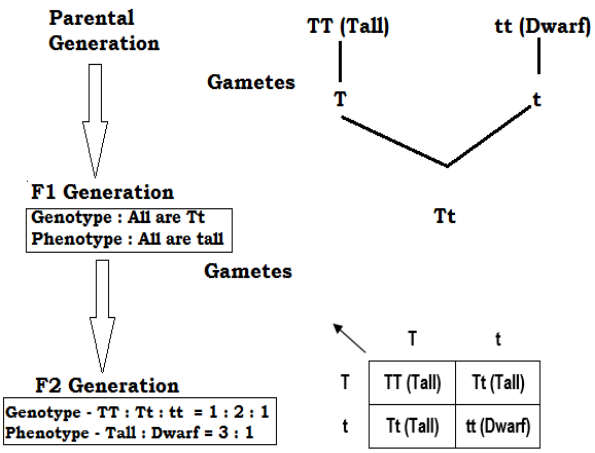
Points to Remember

Heredity	❋ Heredity is transmission of characters, from one generation to the next generation. ❋ ***Gregor Johann Mendel*** discovered the basic principles of heredity.
Terminologies	• ***Phenotype :*** External expression of a particular trait. • ***Genotype :*** The genetic expression of an organism. • ***Homozygous :*** Plants having alike factors in their pairs. ***Ex :*** TT-tall, tt-dwarf • ***Heterozygous :*** Plants having unlike factors in their pairs. ***Ex :*** Tt - tall • ***Alleles :*** 2 factors making up a pair of contrasting characters. • ***Dominant condition :*** The character which expresses itself. • ***Recessive condition :*** Character which is masked.

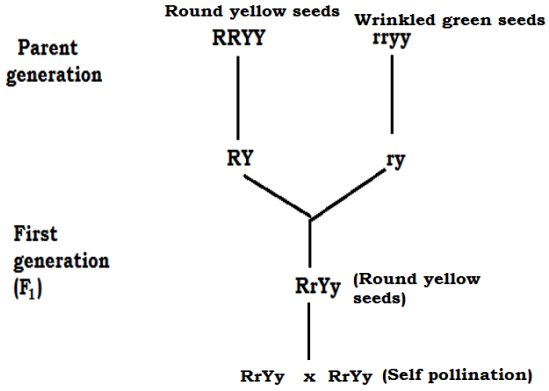
Monohybrid Cross

Cross between one pair of contrasting characters.



Dihybrid Cross

Cross between two pairs of contrasting characters.



F2 Generation

	RY	rY	Ry	ry
RY	RRYY	RrYY	RRYy	RrYy
rY	RrYY	rrYY	RrYy	rrYy
Ry	RRYy	RrYy	RRyy	Rryy
ry	RrYy	rrYy	Rryy	rryy

Phenotypic ratio – 9 : 3 : 3 : 1

- RRYY(1), RRYy(2), RrYY(2), RrYy(4)–Round yellow - 9
- RRyy (1), Rryy(2) – Round green – 3
- rrYy(2), rrYY(1) - wrinkled yellow – 3
- rryy(1) – wrinkle green – 1

7 Characters of pea plant by Mendel

Character	Dominant	Recessive
Stem length	*Long*	*Short*
Flower position	*Axillary*	*Terminal*
Flower colour	*Blue*	*White*
Pod shape	*Inflated*	*Constricted*
Pod colour	*Green*	*Yellow*
Seed shape	*Round*	*Wrinkled*
Seed colour	*Yellow*	*Green*

Mendel's Laws / Laws of Heredity	i) Law of Dominance ii) Law of Segregation or Law of purity of gametes iii) Law of independent assortment

Chromosomes : *The nucleus of each cell contains thin thread like structures called* ***chromosomes****.*

Structure of Chromosome

They are thin, long and thread like structures with two identical strands called ***sister chromatid.***

i) Primary constriction / centromere : The two arms of a chromosome meet at this point.

ii) Secondary constriction / Nuclear zone / Nucleolar organizer : It occur at any point of the chromosome.

iii) Telomere: End of the chromosome that provides stability

iv) Sat-chromosomes : These chromosomes have an elongated knob-like appendage(satellite) at its one end.

Types of chromosomes based on position of centromere	
Telocentric	Centromere is found on the proximal end. *Rod shaped.*
Acrocentric	Centromere is found at one end with a short arm and a long arm. *Rod-shaped.*
Submetacentric	Centromere is near the centre of chromosome & form two unequal arms, *J shaped / L shaped.*
Metacentric	Centromere is in the centre of the chromosome and form two equal arms *V shaped*.

Types of Chromosomes based on function	
Autosomes	They determine the somatic (body) characters**.** Male & female have equal number of autosomes.
Allosomes / Sex hormones / Hetero chromosomes	They determine the sex of an individual. ***Types :*** X and Y- chromosomes. ❋ ***Human male*** - one X and one Y chromosome ❋ ***Human female*** - two X chromosomes
Karyotype	It is the number, size and shape of chromosomes in the cell nucleus of an organism. ***Idiogram*** is the diagrammatic representation of karyotype of a species. ***Haploid*** – Single set of chromosome ***Diploid*** – Occur in pairs

Deoxyribo Nucleic Acid(DNA) *is the hereditary material that have genetic information.*

Chemical composition of DNA molecule	It is ***polynucleotide*** with millions of nucleotides. Each nucleotide is, **Nucleotide = Nucleoside + Phosphate** ⇩ **Nitrogen base + Sugar** ⇩ ⇩ **Purines - Adenine & Guanine** **Pyrimidines - Cytosine & thymine** **Deoxyribose sugar**
DNA replication	It is a process in which DNA molecule produces exact copies of its own structure. **Steps involving DNA replication :** i) Origin of replication ii) Unwinding of DNA molecule iii) Formation of RNA primer iv) Synthesis of new complementary strand

Sex Determination

- The formation of zygote into male or female sex during development is called ***sex determination***.
- Human beings have 23 pairs of chromosomes 22 pairs of autosomes and 1 pair (23rd pair) is sex chromosome.

Homogametic	***Ex :*** Female gametes or Egg **(i) (22+X) (ii) (22+X)** chromosomes
Heterogametic	***Ex :*** Male gametes or Sperms. (i) **(22+X)** (ii) **(22+Y)** chromosomes

Mutation *is an inheritable sudden change in the genetic material (DNA) of an organism.*

Chromosomal mutation	Sudden change in the structure or number of chromosomes. ***i) Changes in the structure of chromosomes:*** Due to errors in cell division. **ii)** ***Changes in the number of chromosomes(Ploidy):*** Addition or deletion of chromosomes. **(a)Euploidy:** It bears more than the usual number of diploid chromosomes. ***Ex:*** *Triploidy (3n), Tetraploidy (4n)* **(b) Aneuploidy:** It is loss or gain of one or more chromosomes in a set. ***Ex:*** Monosomy (2n-1), Trisomy (2n+1) and Nullisomy (2n-2). ***Down's syndrome:*** Condition of having extra copy of chromosome 21 (Trisomy 21).
Gene (or) Point mutation	It is the changes occurring in nucleotide sequence of a gene. It involves substitution, deletion, insertion or inversion of a single or more than one nitrogenous base.