أكاديمية أجيال المستقبل

مرخصة من قبل دولة الإمارات العربية المتحدة

2024 BIOLOGY

Grade 11 Advance

Dr. Mohamed Mostafa

للتواصل والاستفسار » Mrs. AYA 050 717 5602

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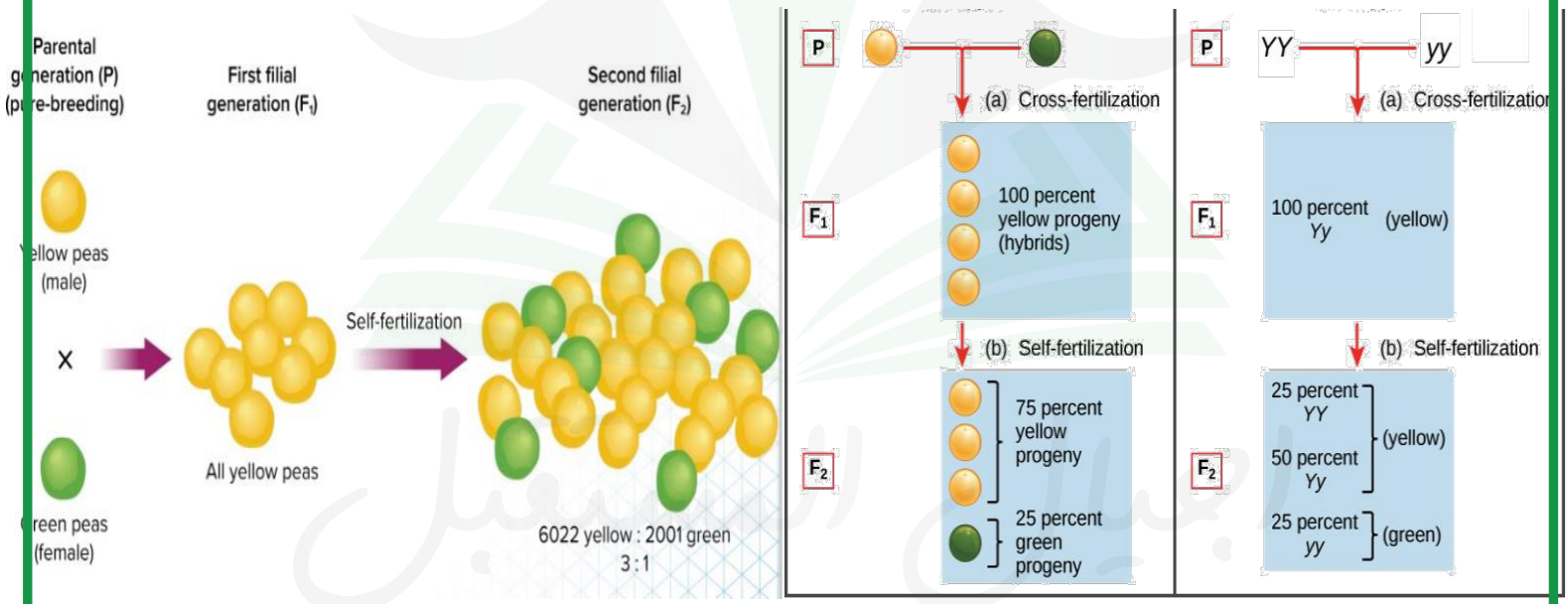
Unit 2

Lesson 1 Mendelian genetics:

- ✓ **Traits:** is the physical characteristics (سمه او صفه)ex. Color of eye
- ✓ **Phenotype:** an individual's observable traits.
- ✓ **Inheritance (heredity):** The passing of traits to the next generation
- ✓ **Genetics:** The study of how traits are passed from parent's offspring
- ✓ Mendel is known as the father of genetics
- ✓ One trait Mendel noticed was seed color.

- Mendel cross-bred the green pea and yellow pea seed plants.



Observation:

- ❖ **In Mendel's peas, the green-seed trait disappeared in the F1 generation, but reappeared in the F2 generation.**
- ❖ **The F2 generation showed a 3:1 ratio of yellow: green seeds**

Conclusion:

Mendel concluded that there must be two forms of traits in the pea plants

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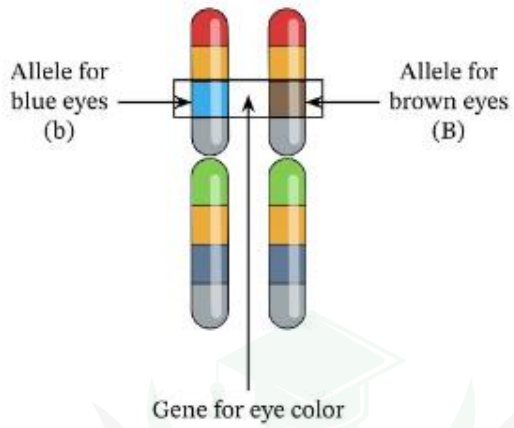
Allele: is an alternative form of a single gene.

Example: The gene for yellow seeds and the gene for green seeds are different alleles for the same gene.



Dominance: is the phenomenon of one variant (allele) of a gene on a chromosome masking or overriding the effect

The dominant allele is represented by a capital letter (Y)

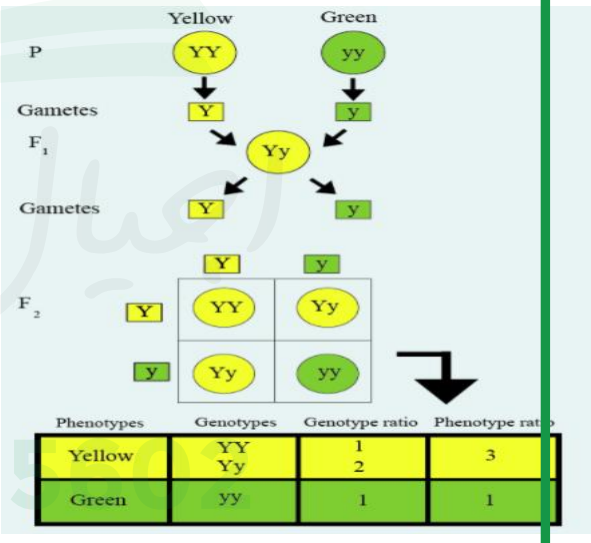
Recessive: a trait that tends to be masked by other inherited traits

A recessive allele is represented with a lower case letter (y)

- **In Mendel's cross, yellow seeds were dominant to green seeds.**

In F1,

- **Dominant alleles controlled the traits that appeared in the F1 generation.**
- **Recessive alleles were masked in the F1 generation.**



Homozygous: An organism with two of the same alleles for a particular trait (YY or yy)

Heterozygous: An organism with two different alleles for a particular trait (Yy).

- **Dominant can be both homozygous or Heterozygous**
- **Recessive is only homozygous**

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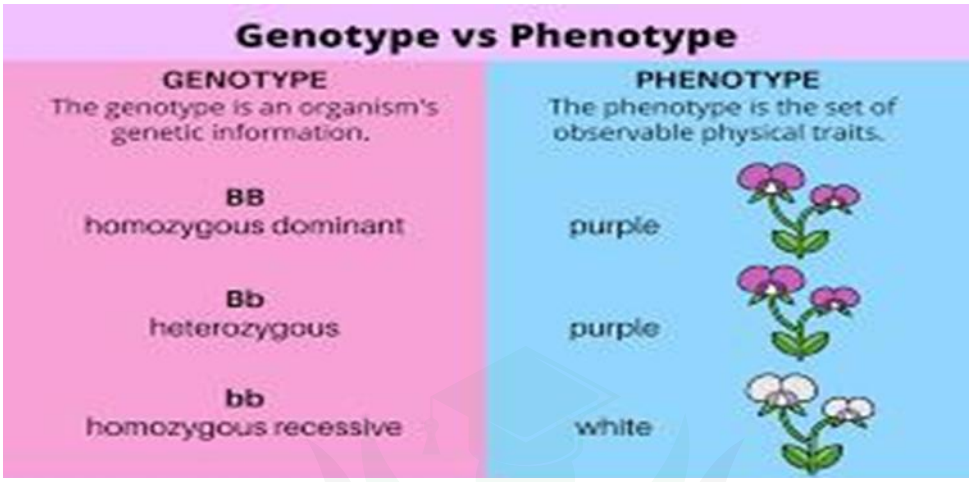
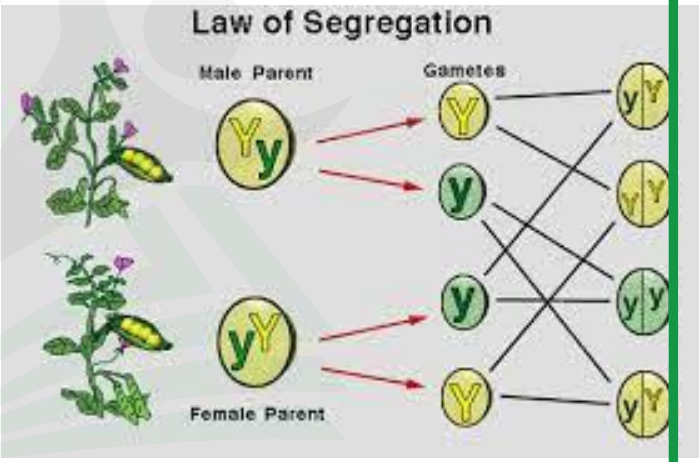
Genotype: An organism's allele pairs

Phenotype: The observable characteristic or outward expression of an allele pair



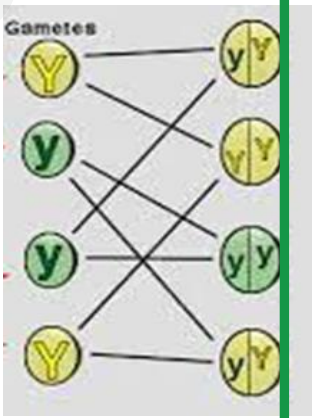
Mendel's Law of Segregation

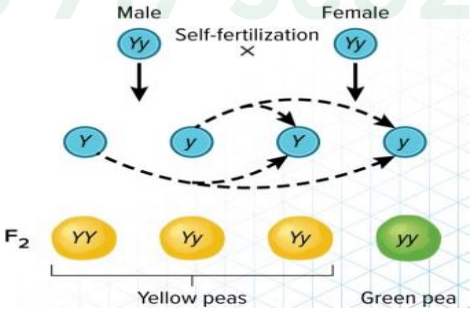
- The law of segregation states that the two alleles for each trait separate during meiosis (gamete formation).
- During fertilization, two alleles for that trait unite.
- Hybrids: Heterozygous organisms



Mendel's Law of Independent Assortment

- The law of independent assortment states that random distribution of alleles occurs during gamete formation.
- Genes on separate chromosomes sort independently during meiosis.
- Each allele combination is equally likely to occur





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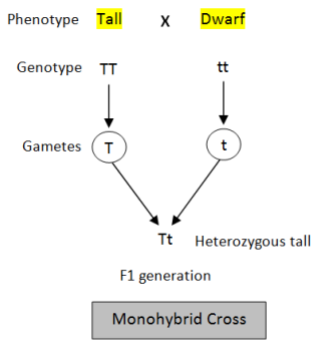
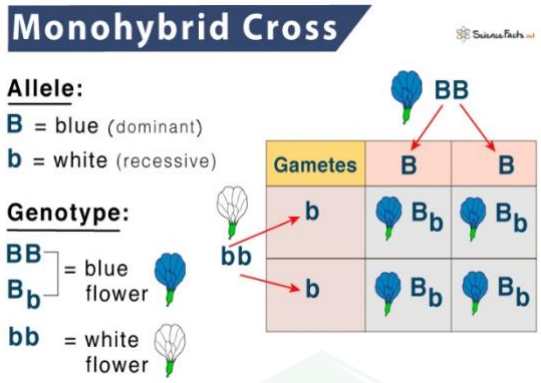
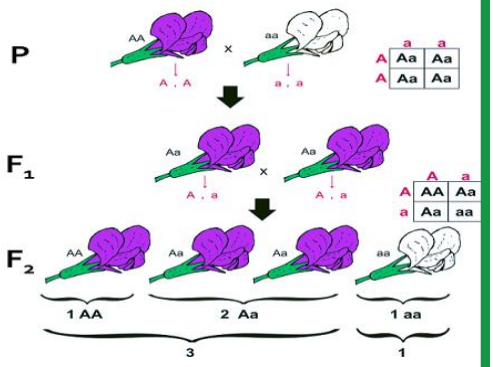
Monohybrid cross & dihybirid cross

1) Monohybrid cross: A cross that involves hybrids for a single trait.

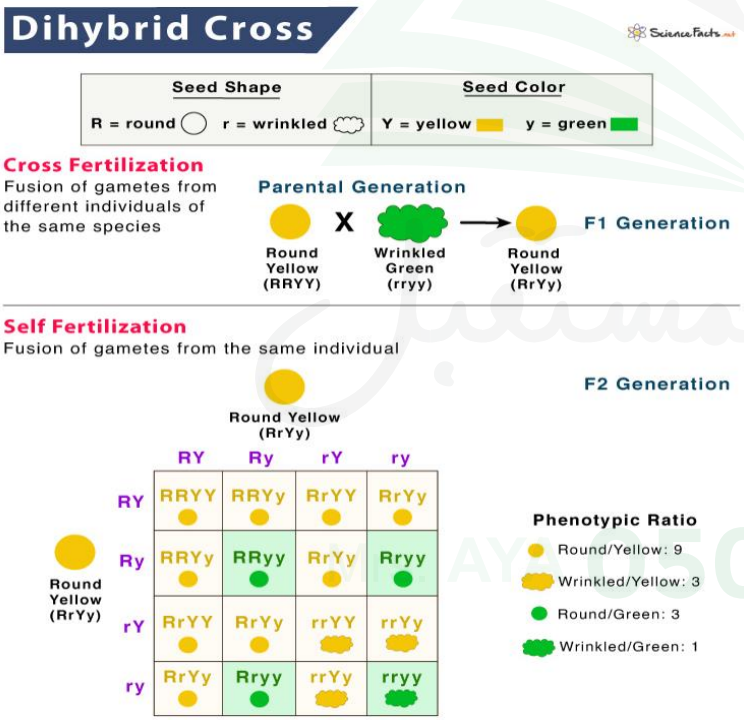


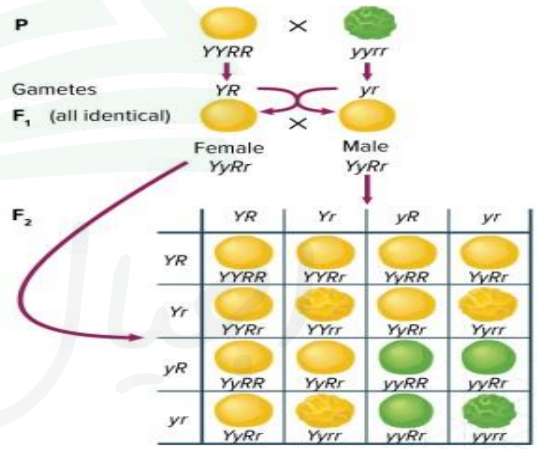




- **In F1, 100% dominant & the recessive allele disappeared**
- **In F2 generation showed a 3:1 ratio of dominant: recessive**

2) Dihybrid Cross: The inheritance of two or more traits in the same plant





Type	Genotype	Phenotype	Number	Phenotypic ratio
Parental	Y_R_	yellow round	315/556	9:16
Recombinant	yyR_	green round	108/556	3:16
Recombinant	Y_rr	yellow wrinkled	101/556	3:16
Parental	yyrr	green wrinkled	32/556	1:16

Four types of alleles from the male gametes and four types of alleles from the female gametes can be produced.

The resulting phenotypic ratio is 9:3:3:1

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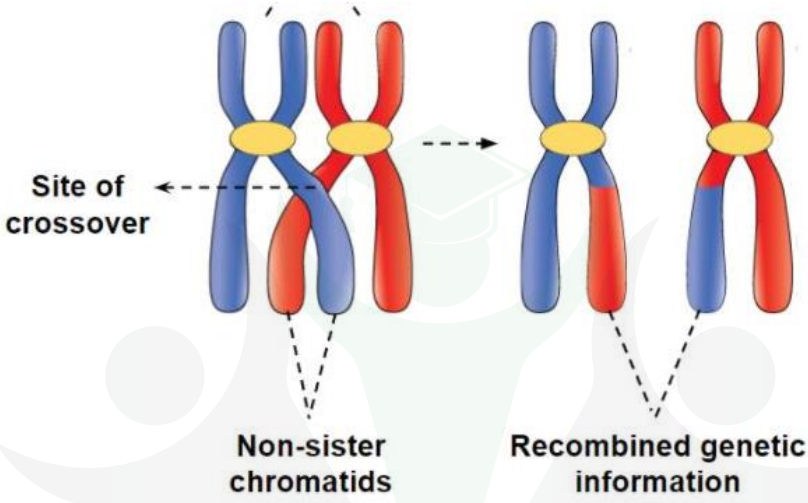
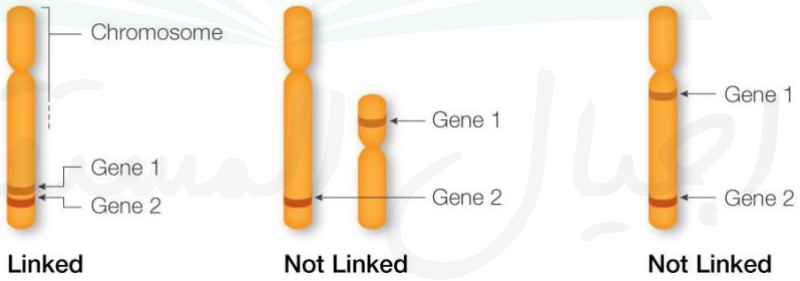
Lesson 2:
Genetic recombination

❖ **Genetic recombination: the new combination of genes produced by crossing over and independent assortment**



❖ Gene Linkage

• Genes located close to each other on the same chromosome are said to be linked.



• They usually travel together during gamete formation.

• Gene linkage results in an exception to Mendel's law of independent assortment.

Gene linkage: Two different genes situated close together on the same chromosome tend to be inherited together.

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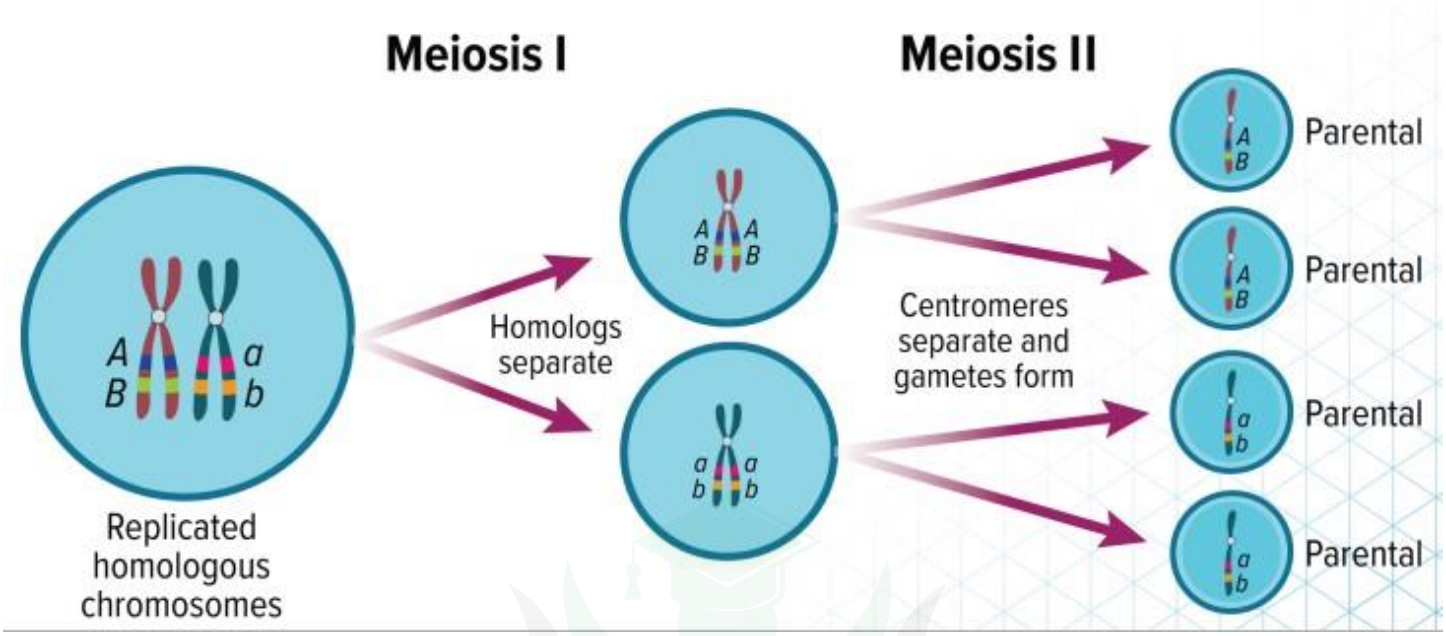
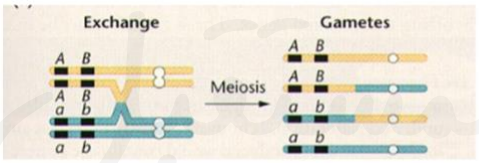


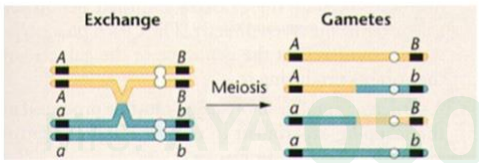
❖ **Crossing over occurs more frequently between genes that are farther apart.**

❖ **Cross-over data can be used to create chromosome maps**

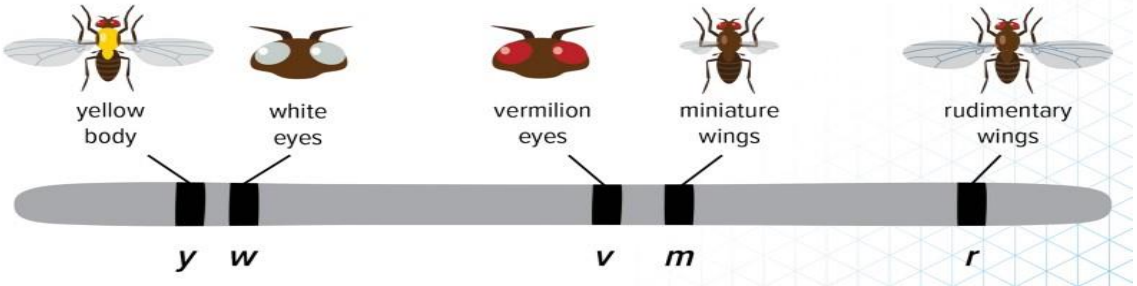
❖ **Chromosome maps: depictions of how genes are arranged on a chromosome**



if closely linked: cross-overs less likely to occur between A&B



if farther apart: cross-overs more likely to occur between A&B



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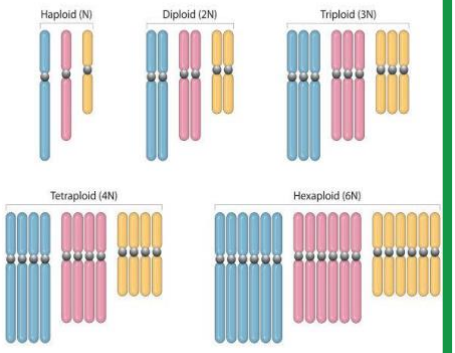
Polyploidy

- ✓ **Polyploidy is the occurrence of one or more extra sets of all chromosomes in an organism.**
- ✓ **A triploid organism is designated 3n: which means that it has three complete sets of chromosomes.**
- ✓ **Many agricultural crops are polyploidy.**
- ✓ **Example: wheat (6n), oats (6n), and sugar cane (8n)**
- ✓ **Polyploidy plants often have increased vigor and size**



A housefly has six pairs of chromosomes. If two houseflies are crossed, how many possible types of fertilized eggs could result from the random lining up of the pairs?

Answer:

Since there are 6 pairs of chromosomes, there are 2^6 possible combinations for the chromosomes to line up. $2^6 = 64$

So, there are 64 possible types of fertilized eggs that could result from the random lining up of the pairs

64 X 64 = 4096

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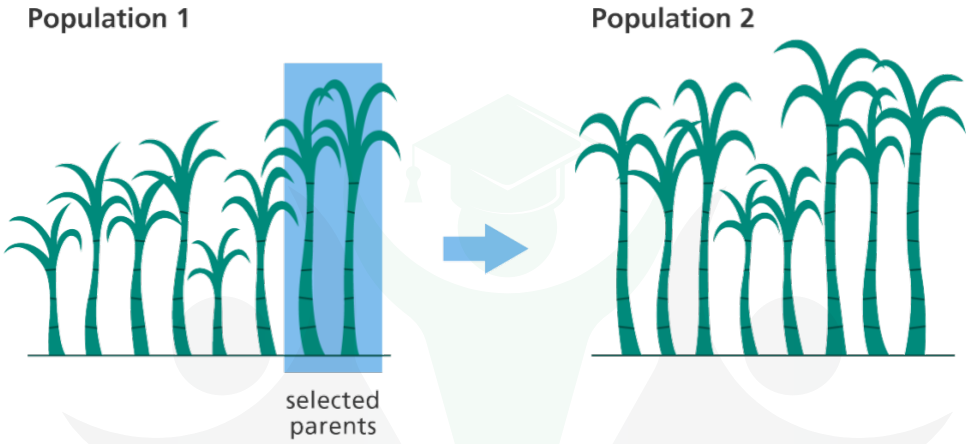
Lesson 3
Applied genetics

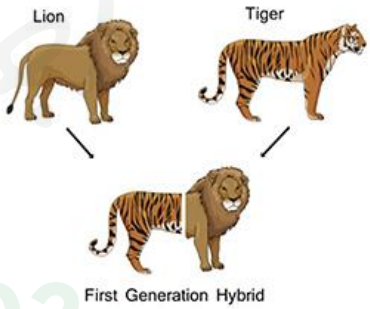
Selective breeding: **The process by which desired traits of certain plants and animals are selected and passed on to their future generations.**



Selective breeding include

1) Hybridization
2) Inbreeding

1) Hybridization



Hybridization: **The process of creating hybrids.**

A hybrid occurs by crossing parent organisms with different forms of a trait to produce offspring with specific traits.

Disadvantages of hybridization include expense and length of time needed.

Advantages of hybridization include adaptability and increased numbers of offspring

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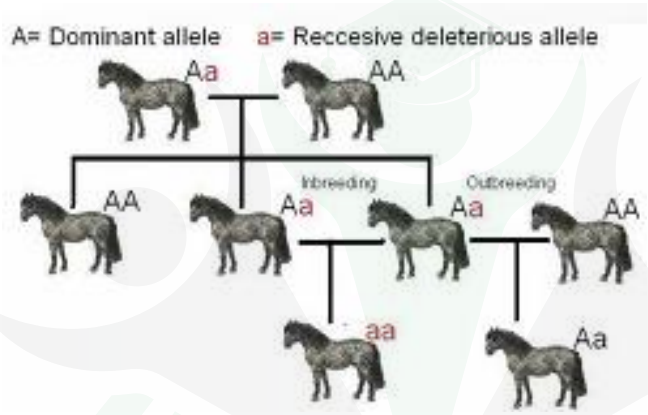
2) Inbreeding

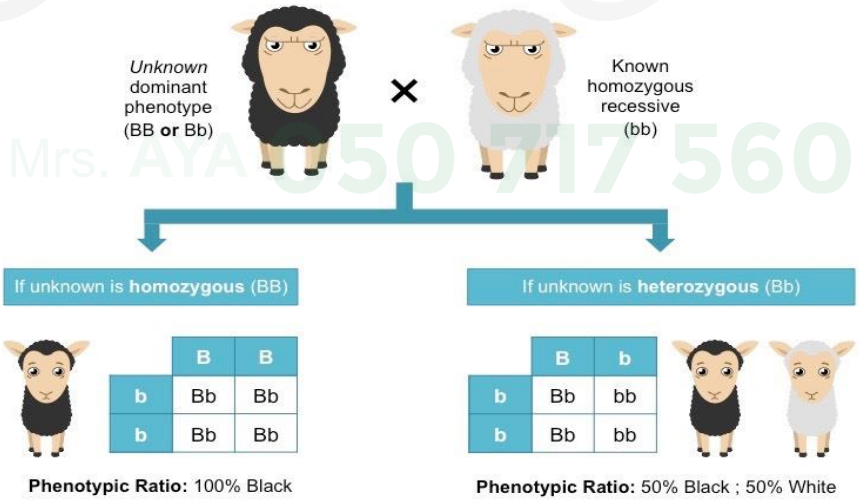
- ✓ **Inbreeding:** is the process in which two closely related organisms are bred to have the desired traits and to eliminate the undesired ones in future generations.
- ✓ Inbreeding is used to create pure breeds in horses, dogs, and other animals.
- ✓ A disadvantage of inbreeding is that harmful recessive traits also can be passed on to future generations.



- ✓ Breeders can determine the genotype of the hybrid by using a test cross.
- ✓ **A test cross:** involves breeding an organism that has the unknown genotype with one homozygous recessive for the desired trait.

Unknown genotype X (hh)

- ✓ • If the parent's genotype is homozygous dominant, all the offspring will have the dominant phenotype.
- ✓ • If the parent's genotype is heterozygous, the offspring will show a 1:1 phenotypic ratio



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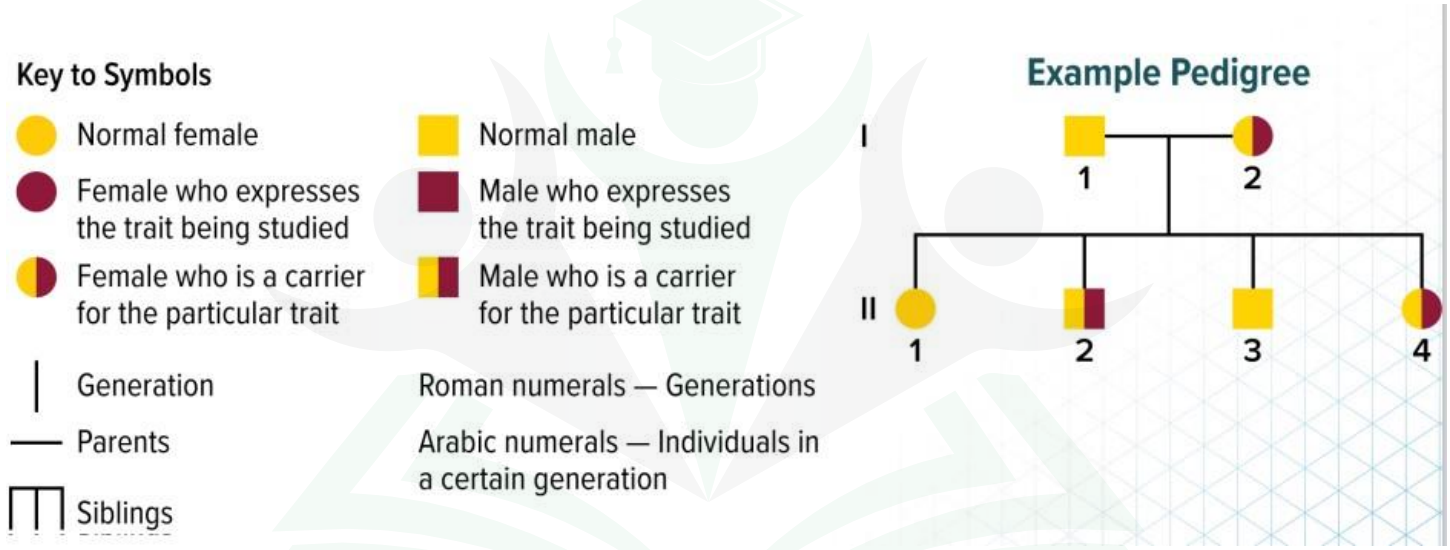
Lesson 4:

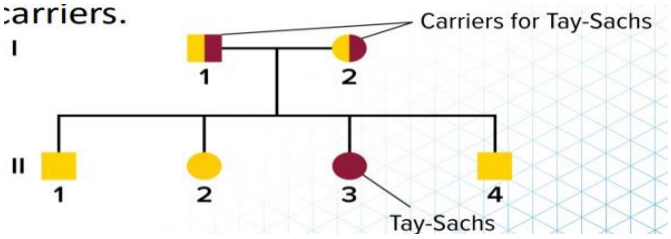
Basic Patterns of Human Inheritance

- **A carrier: An individual who is heterozygous for a recessive disorder.**
- **Pedigree: a diagram that traces the inheritance of a particular trait through several generations**
- **Inheritance of disorders in humans can be achieved by the use of a pedigree**



Recessive Genetic Disorders

- **This pedigree shows an example of a recessive genetic disorder, Tay-Sachs.**
- **Two unaffected parents have an affected child.**
- **This indicates that both parents are heterozygous and carriers for the trait. The half-filled square and circle show that both parents are carriers**



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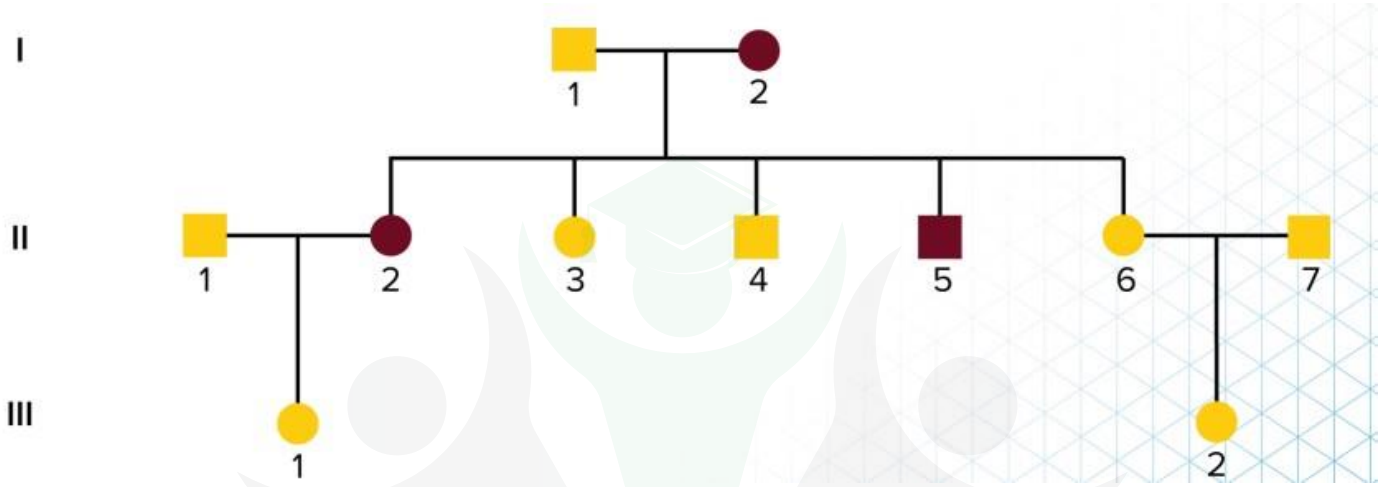
Dominant Genetic Disorders

- **This pedigree shows an example of a dominant genetic disorder, polydactyly.**
- **Affected parents can pass the gene to their children.**
- **Unaffected parents cannot have an affected child**



Using pedigrees can help predict the possibility of disorders occurring in future offspring

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