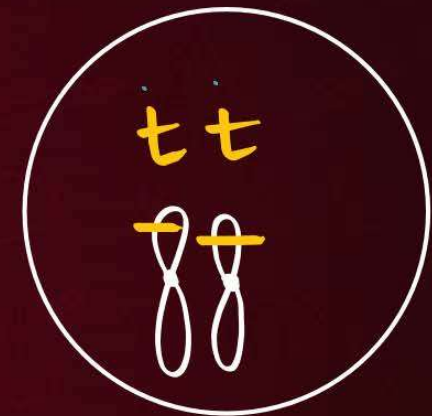
Tall

Heterozygous
condition
(hybrid condition)



Tall

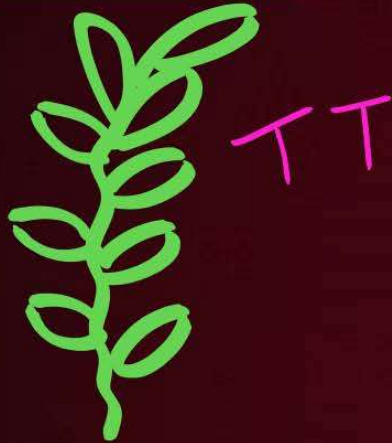
Homozygous
Recessive condition
(pure condition)



Short/dwarf



Homozygous
dominant condition
(pure condition)



Genotype : TT
Phenotype : Tall

Heterozygous
condition
(hybrid condition)



Genotype : Tt
Phenotype : Tall

Homozygous
Recessive condition
(pure condition)

















Genotype : tt
Phenotype : Dwarf / Short



Mendal and his contribution

He worked on pea plant (*Pisum sativum*) and proposed laws of inheritance.

He chose Garden Pea plant as his experimental material because of following property :

GENE	ALLELES	
Character	Dominant Trait	Recessive Trait
Seed shape ✓	Round 	Wrinkled 
Seed colour ✓	Yellow 	Green 
Flower colour ✓	violet 	White 
Pod shape ✓	Full 	Constricted 
Pod colour ✓	Green 	Yellow 
Flower position ✓	Axial 	Terminal 
Stem length ✓	Tall 	Dwarf 

	Property	Advantages of properties
a.	Short life cycle ✓	Results of experiments were obtained in less time.
b.	Annual Plant ✓	Many generations can be studied within a short period of time
c.	Choice of cross or self fertilization ✓	Mendel could conduct experiment as per his desire.
d.	7 pairs of allelic characters	Large number of choice for experiments
e.	Large number of offspring ✓	Good number of data for statistical analysis.

Monohybrid Cross

It is a cross in which only one character is studied at time.

Phenotypic Ratio

Phenotypic ratio in F_2 Generation:

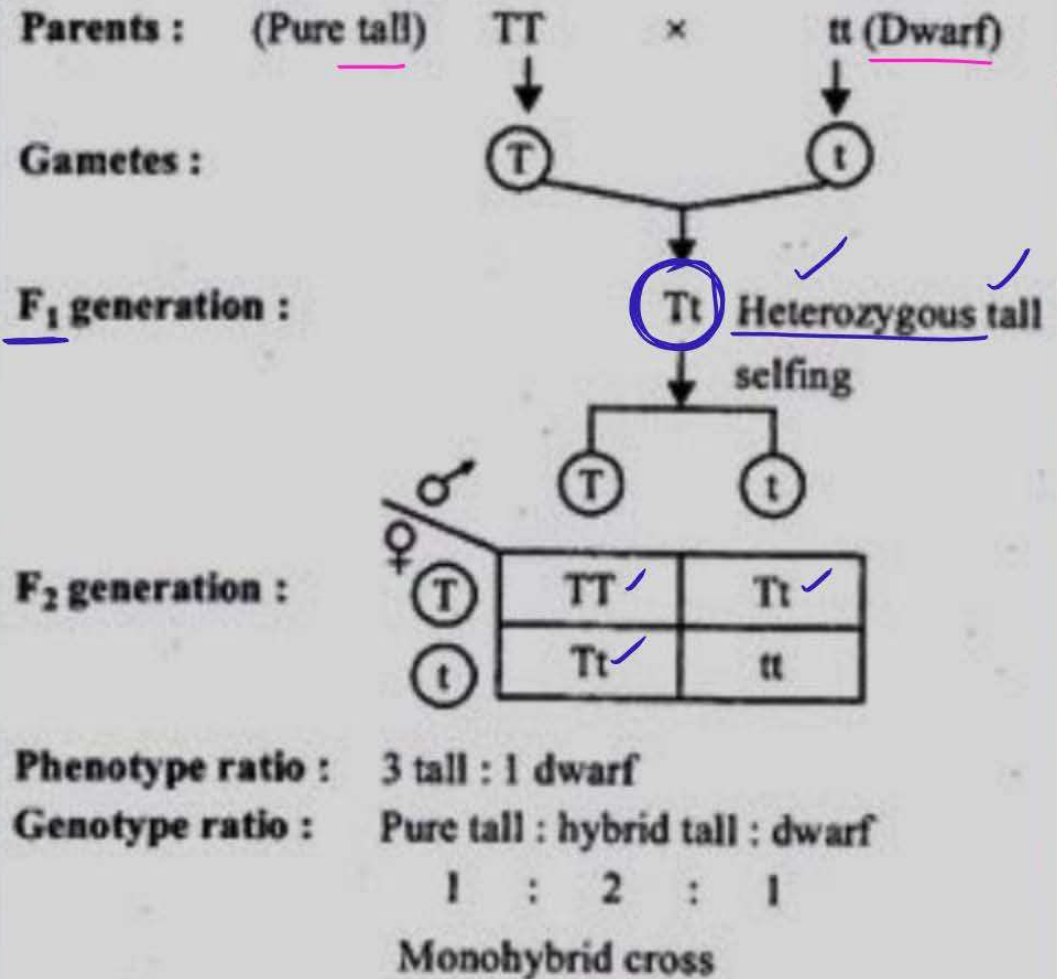
3:1

Genotypic Ratio

Genotypic ratio in F_2 Generation:

TT : Tt : tt

1 : 2 : 1



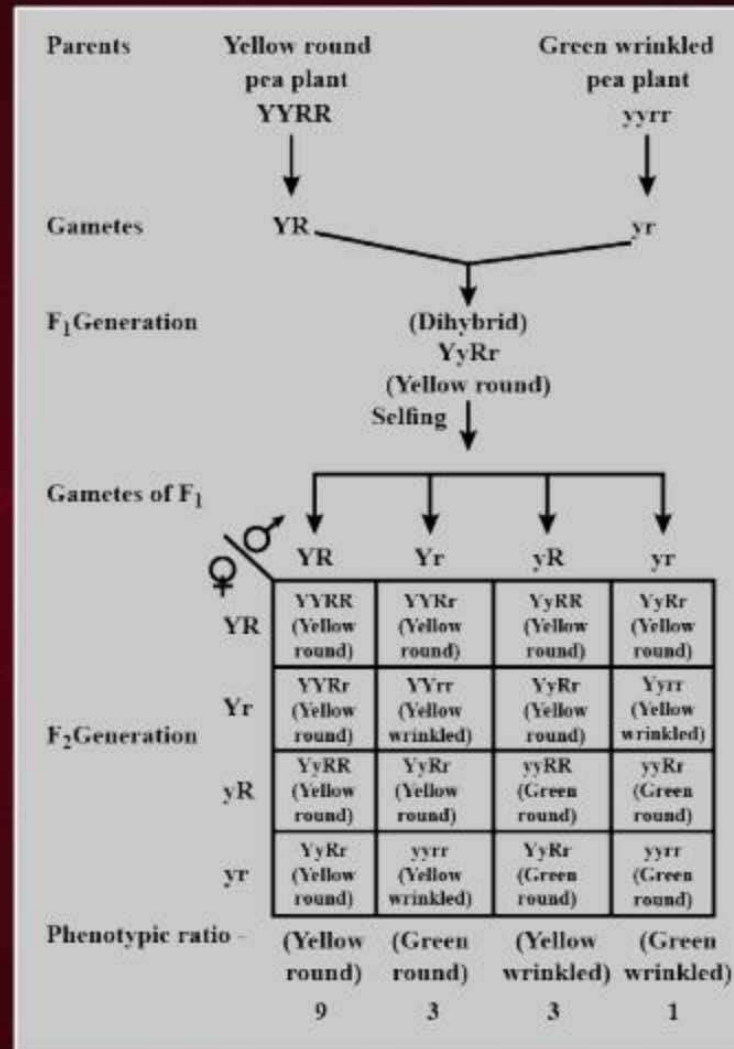
Dihybrid Cross

A cross in which study of inheritance of two pairs of contrasting traits.

Phenotypic Ratio

Phenotypic ratio in F₂ Generation: ✓

9:3:3:1



MENDEL'S LAW OF INHERITANCE

Based on Monohybrid Cross

(1) Laws of Dominance

When an inherited pair of two alleles is heterozygous, the allele that is expressed is called dominant while the other is called recessive.

(2) Laws of Segregation (Law of Purity of Gametes)

During the gamete formation, copies of genes or alleles are divided or segregated such that each gamete receives only one allele.

Based on Dihybrid Cross

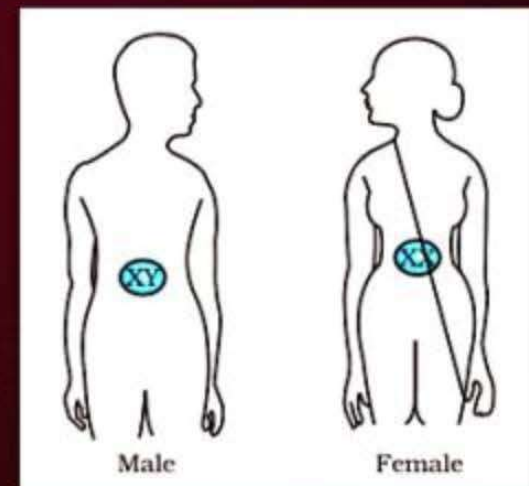
(3) Law of Independent assortment

Alleles of two or more different genes get assorted into gametes independently of one another.

Factors affecting Sex Determination



Non-Genetically	Genetically
<ul style="list-style-type: none"> • Environmental cues: In turtles, alligators, Crocodile, which fertilized eggs are kept determines sex. • In Snails, individuals can change sex. 	<ul style="list-style-type: none"> • In humans, genes/chromosomes inherited from parents decide the sex of the offspring



Sex determination

- If a sperm with X chromosome fertilises the egg then the zygote will have XX chromosome in the 23rd pair.
- A zygote with XX chromosome will develop into a girl child.
- If a sperm with Y chromosome fertilises the egg then the zygote will have XY chromosomes on the 23rd pair.
- A zygote with XY chromosome will develop into a male child.

