

# HEREDITY

Heredity- Transfer of characters from parents to offsprings is called heredity

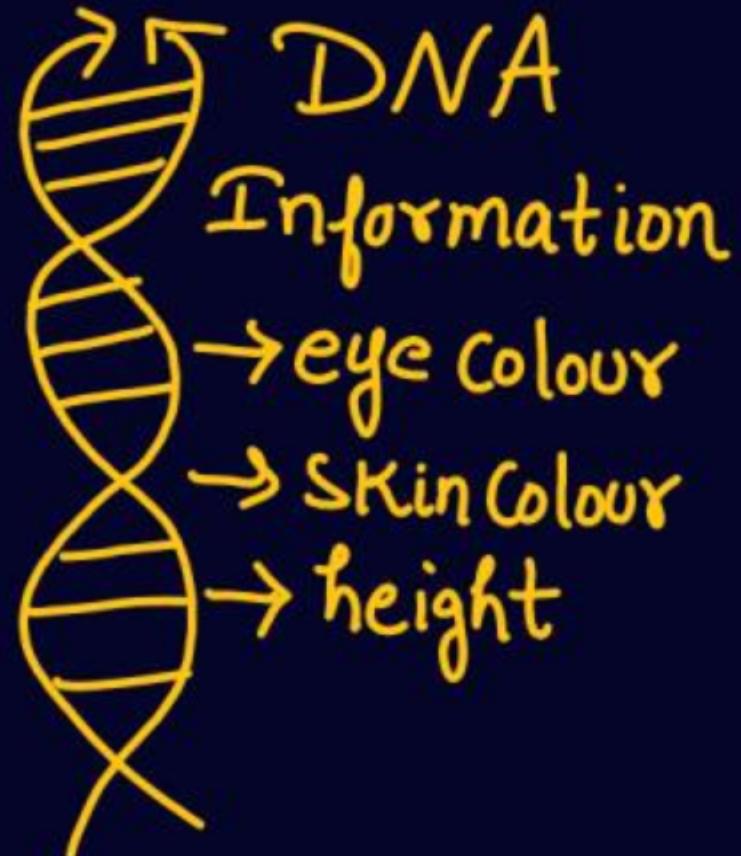
Characters - Traits (height, complexion, colour of eyes, shape of nose etc)

Hereditary information is present in sex cells (gametes) of parents



Male Gamete + Female Gamete  
(Sex Cells)      ↓      (Sex Cells)  
Zygote

Characters → Traits → Information → DNA in Nucleus





<b>Acquired traits</b>	<b>Inherited traits</b>
acquired after birth	inherited from parents during reproduction <i>before birth</i>
neither inherited nor transmitted to the next generation	can be inherited as well as transmitted to the next generation
Example: Piercing of ear or nose, Acquiring weight ,acquiring Knowledge, scars	Example: skin colour, eye colour, nose shape, blood group, dimples



## **Are these traits acquired or inherited?**

1. **Colour of skin**
2. **Height**
3. **Tattoo hai**
4. **Eye brown**
5. **Chehre pe scar hai**
6. **Ear piercing hai**
7. **Hair black hai**
8. **Earlobe**
9. **Body hai**
10. **Cricketer hai**
11. **Knowledge hai**
12. **Blood group B+**



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



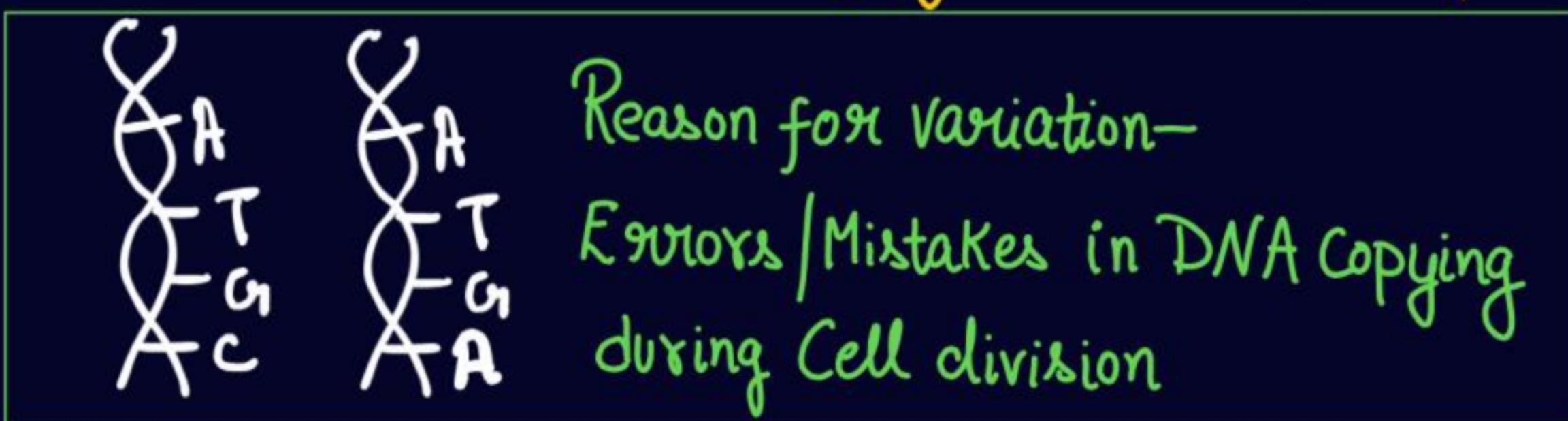
Skin Colours



Colour of Eyes

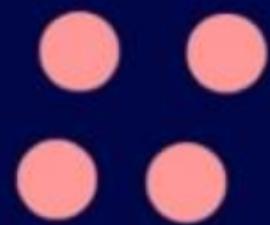


Types of Earlobes

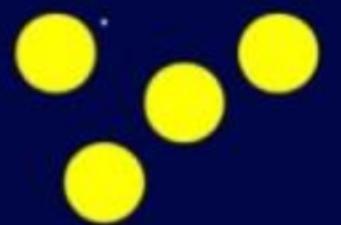


## **IMPORTANCE OF VARIATION**

- 1) Variation helps organisms to adapt to the changing environment. i.e., provides stability to a species
- 2) Helps in Evolution of species
- 3) Variation in DNA results in the varieties of a species and formation of new species.

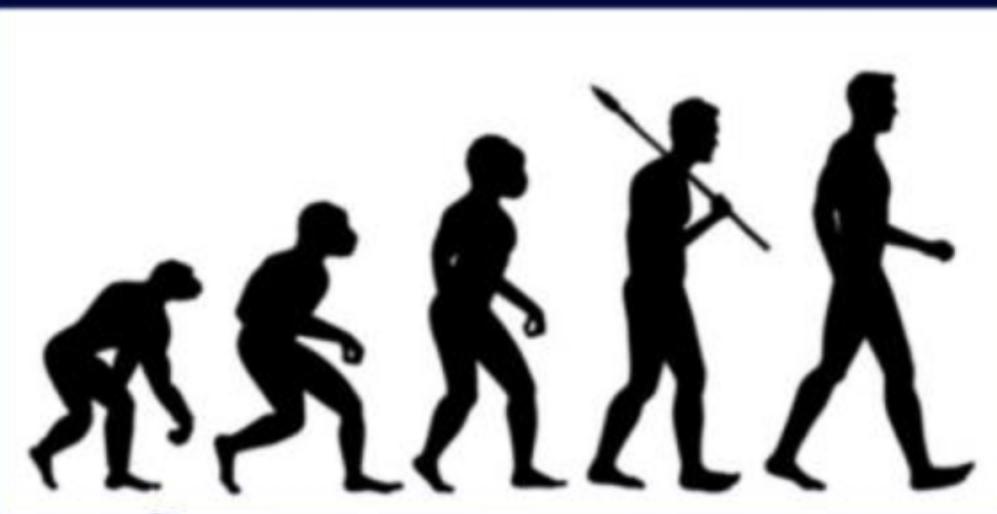


Temp- 15C-25C



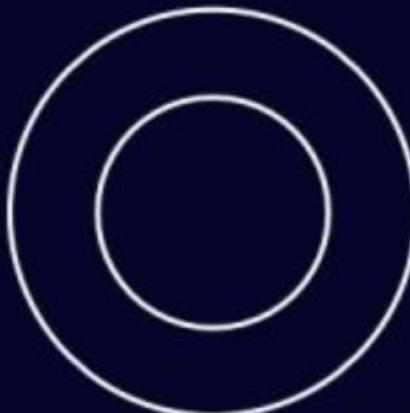
Temp - 25C-35C

Variation in Bacteria



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

**DNA - Thread like structure which carries all the information about our characters**



**Chromatin- Scattered form of DNA dispersed throughout the nucleus**

**Chromosome- Highly coiled and condensed form of DNA**



Chromatin



Chromosome

In Humans  
↓  
Single Cell  
↓  
46 chromosomes  
↓  
23 pairs

## Diploid cell

two copies of each chromosome

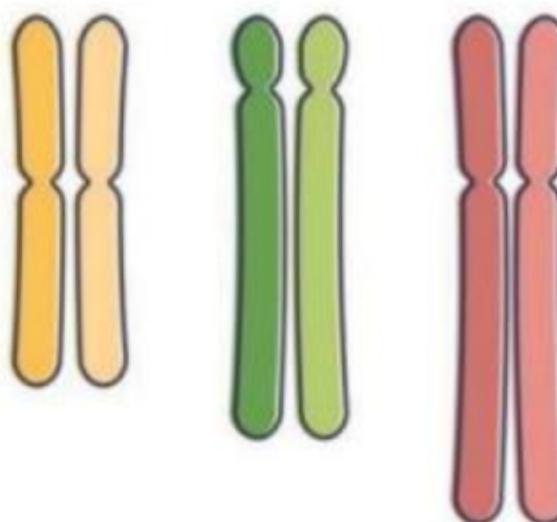
All cells of humans {except Sex cell}



Diploid cells  
23 pairs of chromosomes  
=46 chromosomes



### DIPLOID ( $2n$ )



## Haploid cell

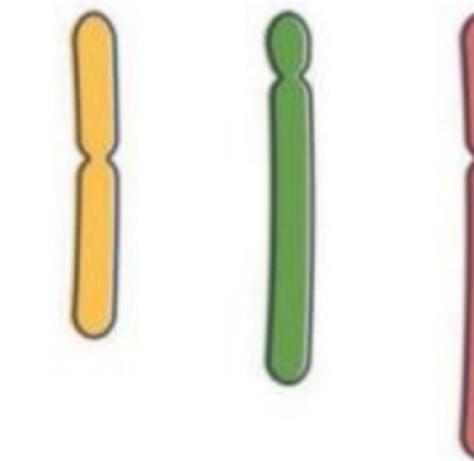
single copy of each chromosome

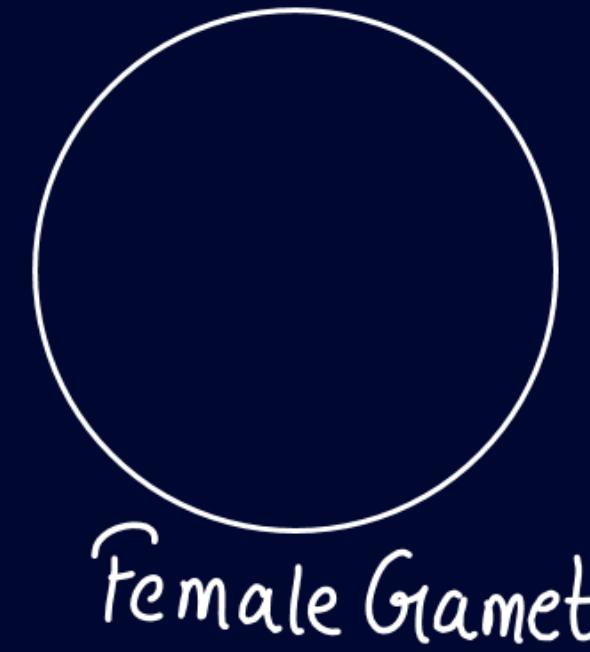
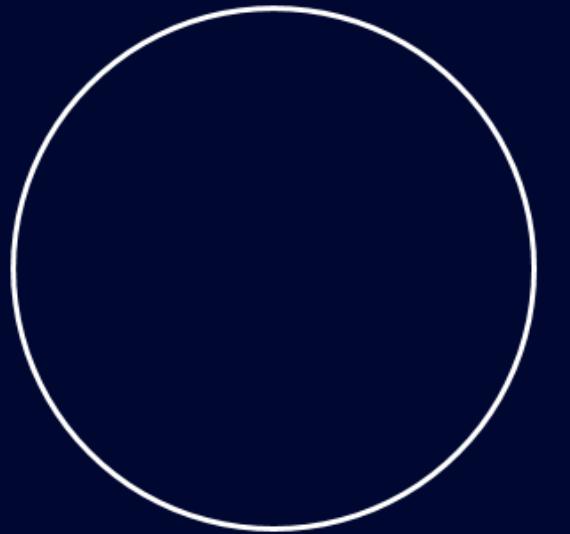
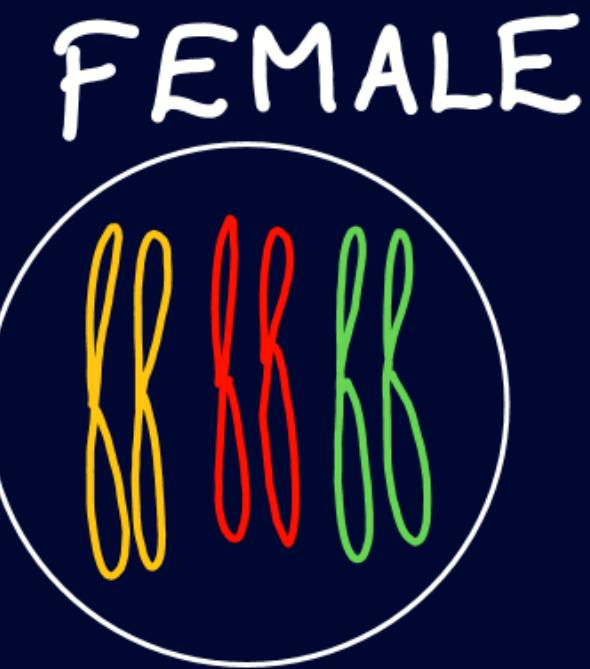
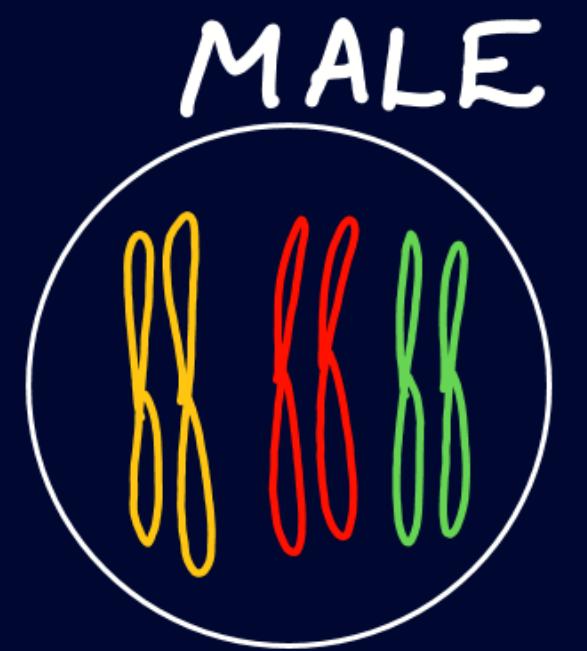
Sex cells/ Gametes of human beings



Haploid cells  
23 chromosomes

### HAPLOID ( $n$ )

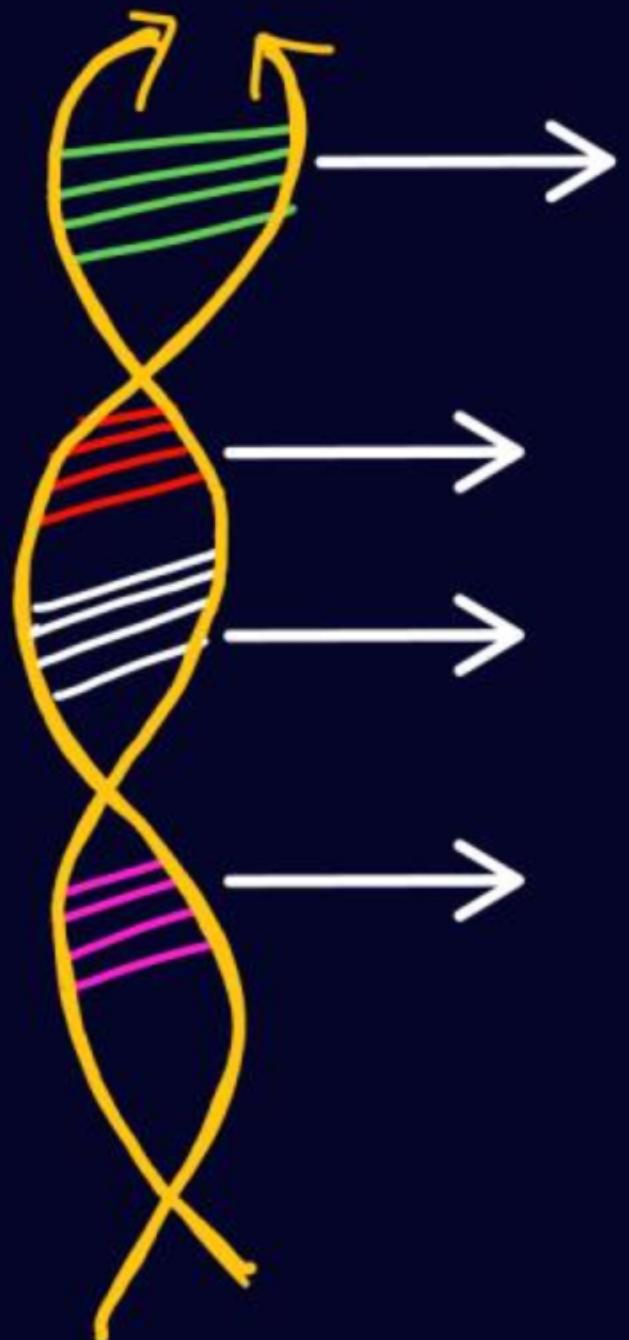




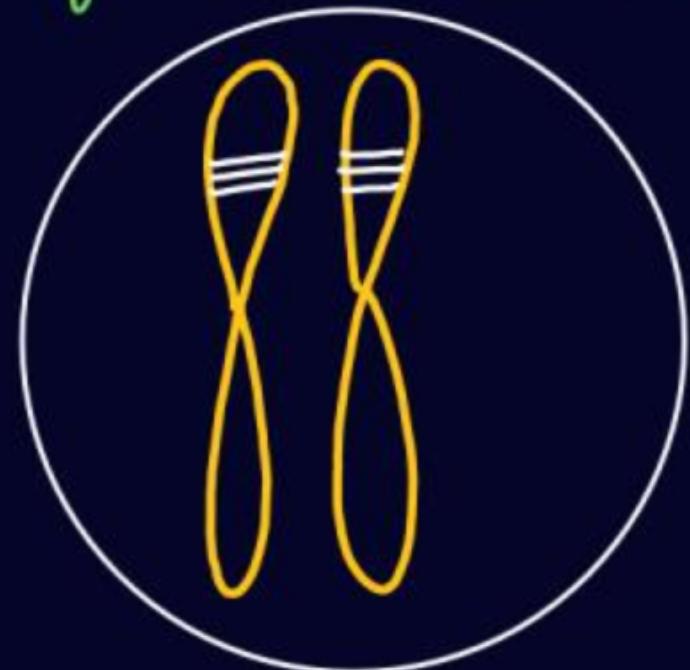
**Gene - A segment or a part of DNA that carries information of a particular character**

DNA :

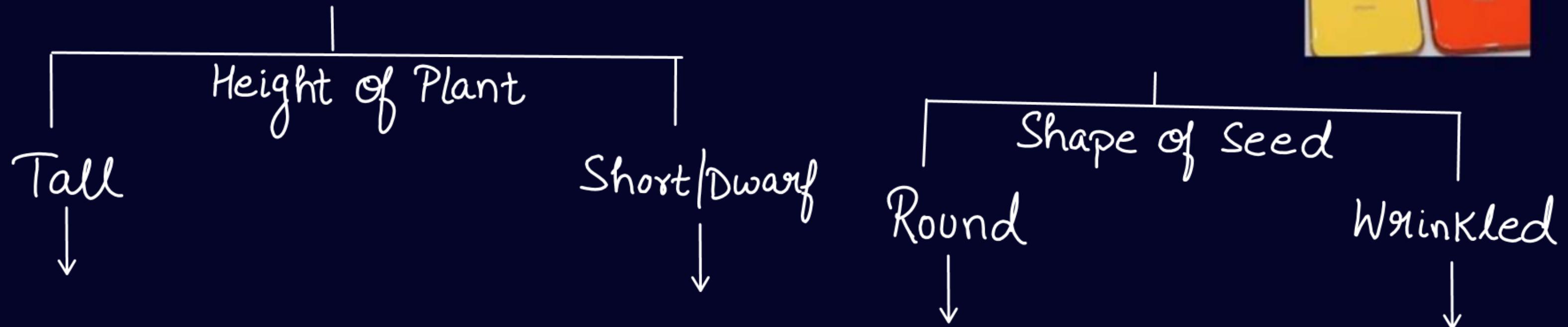
Approx 20,000  
Genes in One Cell



Pair of Chromosome in Nucleus



## Alleles - Alternative Versions or variants of a gene





Homozygous Dominant



Homozygous Recessive



Heterozygous

### Homozygous dominant condition

**TT**

#### Dominant Allele

Dominant allele is the stronger one from the two alleles.

Denoted by capital letters (e.g., T, B, R, V, W).

Expresses itself in both homozygous (TT) and heterozygous (Tt) conditions.

Trait appears due to the expression of a dominant allele and is called a dominant trait.

#### Recessive Allele

Recessive allele is the weaker one from the two alleles.

Denoted by small letters (e.g., t, b, r, v, w).

Expresses itself only in the homozygous condition (tt).

Trait appears due to the expression of a recessive allele and is called a recessive trait.

### Homozygous recessive condition

**tt**

### Heterozygous condition

**Tt**



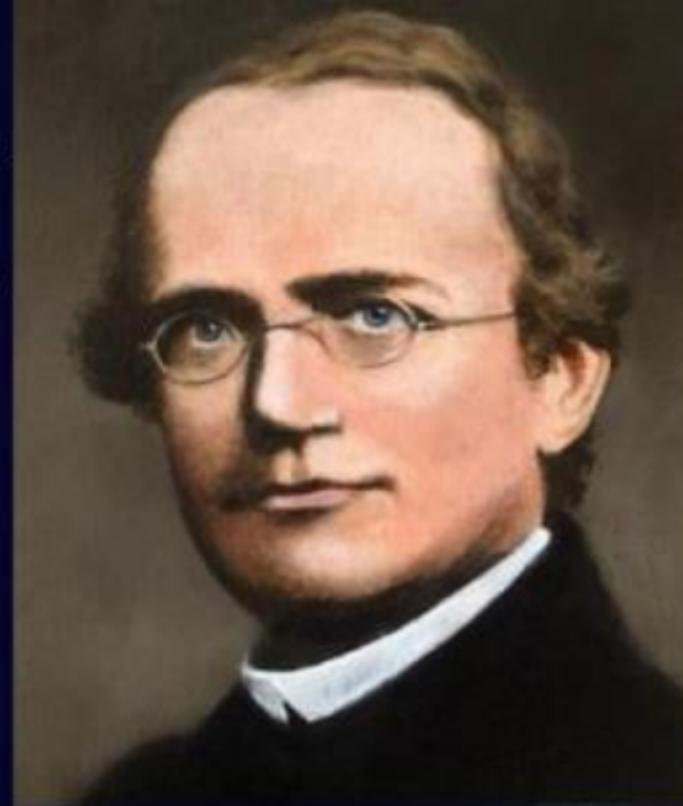
**Phenotype** Appearance of an organism or observable physical trait.

**Genotype** Combination of genes in an organism

**GREGOR MENDEL** was the first scientist to make a systematic study of patterns of inheritance which involved the transfer of characteristics from parents to progeny

## Traits studied by Mendel

3 Laws  
Conclusions



Traits	Shape of seeds	Colour of seeds	Colour of pods	Shape of pods	Plant height	Position of flowers	Flower colour
Dominant trait	Round (R) 	Yellow (Y) 	Green (G) 	Full (F) 	Tall (T) 	At leaf junction 	Violet (V) 
Recessive trait	Wrinkled (y) 	Green (y) 	Yellow (g) 	Flat, constricted (f) 	Short (t) 	At tips of branches 	White (v) 

Seven pairs of contrasting traits in pea plant

**Mendel chose pea plant because:-**

1. **Bisexual flower - Self pollination can be done**
2. **Short life span- Faster results**
3. **Large number of offsprings**
4. **Contrasting traits of seven characters**

**Monohybrid Cross - Cross in which inheritance of one character is studied at a time**

**Parents →**

**Pure Tall**



**Pure Dwarf**



**Gametes →**

**F1 Generation →**

**Phenotype →**

**Genotype →**

**Selfing → F1 × F1**

**Parents →**

**Pure Round Seeds**



**Pure Wrinkled Seeds**



**Gametes →**

**F1 Generation →**

**Phenotype →**

**Genotype →**

**Selfing → F1 × F1**

**Parents →**

Pure Yellow Seed



Pure Green Seed



**Gametes →**

F1 Generation →

Phenotype →

Genotype →

**Selfing → F1 × F1**

**Parents →**

Pure Violet Flower

Pure White Flower



**Gametes →**

F1 Generation →

Phenotype →

Genotype →

## **(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 , alleles are segregated such that each gamete receives only one allele**

**Dihybrid Cross - Cross in which inheritance of two characters  
are studied at a time**

**Parents → Pure Tall Plant & Round Seeds      Pure Short Plant & Wrinkled Seeds**

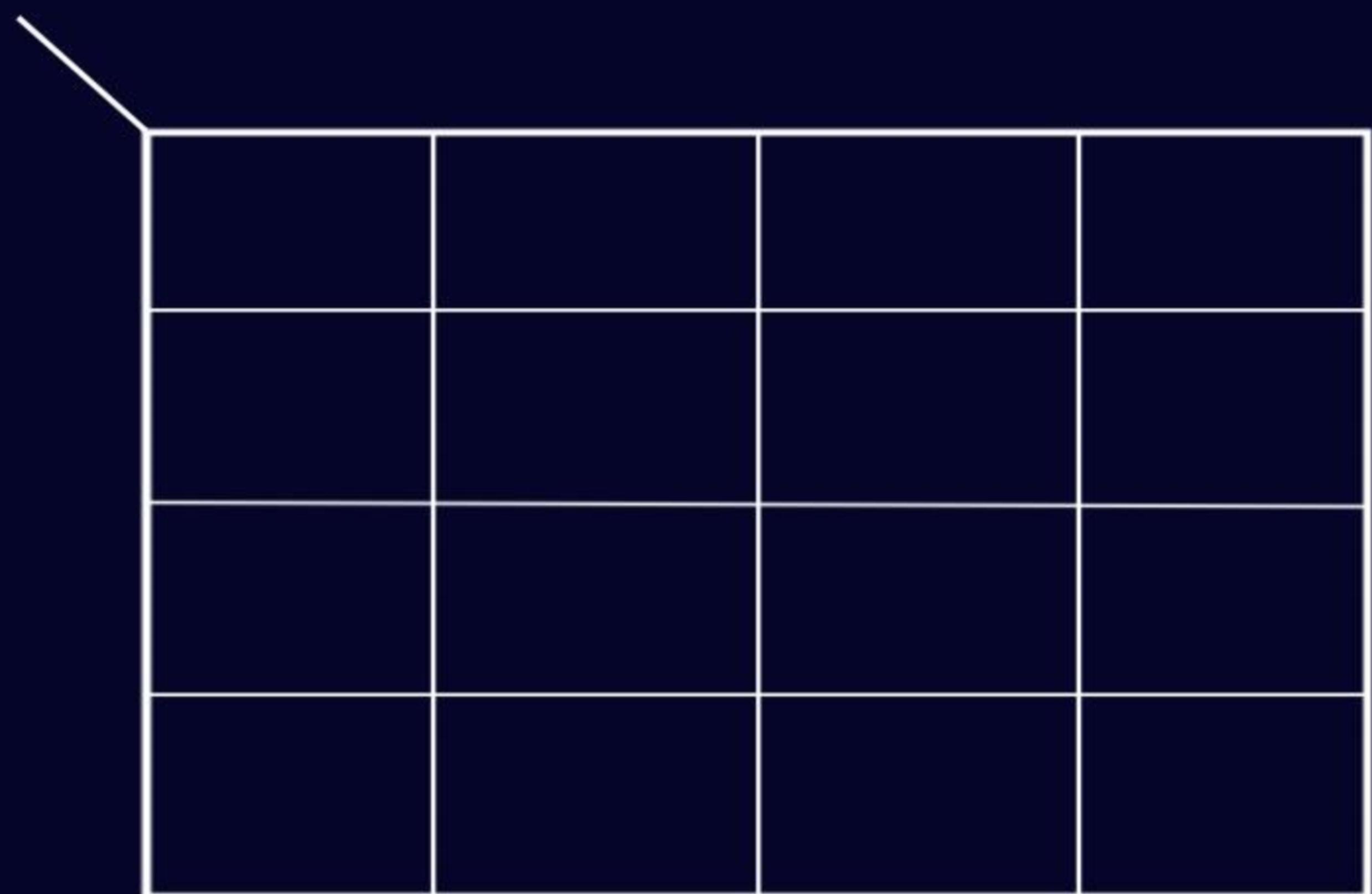
**Gametes →**

**F1 Generation →**

**Phenotype →**

**Genotype →**

**Selfing → F1 X F1**



## **Phenotype Ratio :**

**Dihybrid Cross - Cross in which inheritance of two characters are studied at a time**

Parents → Pure Round & Green Seeds

$RR$

$yy$

Pure Wrinkled & Yellow Seeds

$yy$

$YY$

Gametes →

$Ry$

$Yy$

F1 Generation →

$Ry\text{---}Yy$

Phenotype → Round & Yellow Seed

Genotype →

Selfing → F1 × F1

$RyYy \times RyYy$

Gamete:



		$RY$	$Ry$	$yy$	$yY$
$RY$	$RY$	Round, Yellow $RRYY$	Round, Yellow $RRYy$	Round, Yellow $RyYY$	Round, Yellow $RyYy$
	$Ry$	Round, Yellow $RRYy$	Round, green $RRyy$	Round, Yellow $RyYy$	Round, green $Ryyy$
$yy$	$RY$	Round, Yellow $RyYY$	Round, Yellow $RyYy$	Wrinkled, Yellow $yyYY$	Wrinkled, Yellow $yyYy$
	$Ry$	Round, Yellow $RyYy$	Round, green $Ryyy$	Wrinkled, Yellow $yyYy$	Wrinkled, green $yyyY$

## Phenotype Ratio :

Round Yellow : Round Green : Wrinkled Yellow : Wrinkled green

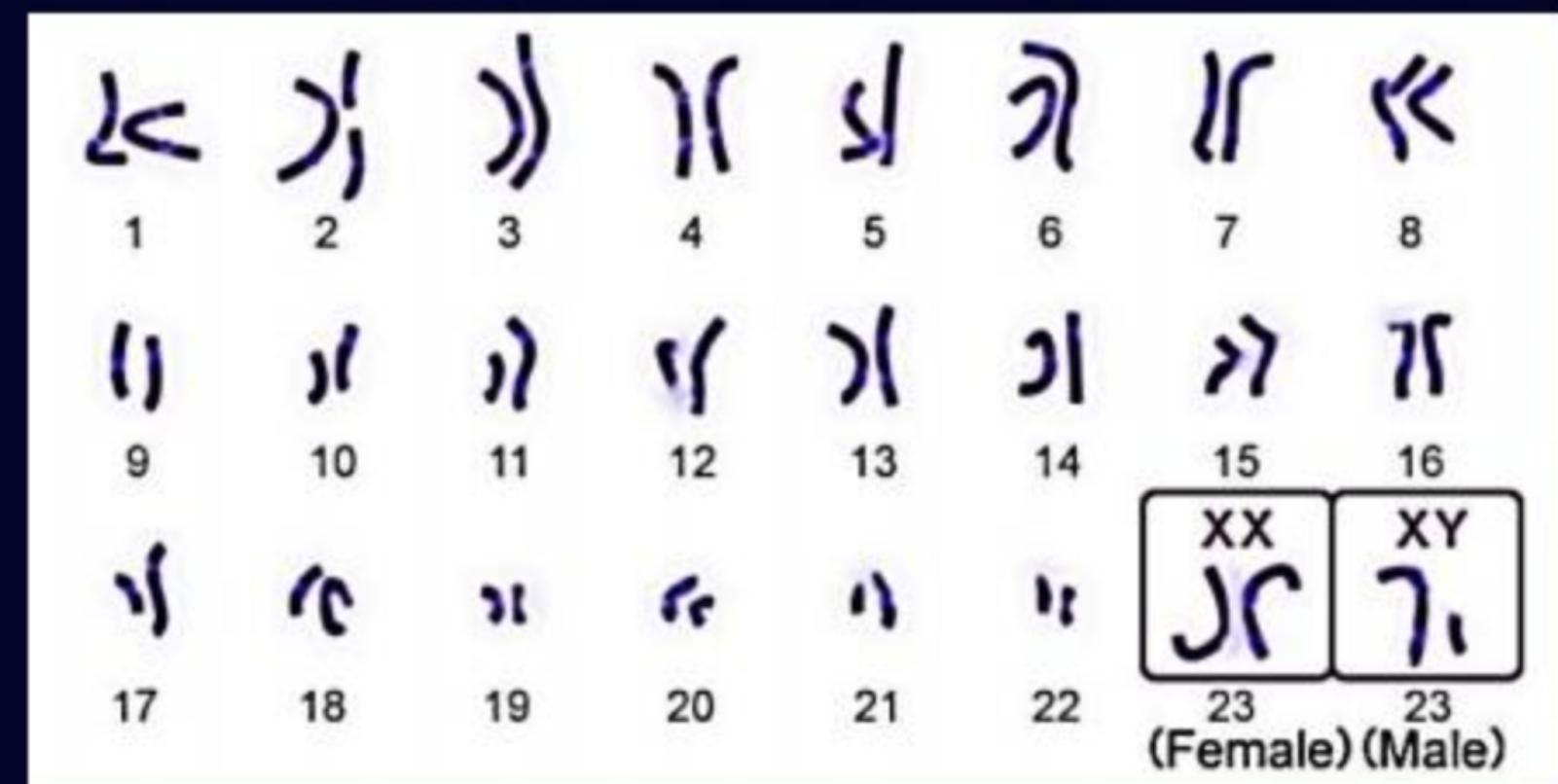
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### Law of Independent assortment

Alleles of different genes are inherited independently.

# SEX DETERMINATION

## Humans

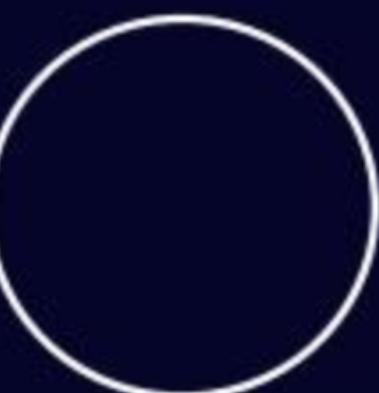


23 pairs of chromosomes

Male



Female



Gamete:

- the sex of the children will be determined by what they inherit from their father.
- A child who inherits an X chromosome from her father will be a girl
- one who inherits a Y chromosome from him will be a boy.

Different species use very different strategies for this.

In few reptiles --> the temperature at which fertilised eggs are kept -->determines whether the animals developing in the eggs will be male or female.



In snails -->individuals can change sex

