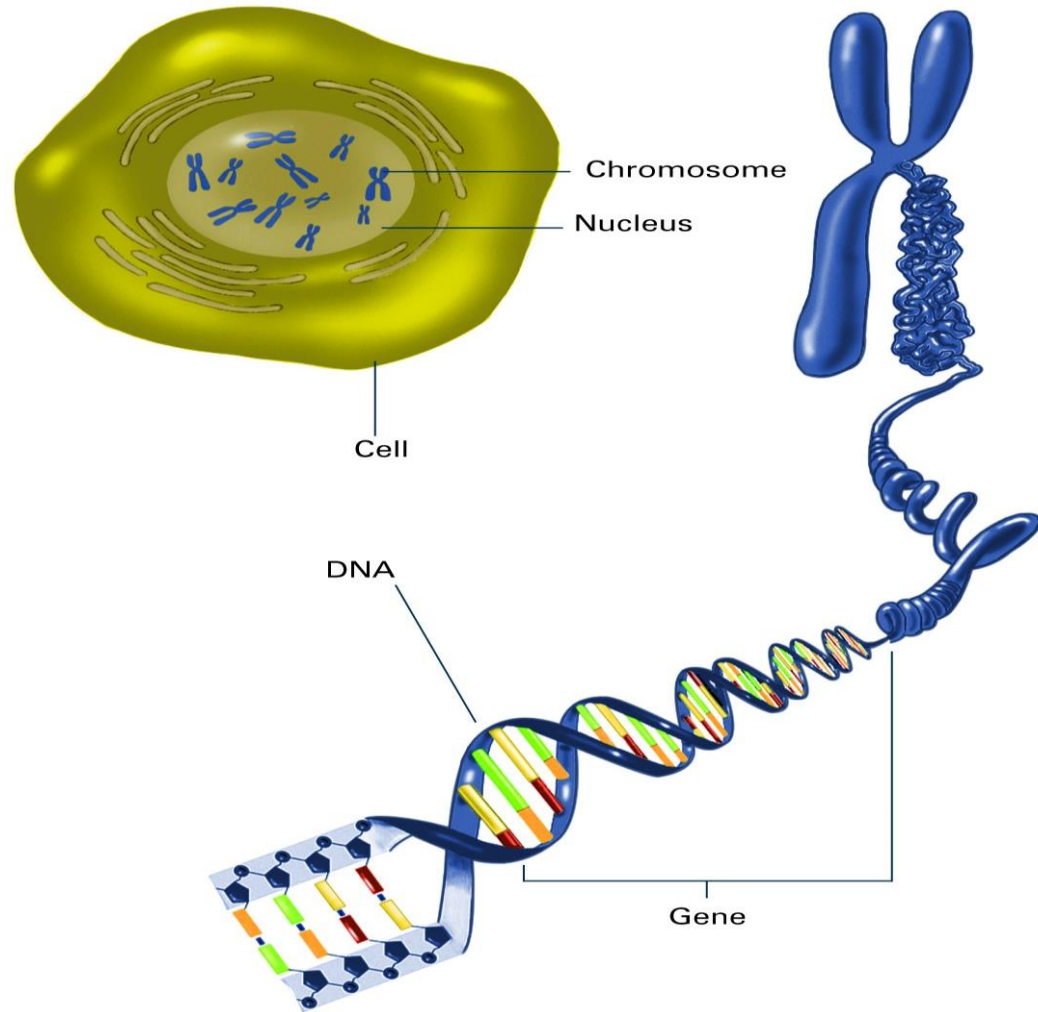


ROLE of GENETICS & Sexual Reproduction in Evolution



KEY TERMS and PROCESSES

GENE

PHENOTYPE

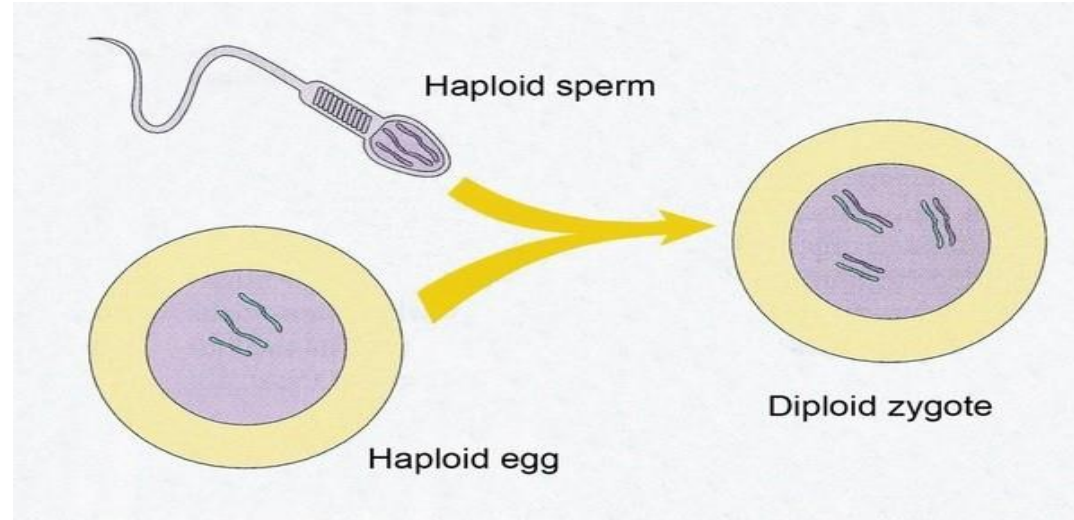
ALLELE

GENOTYPE

SEXUAL REPRODUCTION

ASEXUAL REPRODUCTION

DIPLOID



HAPLOID

MITOSIS

MEIOSIS

SPECIES

POPULATION















MUTATION



What is PHENOTYPE?



The way the genes in an individual organism are expressed physically and displayed on that individual organism. – A physical trait.

Seed form	Seed color	Pod form	Pod color	Flower color	Flower position	Stem length
 Round	 Yellow	 Inflated	 Green	 Purple	 Axial	 Tall
 Wrinkled	 Green	 Constricted	 Yellow	 White	 Terminal	 Short



free earlobe

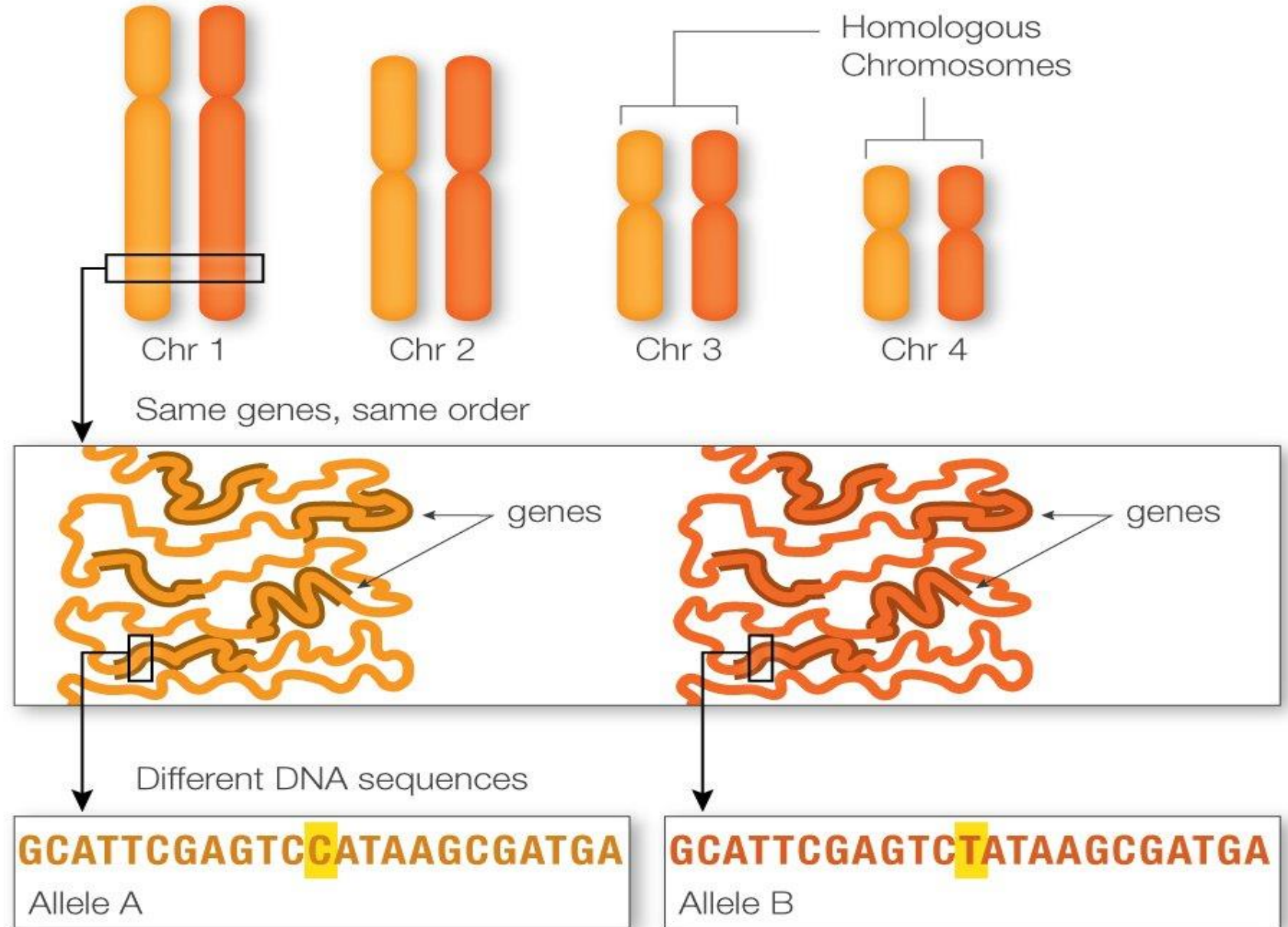


attached earlobe

WHAT IS AN ALLELE?

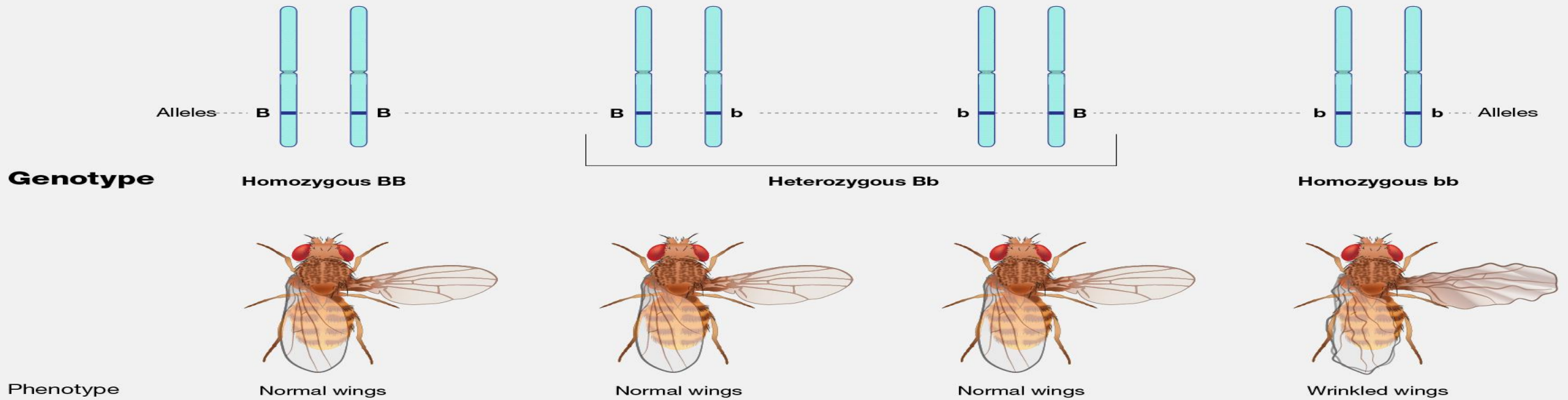
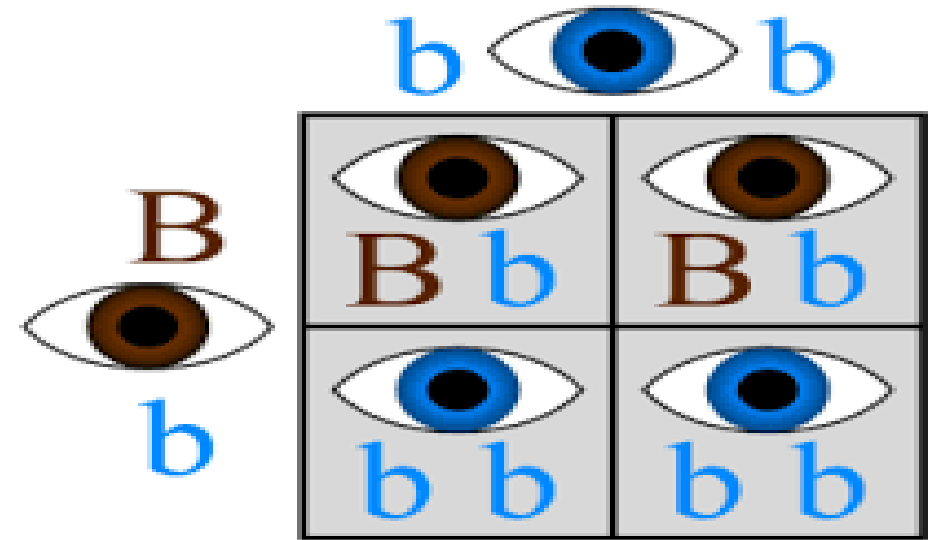
If there is a **GENE** for a particular protein, there may be several different forms of that **GENE**.

On Chromosome #15 in humans, one of the main genes that helps determine eye colour is located. You inherit a chromosome #15 from your mom in the egg, and you also got a second chromosome #15 from your dad in a sperm cell. Both parents may have given you the exact same form of the gene (**ALLELE**), but you may have been given a **Brown-Eyed Allele** from one parent and a **Blue-eyed allele** from the other parent. These two different alleles code for different forms of the protein.



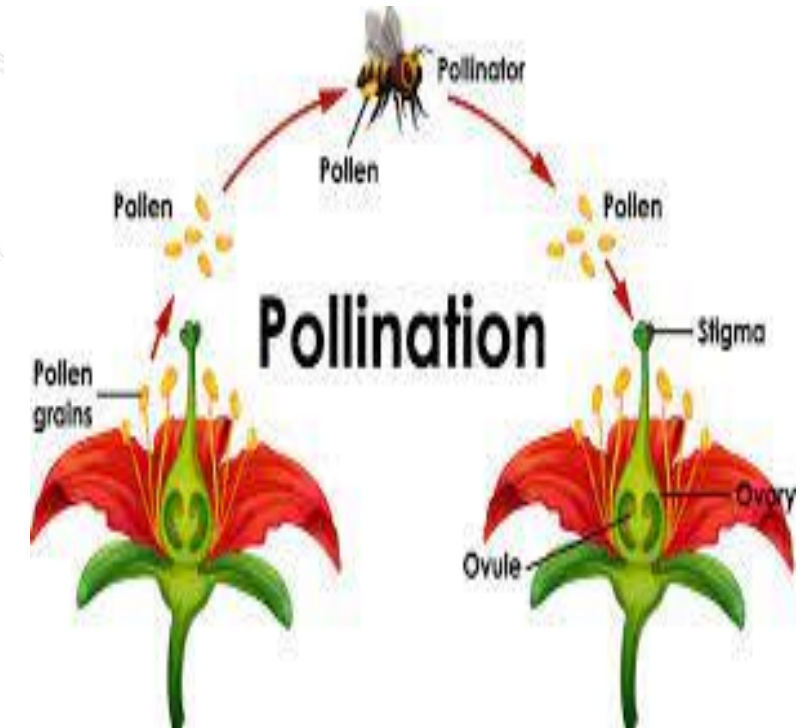
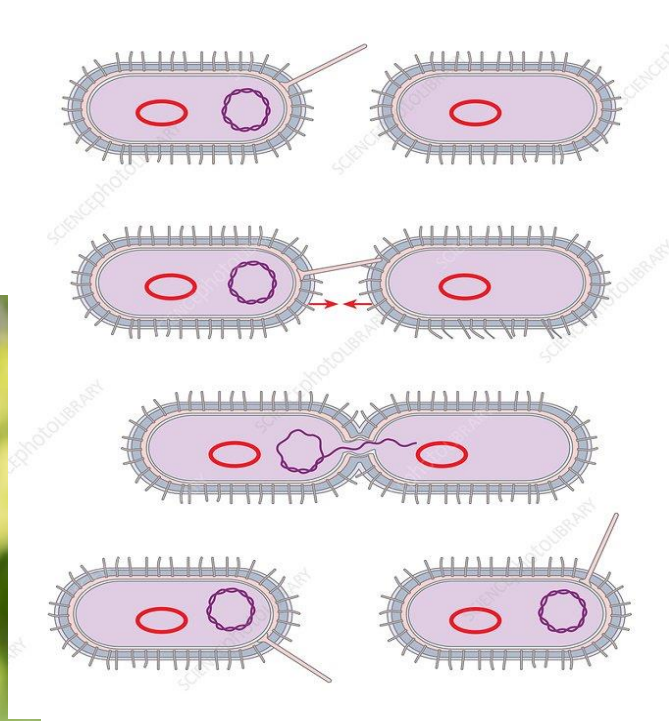
WHAT IS A GENOTYPE?

It is your Genetic make up. A given trait (Phenotype) is determined by the genes you possess. Example a genotype of **Bb** for eye colour will produce the Brown eyed phenotype, so too will the **BB** genotype. But if an individual gets two blue-eyed alleles (**bb**), they will have the blue-eyed phenotype.



WHAT IS SEXUAL REPRODUCTION ?

The process whereby organisms reproduce offspring by combining the genes from two separate parents. The offspring produced are a blend of those genes.

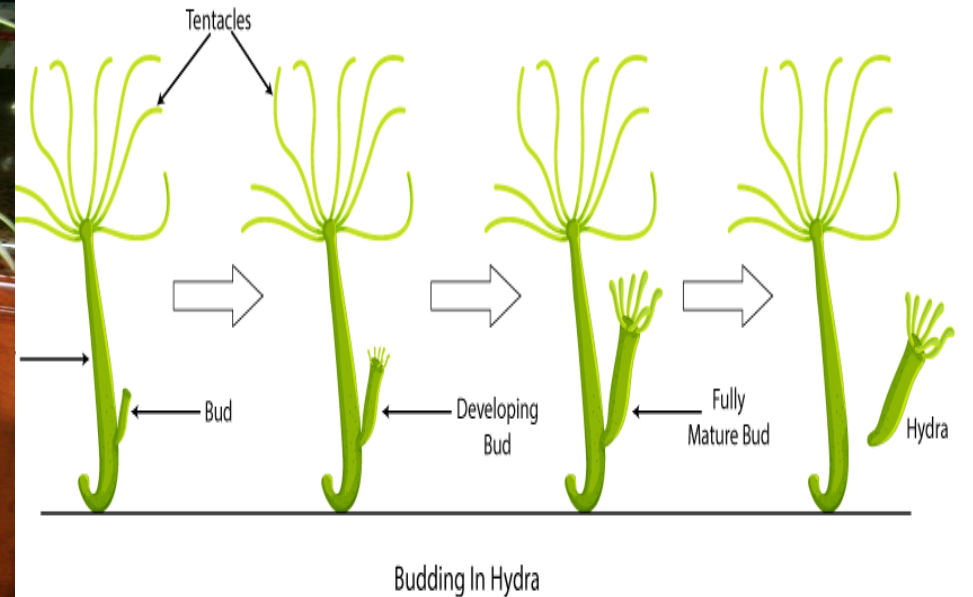
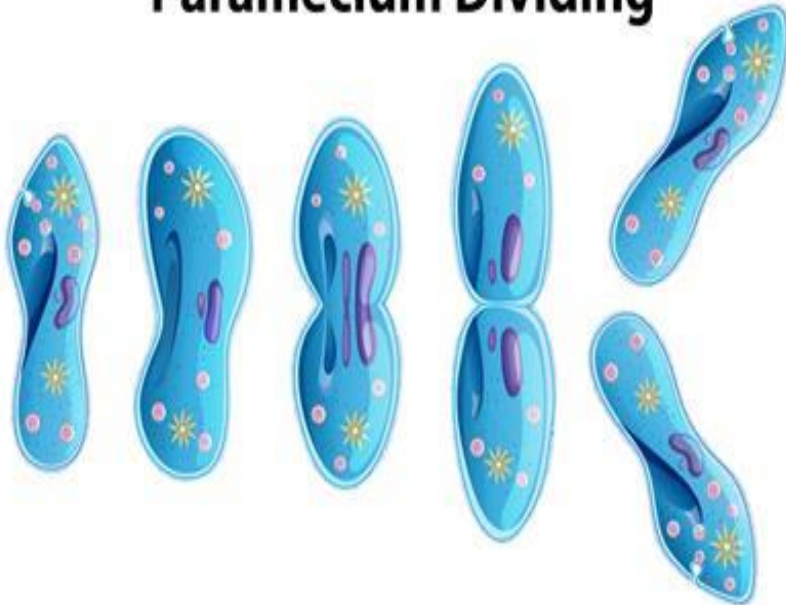


WHAT IS ASESEXUAL REPRODUCTION ?

Process whereby an organism reproduces offspring on its own and the offspring contain the exact same genes as the parent and as each other. They are clones of the parent and clones of each other

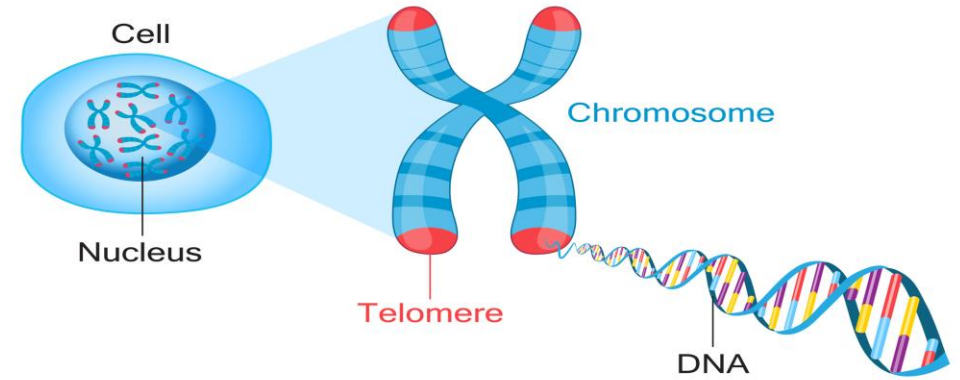


Paramecium Dividing



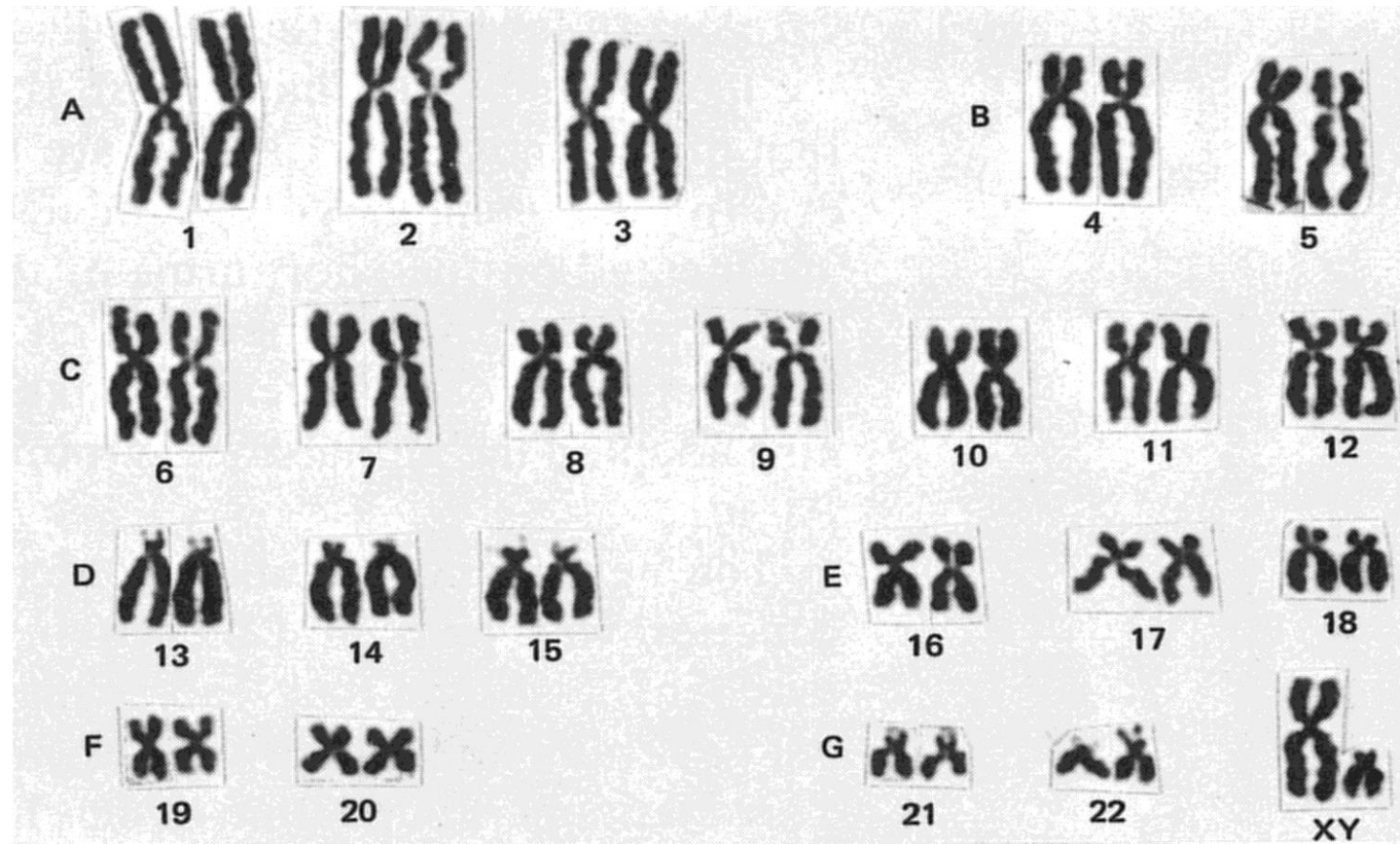
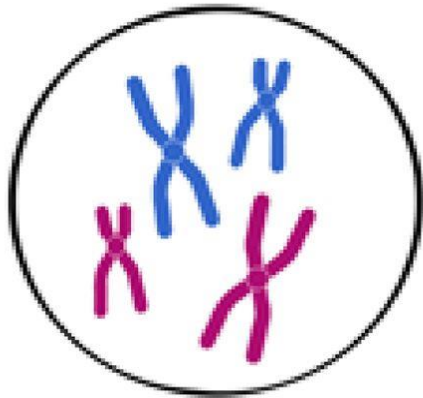
WHAT IS DIPLOID ?

Cells that possess two copies of each type of Chromosome. For example, your body cells have 23 chromosomes from your Mom and 23 chromosomes from your dad. We have a total of 46 chromosomes in our body cells. We have two #1's, two #2's, two #3's etc

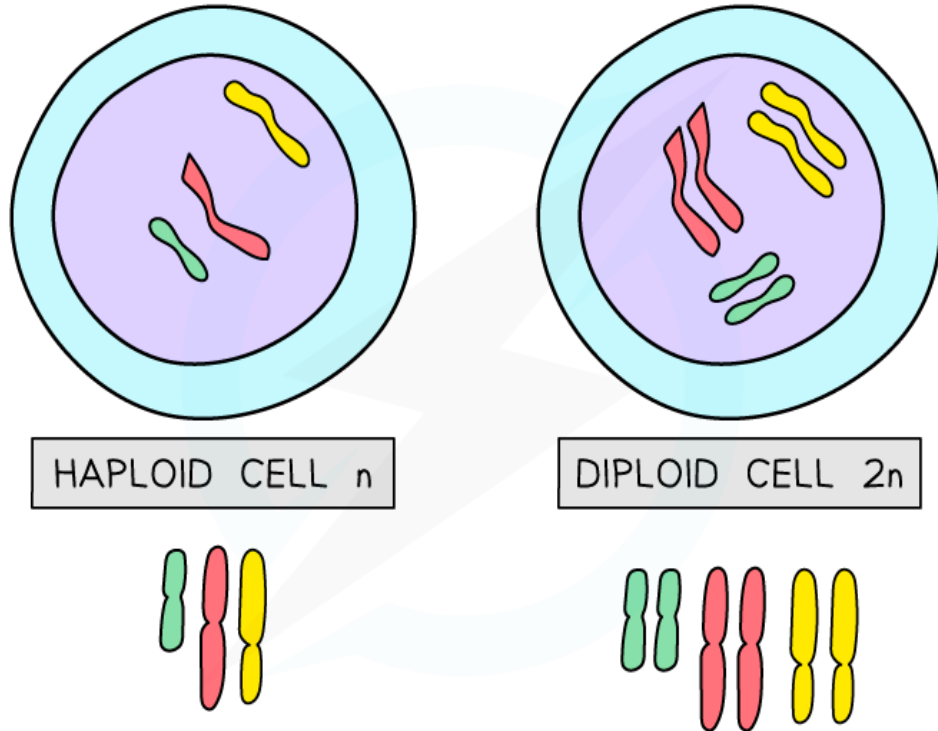


Haploid or Diploid?

$$2n=4$$



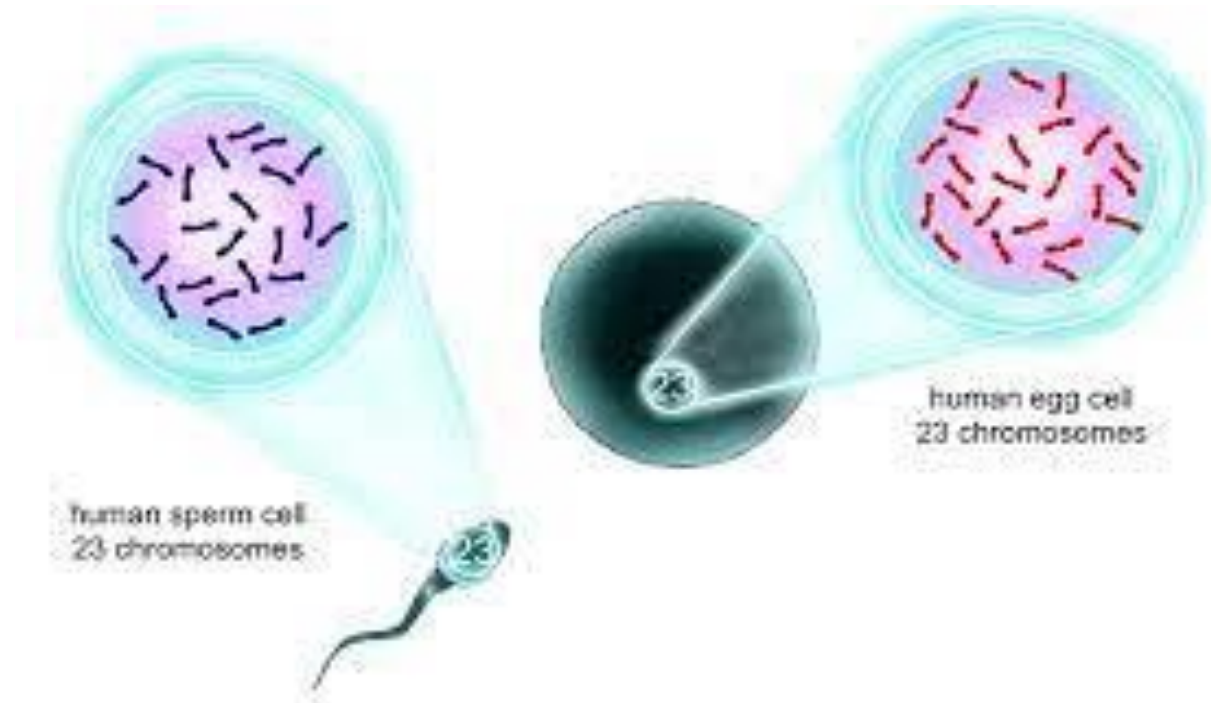
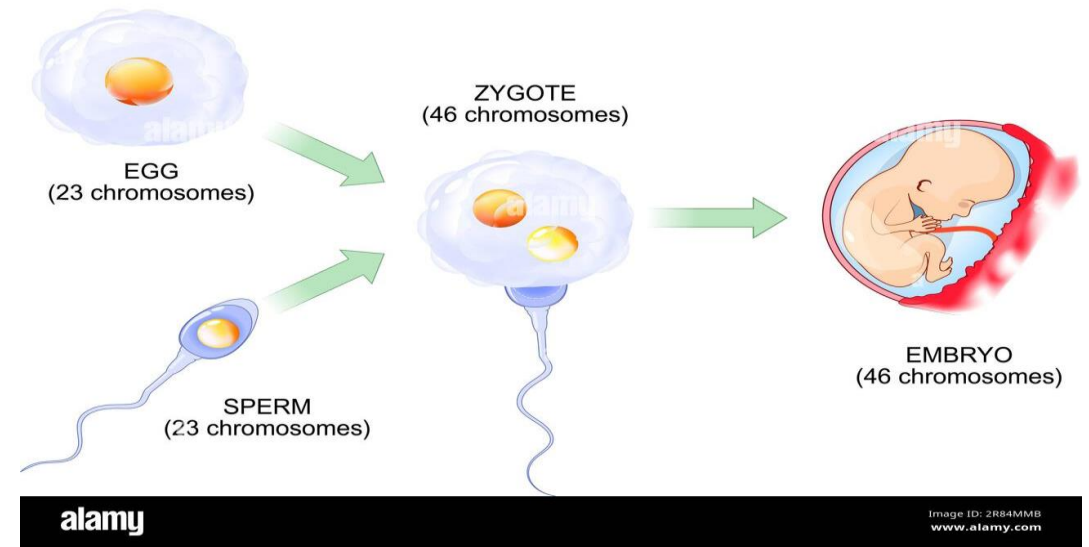
WHAT IS HAPLOID ?



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Cells that only have one of each type of chromosome. In our body, only eggs and sperm (sex cells called **GAMETES**) are haploid. Eggs and Sperm each have 23 Chromosomes. When they unite they give rise to a Diploid cell called a Zygote. This first diploid cell then divides to give rise to the offspring.

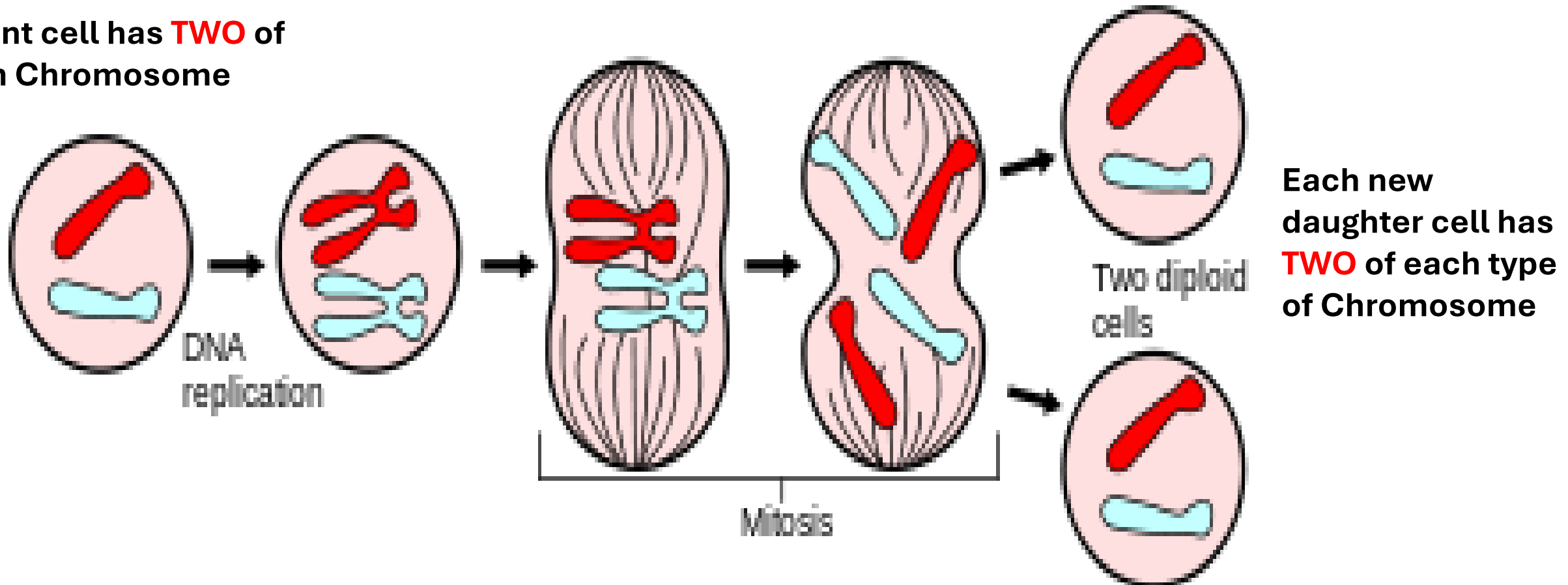
Fertilization



WHAT IS MITOSIS ?

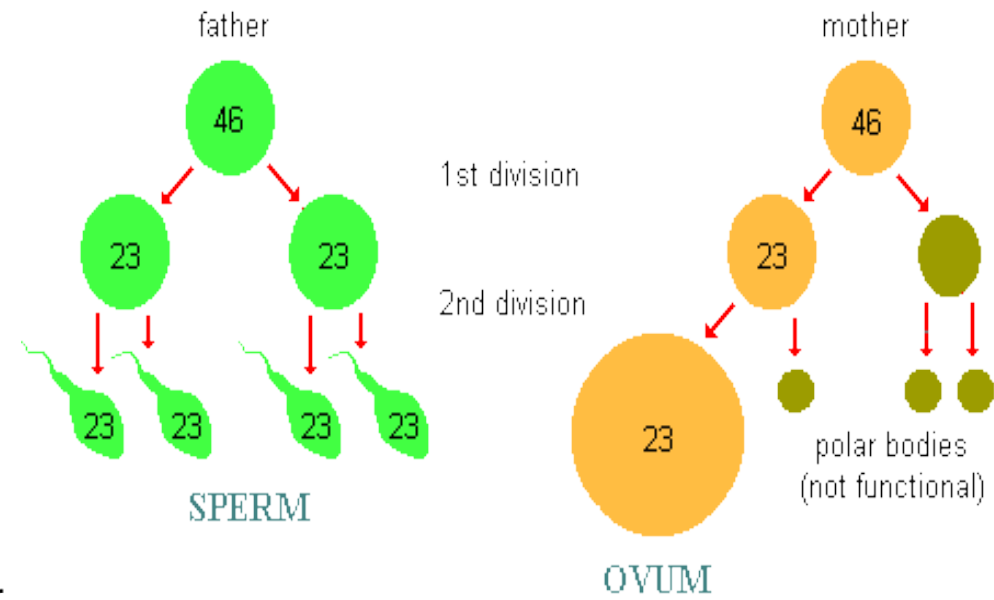
A type of cell division whereby the new cells have the exact same number of chromosomes as the original parent cell. In humans, mitosis is used to take our Diploid body cells to make more diploid body cells.

Parent cell has **TWO** of each Chromosome



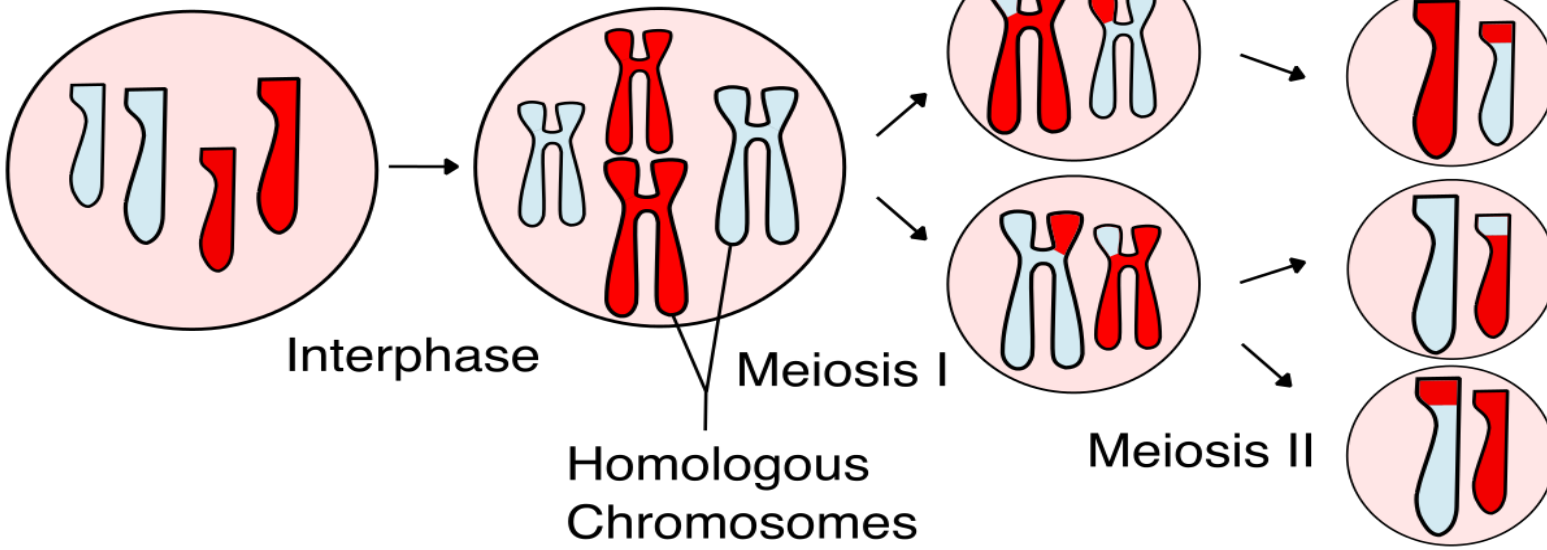
WHAT IS MEIOSIS ?

A type of cell division whereby cells that are **DIPLOID** undergo division to produce new cells that are now **HAPLOID**. In humans, in the testes and ovaries, meiosis takes cells that have 46 chromosomes and produces eggs or sperm that only have 23 chromosomes.



Daughter Nuclei II

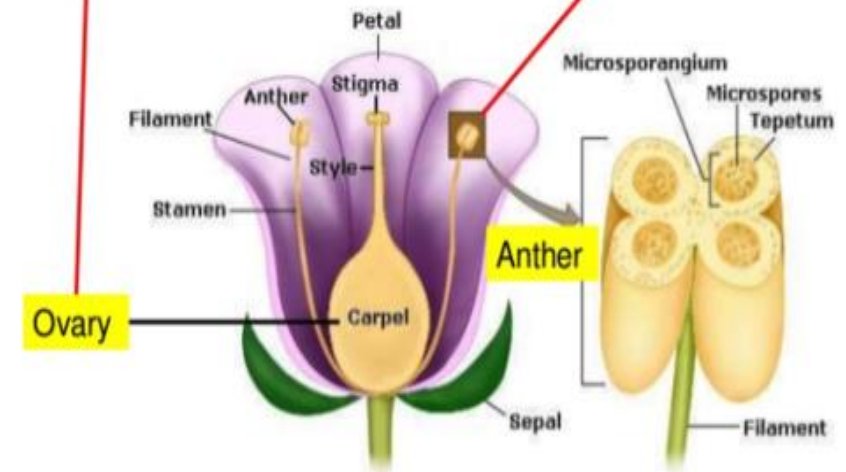
Daughter Nuclei



Meiosis in Plant

Occurs in the
• ovary (female)

Occurs in the
• anther (male)



WHAT IS A SPECIES ?

DIFFERENT SPECIES



Western Meadowlark

Eastern Meadowlark

SAME SPECIES

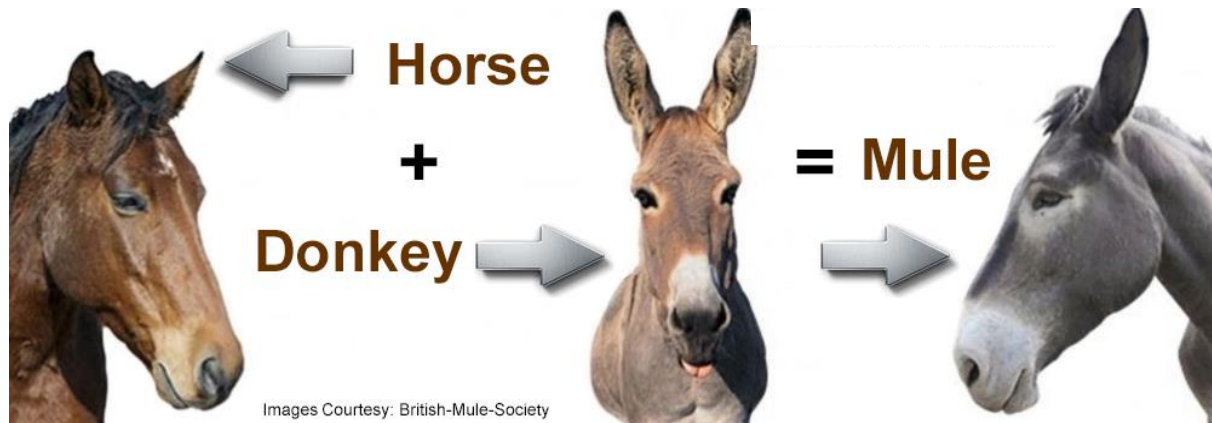


Gaudy Commodore (*Precis octavia*)



Homo sapiens

A group of similar organisms that are capable (and usually) reproduce (breed) with each other to reproduce fertile healthy offspring



Images Courtesy: British-Mule-Society



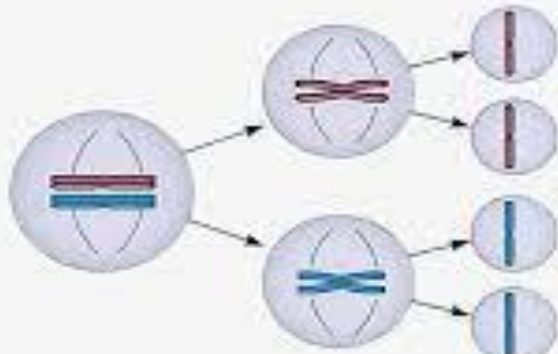
WHAT IS A POPULATION ?

A group of organisms of the **SAME SPECIES**, living in the **SAME area** at the **SAME time**.



So How Does Genetics & Sexual Reproduction Increase Variation ?

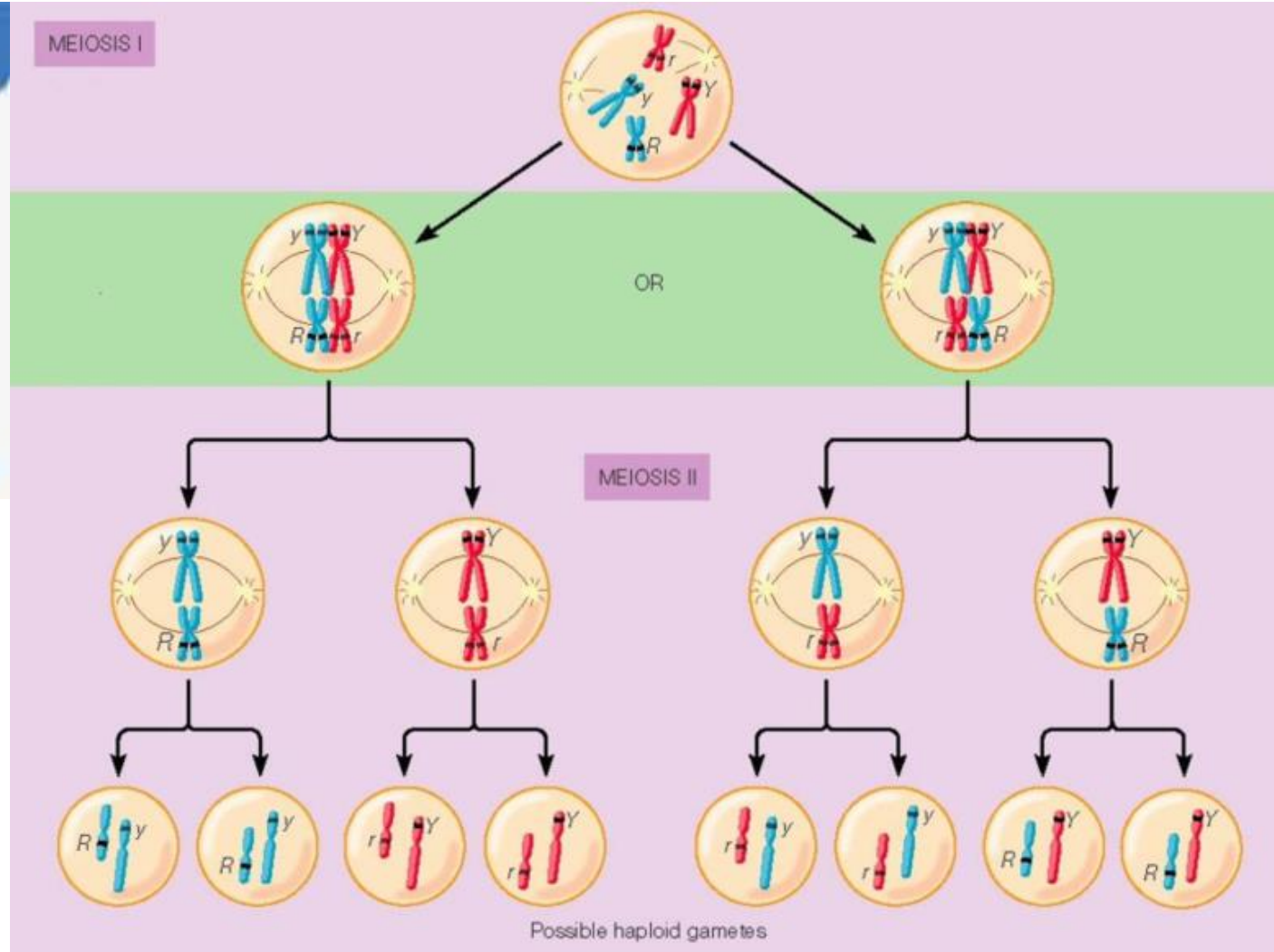
Law of Segregation



What is Law of Segregation?

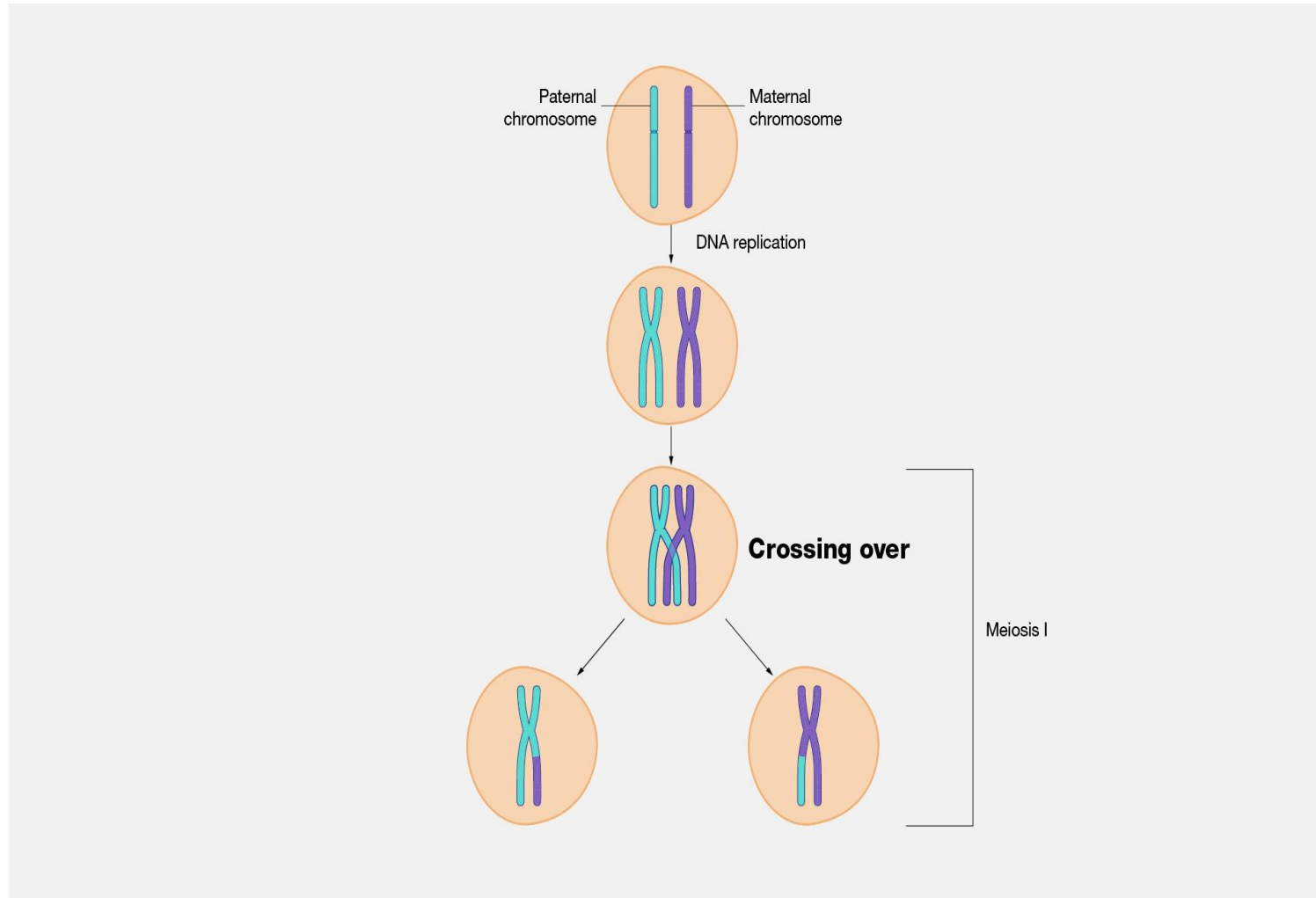
Law of Segregation states: "The two copies of each genetic factor segregate during the development of gametes, to ensure that each parent's offspring attains one factor."

During Meiosis, the Diploid cell has 46 Chromosomes. 23 from dad (paternal) chromosomes and 23 from mom (maternal) chromosomes. These 23 pairs need to separate from each other. Example, Paternal Chromosome #5 needs to go into one egg, while the other Chromosome #5 needs to go into a different egg. Etc, Etc.

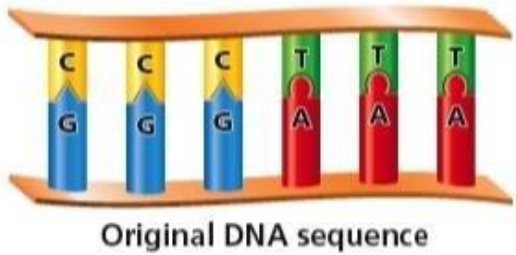


Meiosis helps shuffle off the original chromosomes.

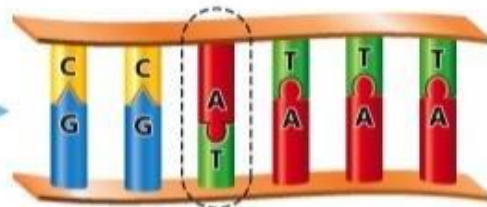
Cross-Over helps form chromosomes that are partly Paternal, Partly Maternal



GENES may also undergo MUTATION

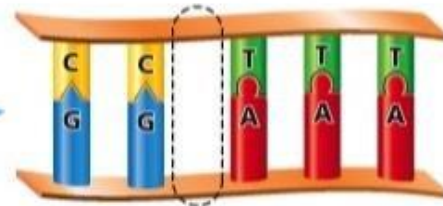


Substitution



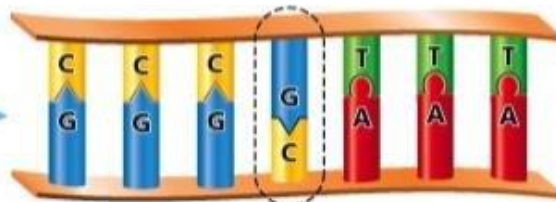
One base pair is substituted for another.

Deletion



One base pair is removed.

Addition



One base pair is added.

