Chapter 6 Meiosis and Mendel

Section 6.3 Mendel and Heredity

I. Mendel laid the groundwork for genetics.

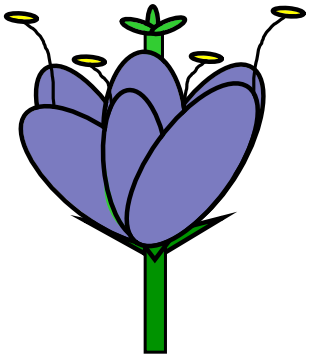
- ***Heredity*** = the passing on of characteristics from parents to offspring.
- **Traits** = Distinguishing characteristics that are ***inherited***
- ***Genetics*** = the branch of biology that studies heredity and variations in organisms.
- ***Gregor Mendel***, an Austrian monk, carried out important studies of heredity.

A. Mendel's data revealed patterns of inheritance.

- Mendel chose to use the ***garden pea*** because they reproduce ***sexually***, which means they produce male and female sex cells, called ***gametes***.

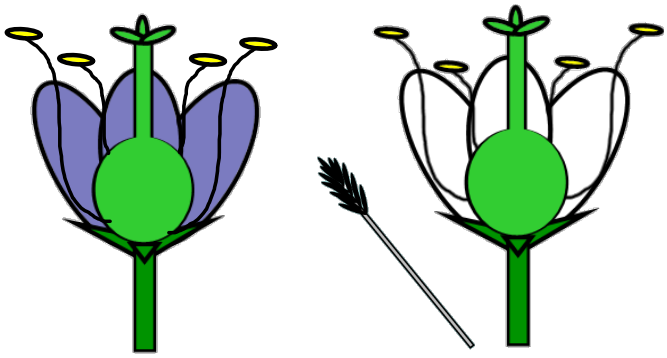
a. ***male*** gamete, ***sperm***, forms in a pollen grain.

b. ***female*** gamete, an ***egg***, forms in the reproductive organ, ovary.



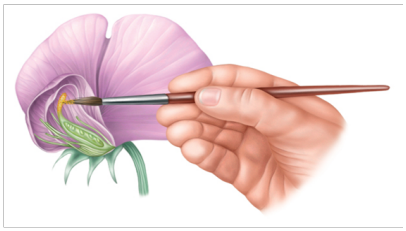
- **Fertilization** = process where the ***male gamete*** unites with the ***female gamete***, resulting in a fertilized cell, called a ***zygote***.
- ***Pollination*** = the transfer of pollen grains from a male reproductive organ to a female reproductive organ.

Note: ***A plant can be pollinated but not fertilized.***



1. Pea plants have ***both*** organs in the same flower; as a result peas normally reproduce by ***self-pollination*** .
2. Mendel also ***cross-pollinated*** in which he took pollen from one plant and transferred it t o another plant.

Mendel controlled the fertilization of his pea plants by removing the male parts, or stamens.



He then fertilized the female part, or pistil, with pollen from a different pea plant.

B. Mendel's experimental design.

1. Mendel studied ***one*** trait at a time to control variables, and he analyzed his data ***mathematically*** **(This had never been done before).**

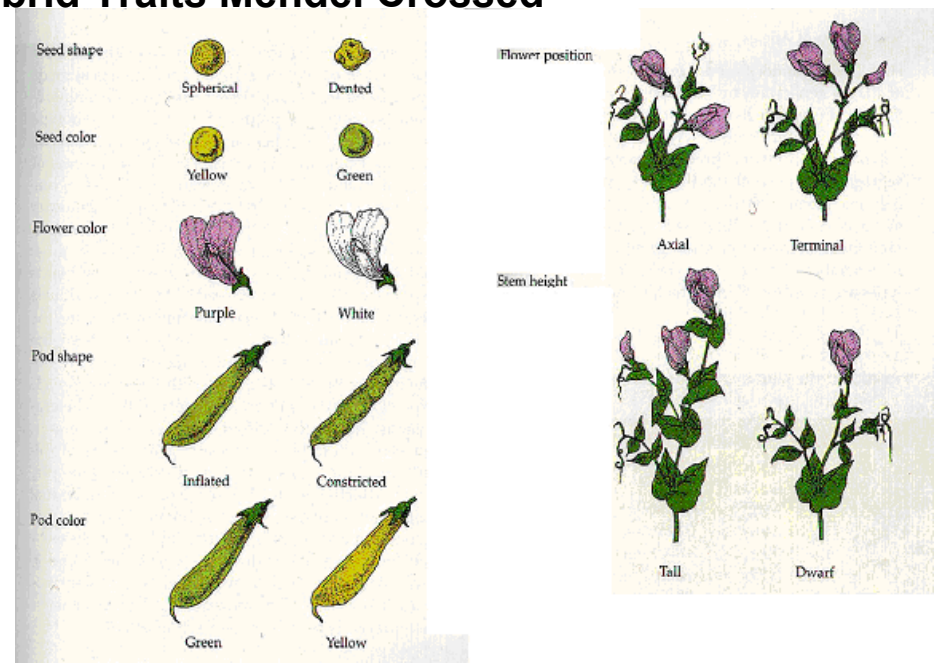
2. He worked with ***tall*** plants that were **purebred** for tallness, and ***short*** plants that were **purebred** for shortness.

II. Mendel's Monohybrid Crosses

- ***Hybrid*** = the offspring of parents that have different forms of a trait.
- Mendel ***crossed*** his **purebred** tall plants with his **purebred** short plants.

Mendel's first experiments are called ***monohybrid crosses*** because mono- means "one" and the parent plants differed from each other by a single trait **- height.**

Monohybrid Traits Mendel Crossed



A. The First Generation

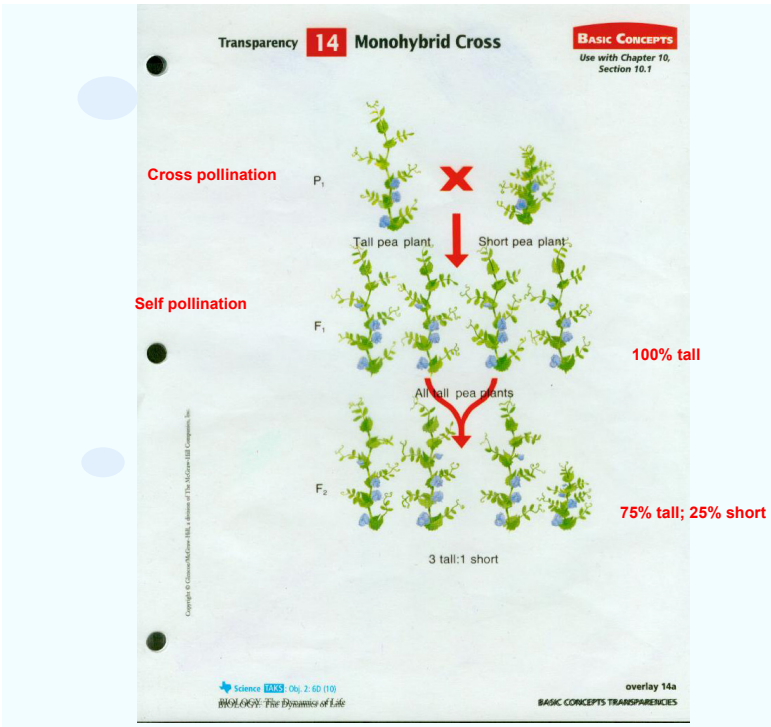
1. Mendel crossed ***purebred*** tall pea plants with ***purebred*** short plants. This is called the P generation (or Parent generation).

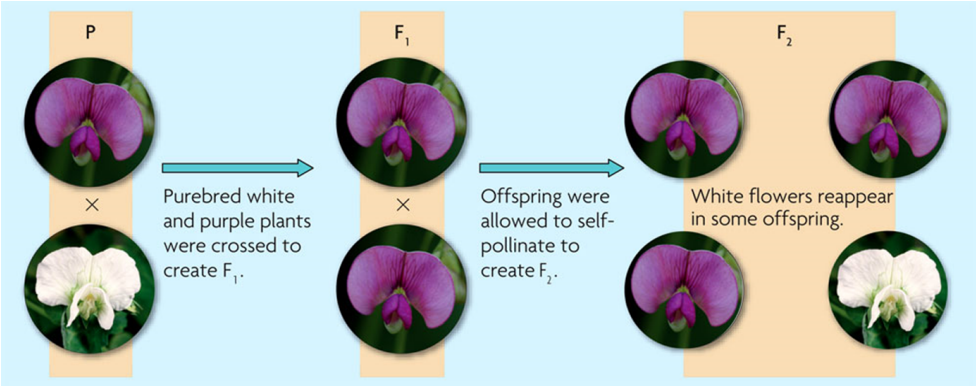
2. The offspring were all ***tall***, this was called the F_1 generation (the filial or son/daughter generation).

B. The second generation

1. Next, Mendel allowed the plants in the F_1 generation to ***self pollinate***.

2. He found in this generation, the F_2 generation that ***75%*** of the plants were tall and ***25%*** of the plants were short.





C. The law of segregation.

- The law of segregation states that every individual has ***two*** alleles of each gene and when ***gametes*** are produced, each one receives ***one*** of these alleles.

  During ***fertilization***, these gametes randomly pair to produce ***four*** combinations of alleles.

Section 6.4 Traits, Genes, & Alleles

- Mendel concluded that each organism has ***two*** factor that control each of its traits.
- These factors are ***genes*** that are located on our ***chromosomes***.
- Genes exist in alternative forms; we call these different gene forms ***alleles***.
- An organism's two alleles are located on different copies of a chromosome, one inherited from the ***female parent*** and one from the ***male parent***.

I. The rule of dominance.

- ***Dominant*** trait = observed trait of an organism that masks the recessive form of a trait.

- ***Recessive*** trait = trait of an organism that can be masked by the dominant form of a trait.

- Mendel concluded that the allele for tall plants is ***dominant*** to the allele for short plants.

II. Phenotypes and Genotypes

- Phenotype = ***the way an organism looks and behaves***. Ex: The phenotype of tall plant is tall.

- Genotype = ***the allele combination an organism contains***.

Ex: The genotype of a tall plant has two alleles for tallness is **TT**, the genotype of a tall plant that has one allele for tallness and one for shortness is **Tt**.

- Homozygous = when there are ***two*** identical alleles for a trait. Ex: Homozygous dominant for tall would have the alleles ***TT***, homozygous recessive for short would be ***tt***.

- Heterozygous = when the two alleles for the trait are ***different***. Ex: Heterozygous for height would be ***Tt***, and expressed as ***tall***.

GENETICS WORKSHEET #1

1. In pea plants, the gene for round seeds is dominant over the gene for wrinkled seeds.

a) What symbol would best represent the gene for round seeds? **R**

b) What symbol would best represent the gene for wrinkled seeds? **r**

c) What is the genotype for a pea plant that is homozygous round? **RR**

d) What is the genotype for a pea plant that is heterozygous round? **Rr**

e) What is the genotype for a pea plant with wrinkled seeds? **rr**

f) What is the phenotype for a pea plants with the genotype Rr? **round**

g) What is the phenotype for a pea plants with the genotype RR? **round**

h) What is the phenotype for a pea plants with the genotype rr? **wrinkled**