Section 5.1 Mendel’s Experiment

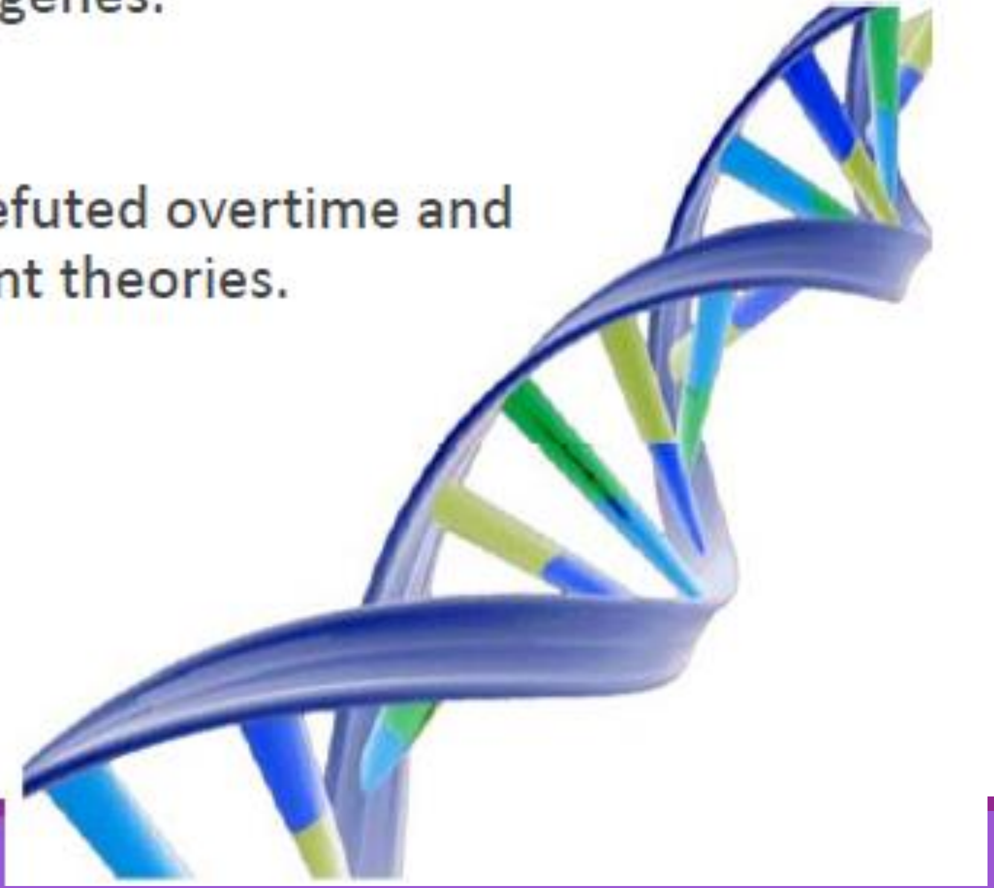
SBI3U

MRS. FRANKLIN

Early Ideas about Inheritance

Many scientists before Mendel, had developed their own theories of inhertiance of genes.

Many of these theories were refuted overtime and replaced with new, more current theories.



1) Aristotle

Aristotle developped the theory of « *Pangenesis* » and believed that eggs and sperms where particles (pangenes) that were found in all parts of the body.

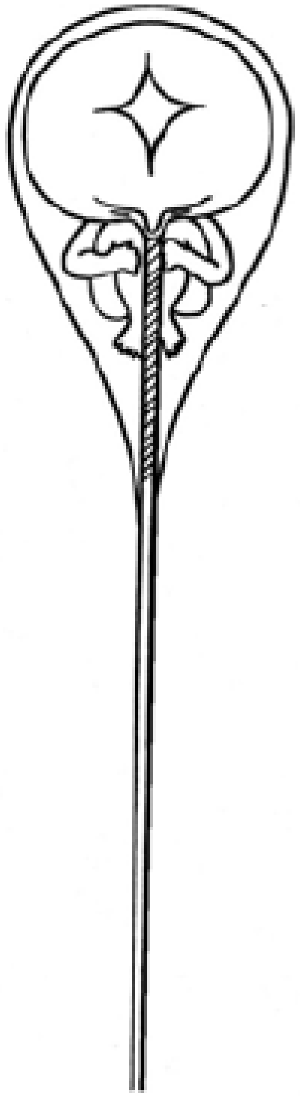
The pangenes were believed to be shed from the different body parts into the bloodstream into the reproductive organs.

2) Antony Van Leeuwenhoek

Discovered sperm in semen with a light microscope

He believed that the head of the sperm contained a mini-human being.

It was beleived that this human being later developed into a human within the female body.



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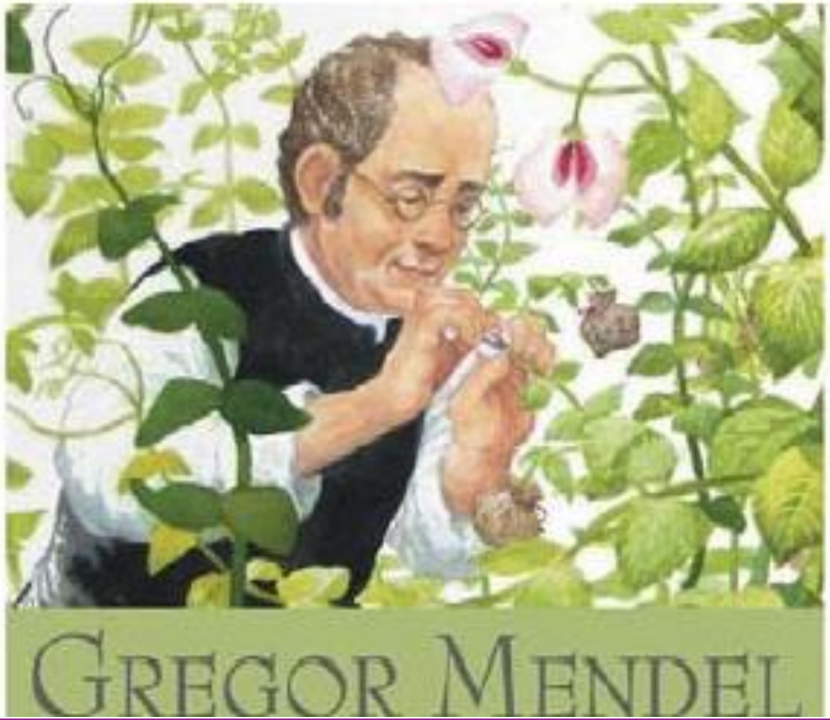
3) Blended Theory

Many scientists in the 18oo's believed that characteristics between parents were blended in the offspring.

It was believed that the blended characteristics could not be reversed and would be lost in successive generations.

4) Gregor Mendel

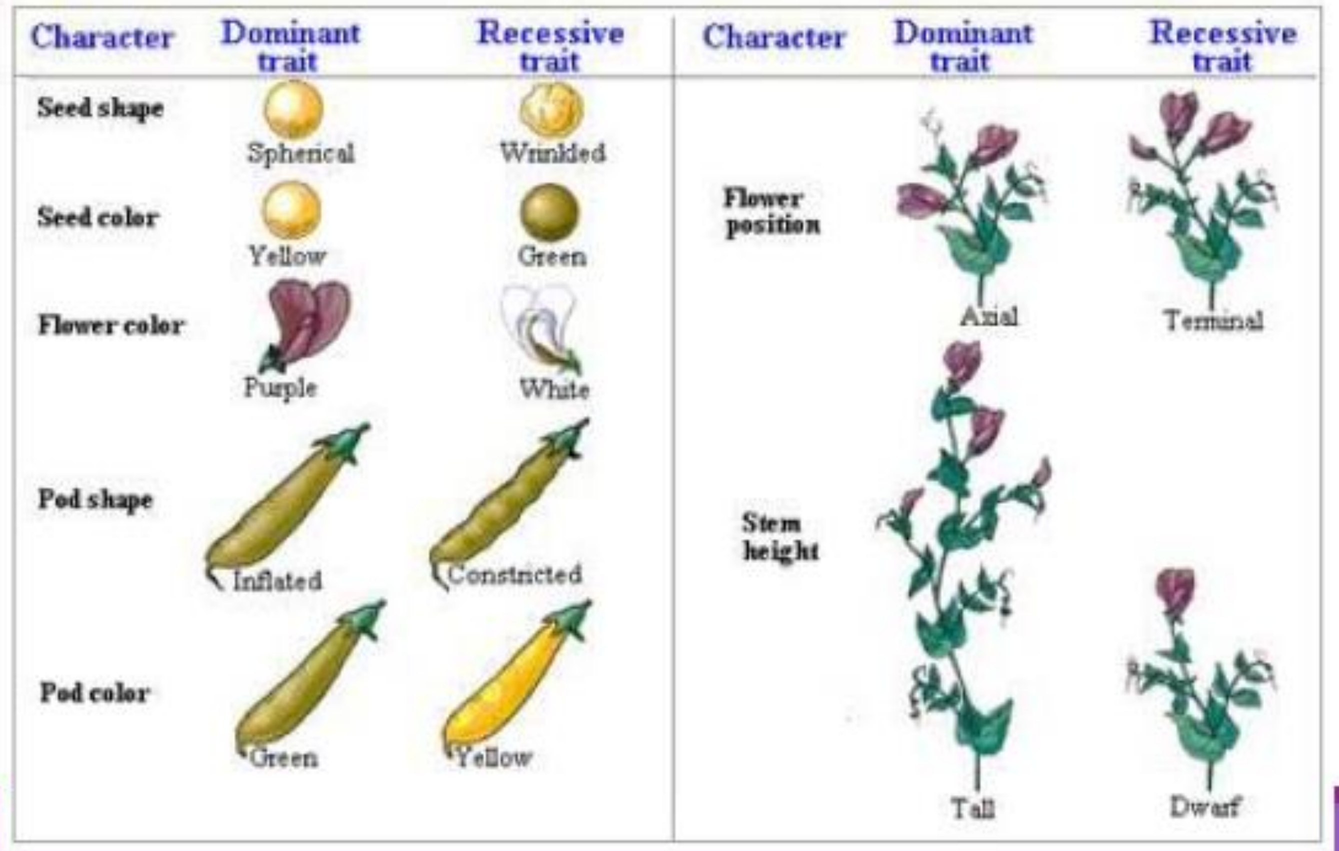
All other theories were eventually disproven by Gregor Mendel. Mendel developed a series of experiments that further explained the laws of genetics and patterns of inheritance.



Most of his experiments were based on ***pea plants.***

Gregor Mendel – Why Use Pea Plants?

1. *Variety of characteristics:* *Peas have a variety of traits which enables Mendel to study many patterns of inheritance.*

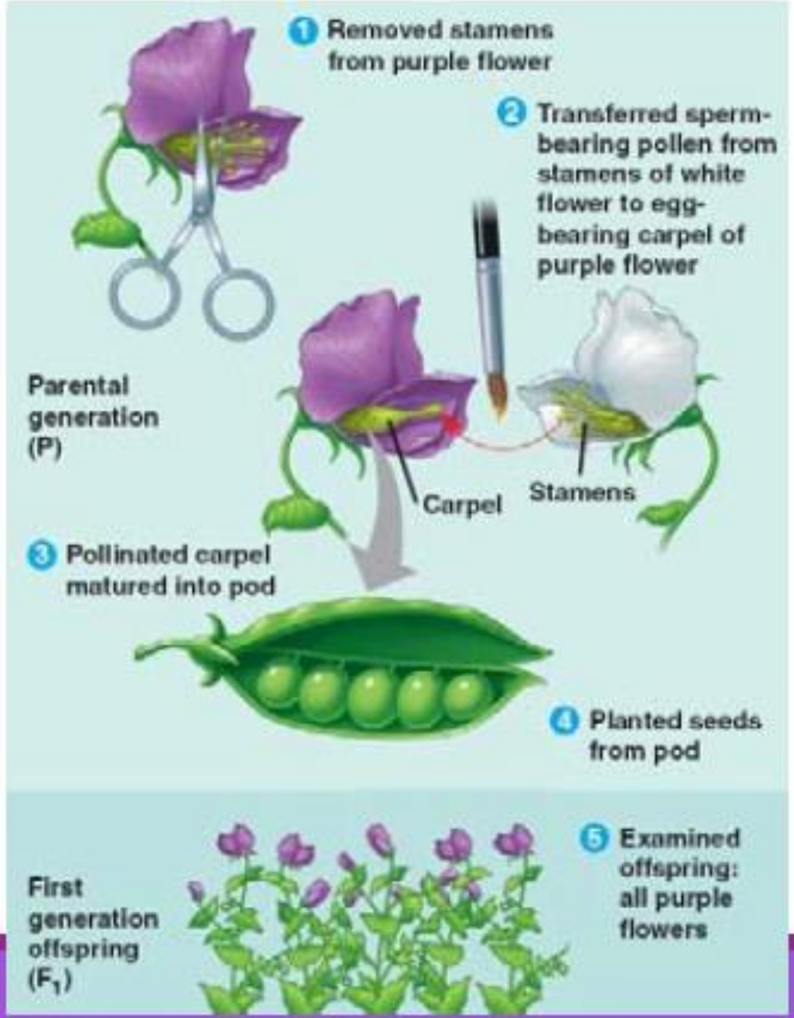


Gregor Mendel – Why Use Pea Plants?

2. ***Mating of Plants:***

It is easy to control the mating of plants through « Cross Pollination »

Mendel was able to carefully select and breed desired traits.

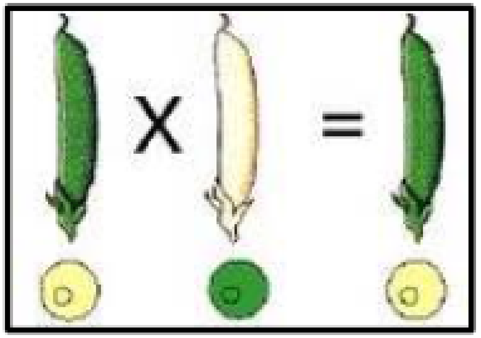


Gregor Mendel – Experimental Procedure

True-bredding Crosses:

Mendel selected plants whose traits were true-breeding *(only one type of trait; no mix)* from generation to generation.

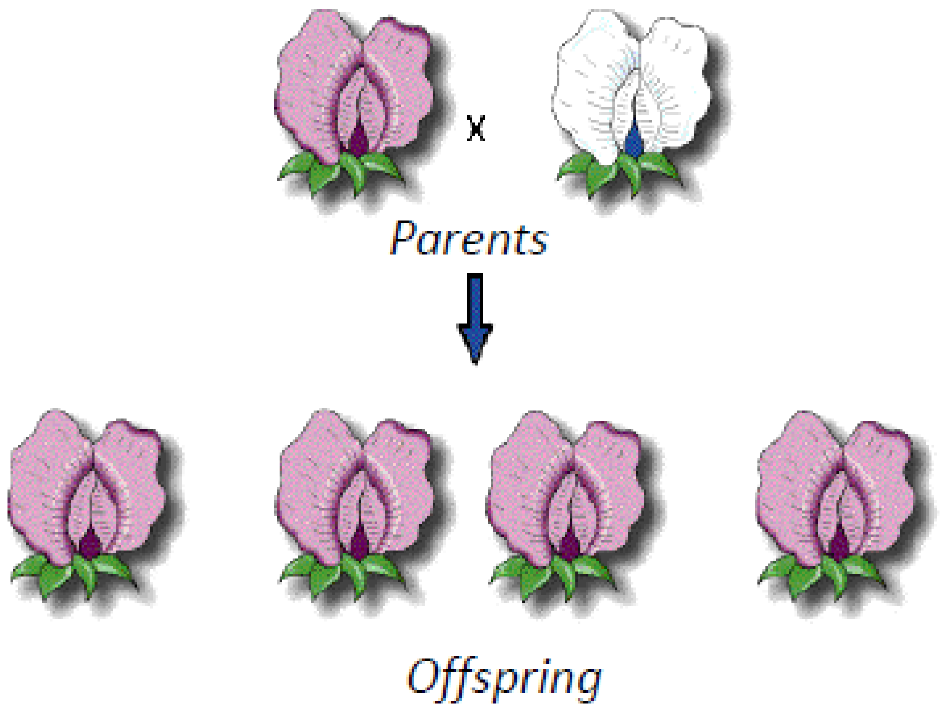
Mendel chose particular traits ***(selective breeding)*** to better track the inheritance of genes.



Gregor Mendel – Key Terms

Monohybrid Cross:

Offspring:



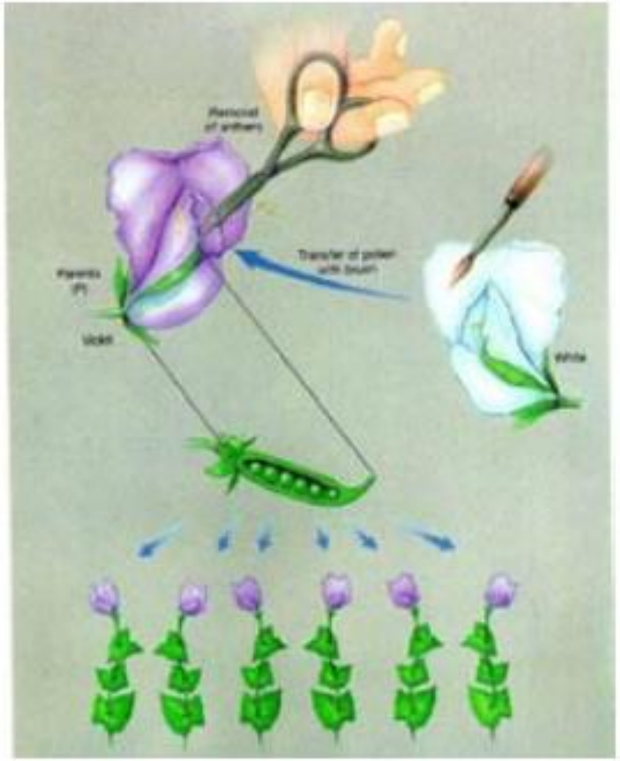
Gregor Mendel – Experimental Procedure

Step 1: Cross-pollination

Mendel cross-pollinated two pea plants with true-breeding characteristics.

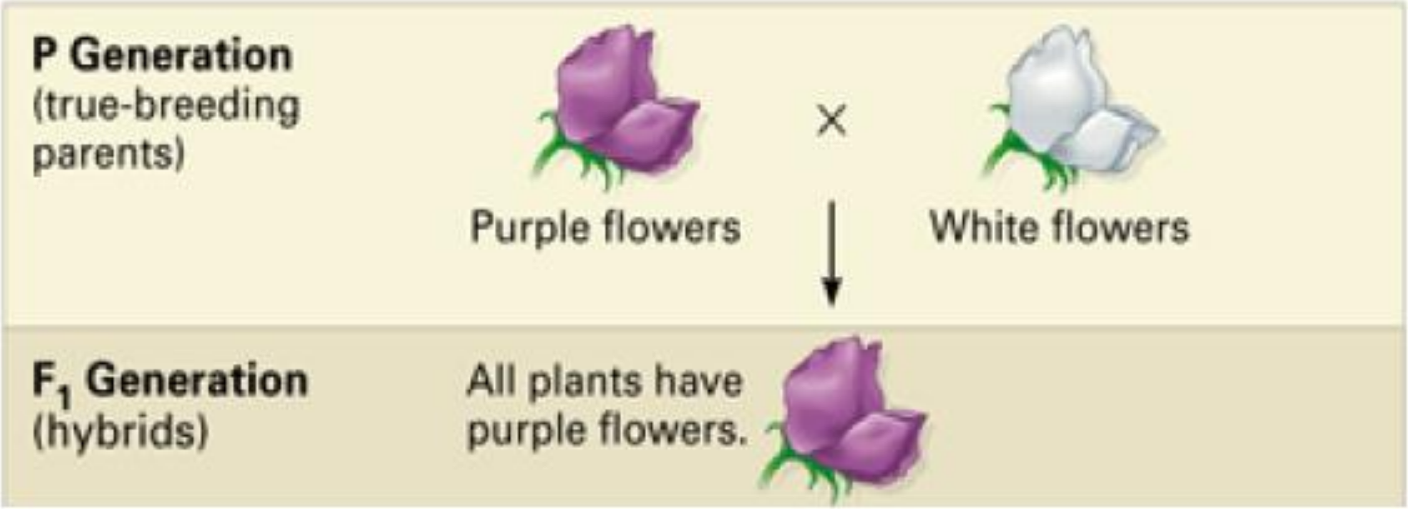
The true-breeding parents are referred to as « P generation » (Parental generation)

The resulting offspring are known as the « F1 generation » (first filial generation)



Mendel had done a cross pollination between purple and white plants.

Gregor Mendel – Experimental Procedure

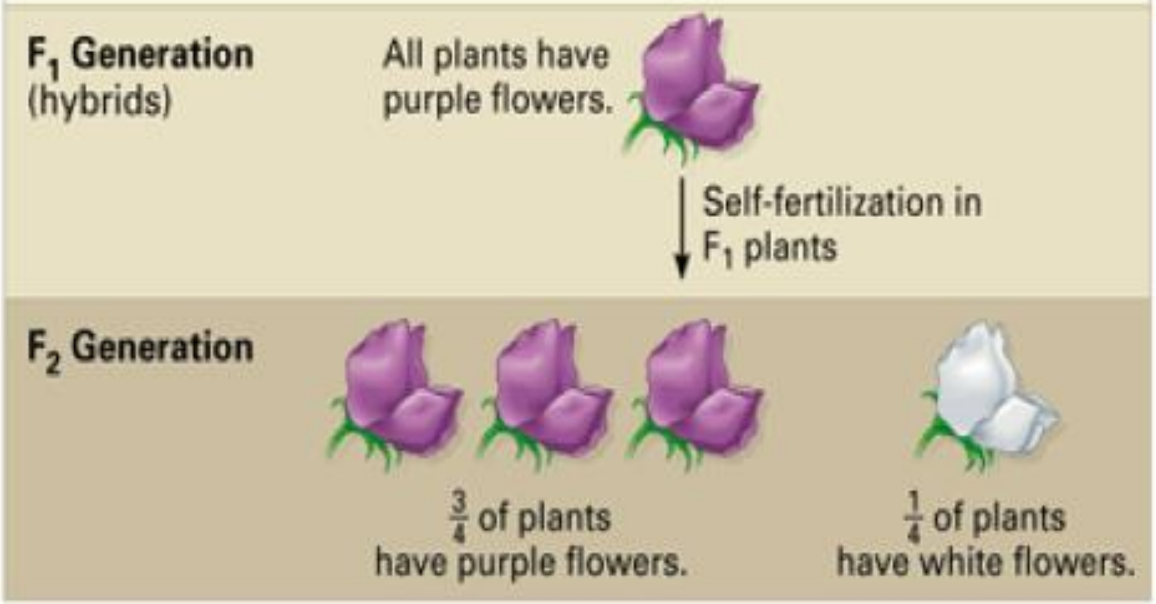


Mendel did not observe any white coloured plants or light purple coloured plants. This helped to refute the blended theory of inheritance.

Gregor Mendel – Experimental Procedure

Step 2: Self-fertilization

The F1 generation was able to self-fertilize to produce the « F2 generation » (second filial generation)



The white flower trait had reappeared in the F2 generation along with the purple trait.

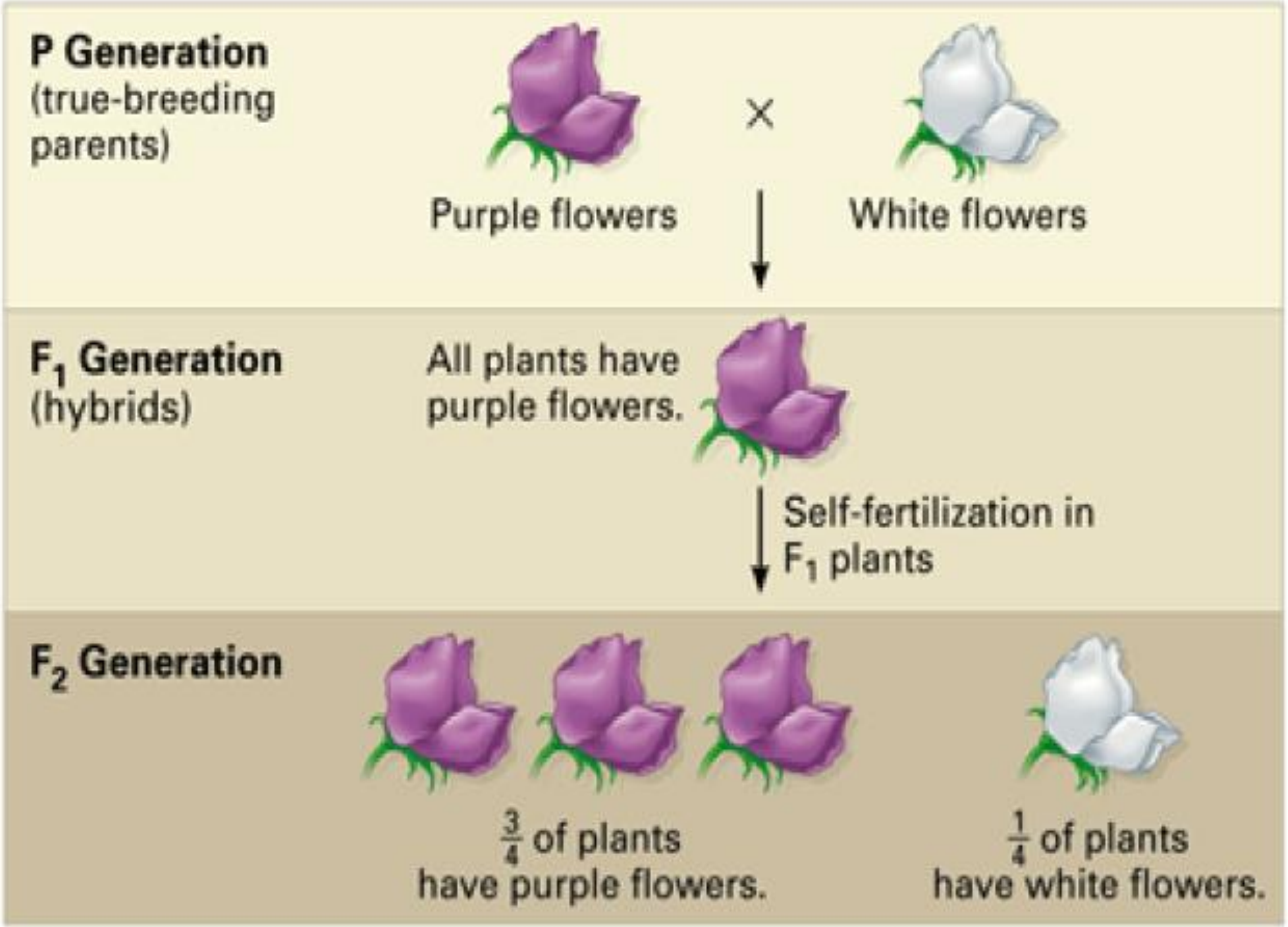

P Generation
(true-breeding parents)
Purple flowers
×
White flowers
F$_1$ Generation
(hybrids)
All plants have purple flowers.
Self-fertilization in F$_1$ plants
F$_2$ Generation
$\frac{3}{4}$ of plants have purple flowers.
$\frac{1}{4}$ of plants have white flowers.

Table 14.1 The Results of Mendel's F_1 Crosses for Seven Characters in Pea Plants [true breeding: itself = itself]

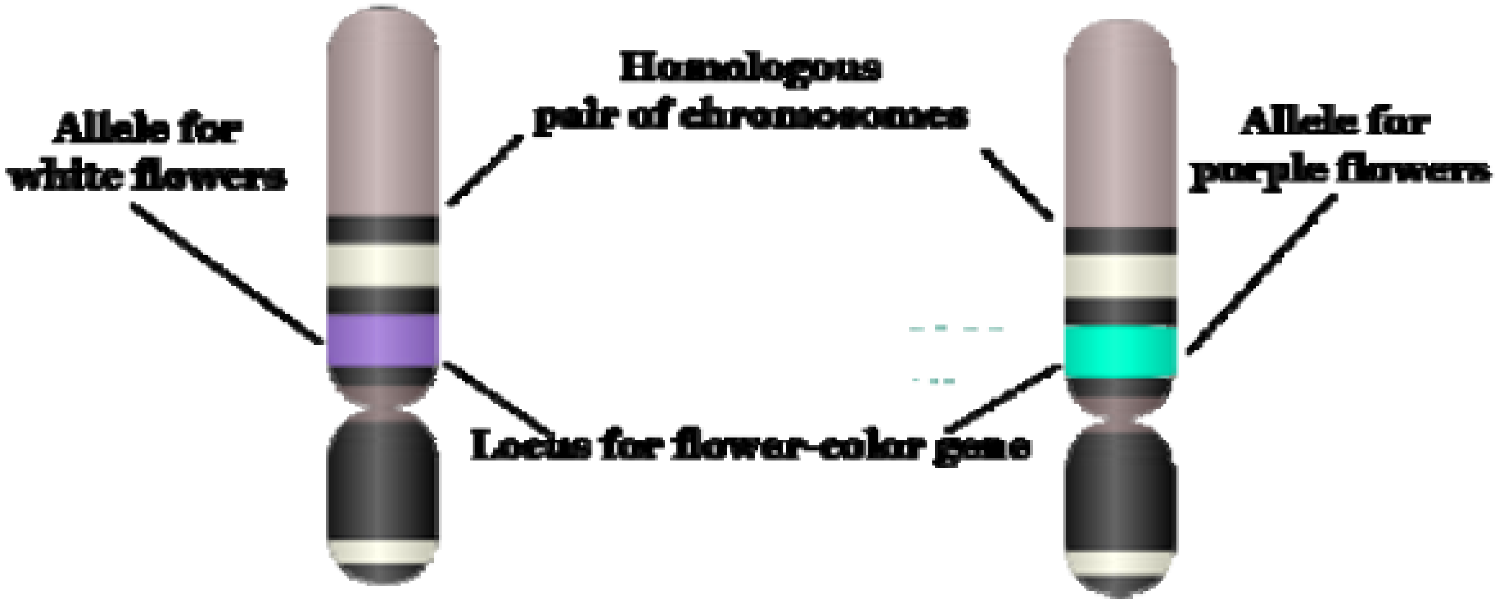
Character	Dominant Trait	×	Recessive Trait	F_2 Generation Dominant:Recessive	Ratio
Flower color	Purple	×	White	705:224	3.15:1
Flower position	Axial	×	Terminal	651:207	3.14:1
Seed color	Yellow	×	Green	6022:2001	3.01:1
Seed shape	Round	×	Wrinkled	5474:1850	2.96:1
Pod shape	Inflated	×	Constricted	882:299	2.95:1
Pod color	Green	×	Yellow	428:152	2.82:1
Stem length	Tall	×	Dwarf	787:277	2.84:1

When performing a monohybrid cross for all seven traits between true-bredding plants, Mendel observed a 3:1 ratio.

This soon became known as the ***« Mendelian Ratio »***

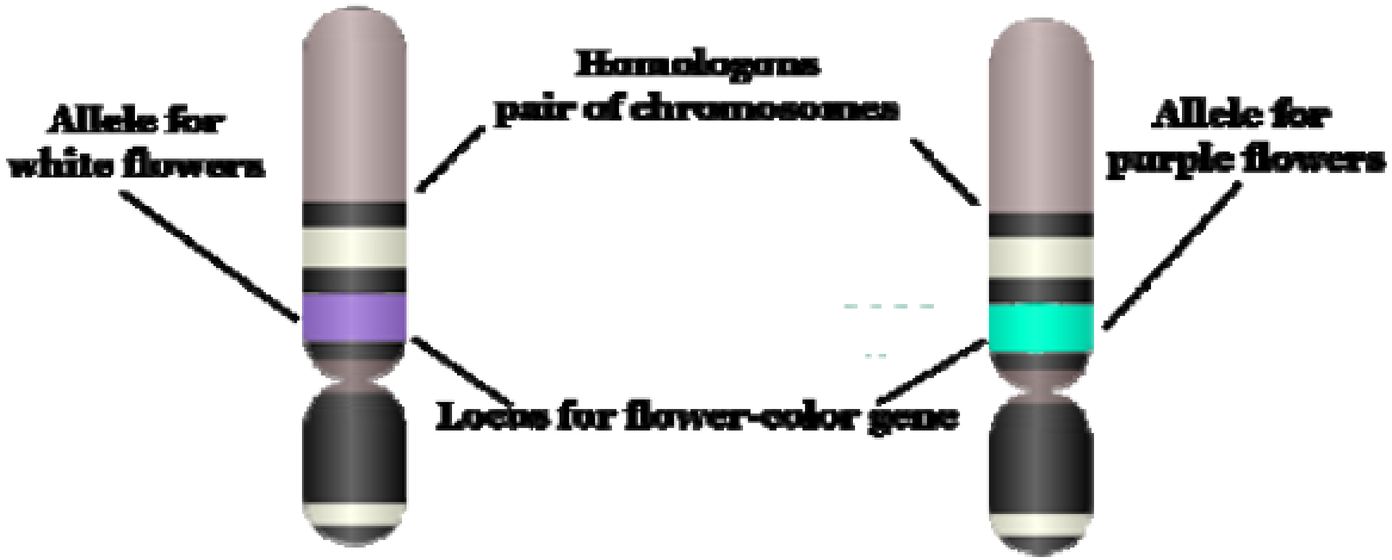
Mendel's Model

1) Alternative versions of genes account for variations in inherited characters. There different versions are known as **'alleles'**.



Mendel's Model

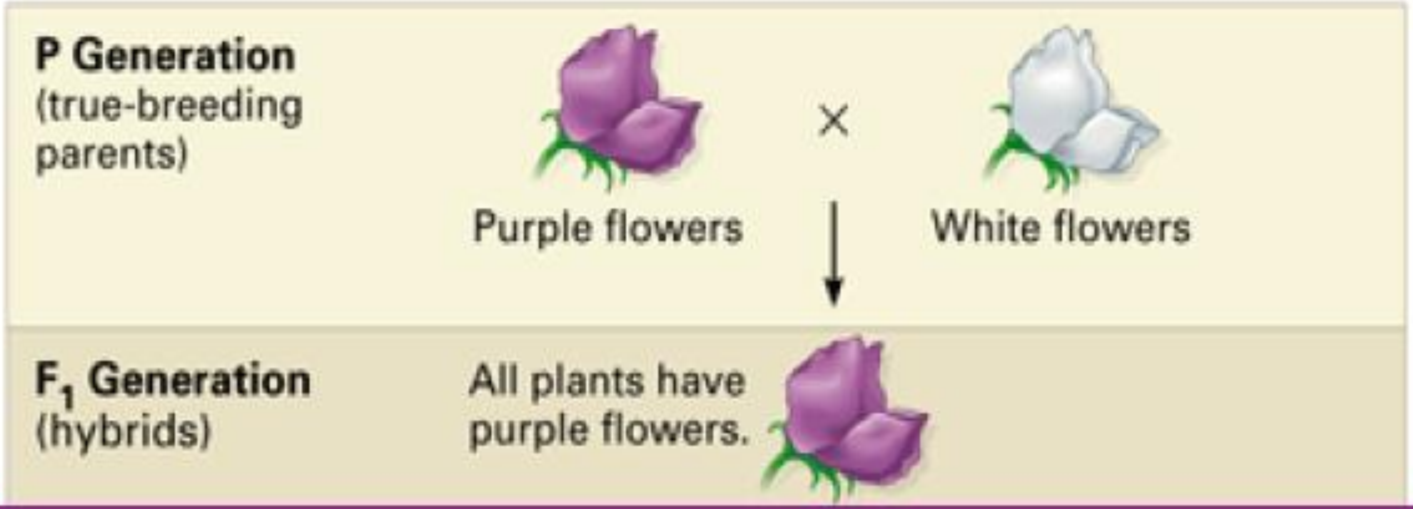
2) For each characteristic, an orgnaism inherits two alleles, one from each parent. Thus, a trait is represented twice in a diploid cell because there are two alleles for each trait.



Mendel’s Model

3) If the two alleles differ, the dominant allele, determines the organisms appearance.

The recessive alleles has no noticeable effect on the organism’s appearance.



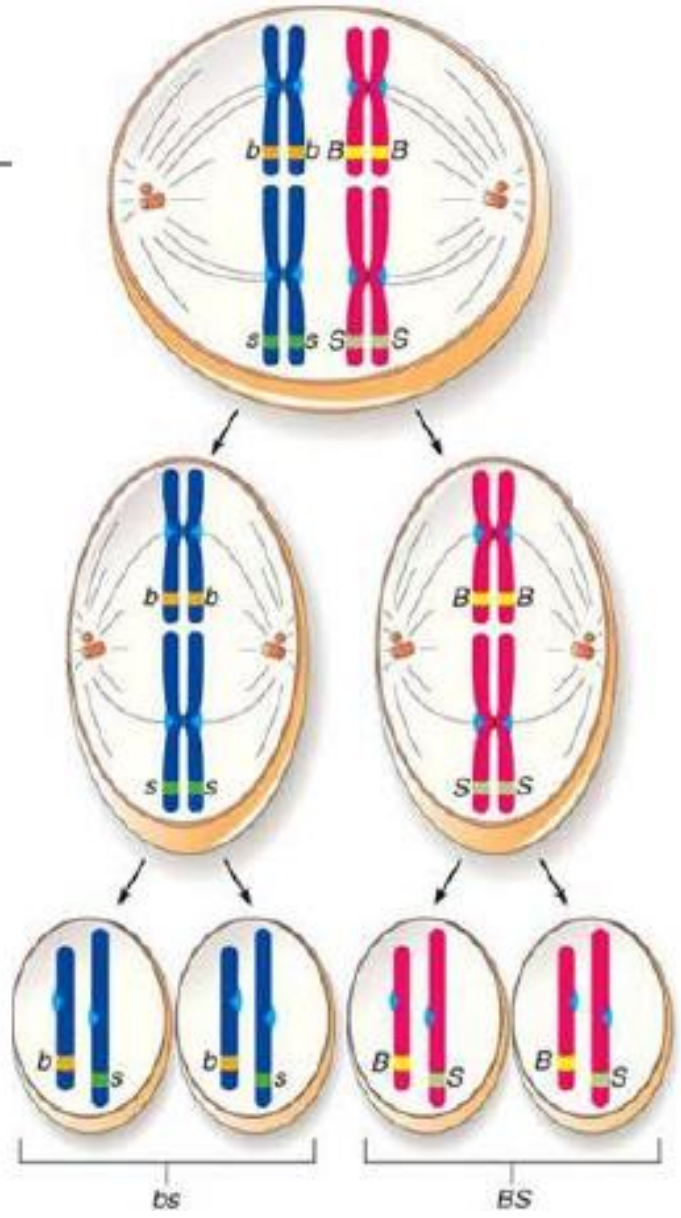
Mendel's Model

4) *Law of Segregation:*

The two alleles for one trait segregate during meiosis and end up in different gametes.

The egg or the sperm only gets one of the two alleles

If an organism has identical alleles then it is true-breeding for the particular characteristic.



Representations of Alleles

Alleles are represented by UPPER and lower case letters.

Dominant alleles: Upper case letter (P)

Recessive alleles: Lower case letter (p)

***** Both the upper and lower case letter MUST be the same for different variations of the trait.***

Key Terms

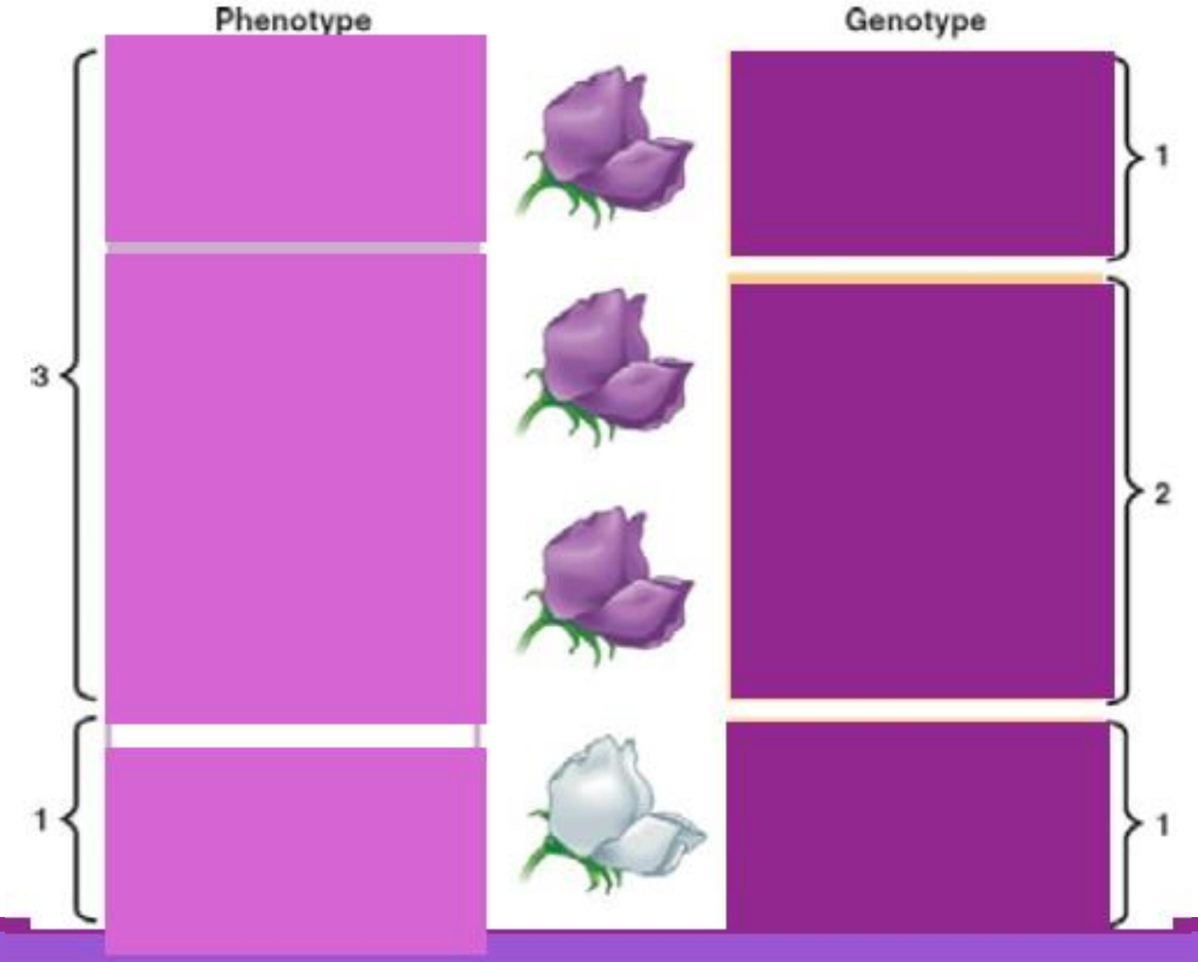
Phenotype:

Genotype:

Homozygous:

Heterozygous:

Representing Genotype and Phenotype



Homework

Textbook: p. 207 # 1, 2, 4, 5, 7 & 10