NOTES – 5.1

Chapter 5 – Genetics
Lesson 1 – Mendel and His Peas

Early Ideas About Heredity

Q: Have you ever wondered why some family members look very similar while others look very different?

In 1851, Gregor Mendel, a young priest/teacher began taking care of the garden where he grew 100's of pea plants. He became curious as to why some of the plants had different physical characteristics, also known as traits.

Q: What are traits?
A: a characteristic that an organism can pass on to its offspring through its genes

He noticed that some plants grew tall while others were short and some produced green seeds, while others produced yellow.

He further observed that the pea plants' traits were often similar but on occasion different to those of their parents, also known as heredity.

Q: What is heredity?
A: the passing of traits from parents to offspring

Mendel studied these pea plants for more than 10 years to understand the process of heredity. His work formed the foundation of genetics.

Q: What is genetics?
A: the scientific study of how traits are passed from parents to offspring; the study of heredity

Mendel's Experimental Methods

Mendel studied genetics by doing controlled breeding experiments with pea plants. Pea plants were ideal for genetics studies because they –

- reproduce quickly

Mendel was able to grow many plants and collect a lot of data.

- have easily observed traits

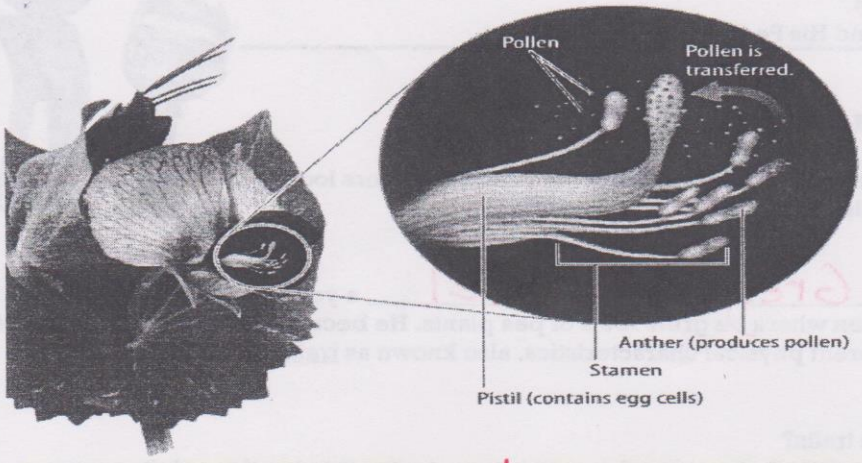
Mendel was able to observe whether or not a trait was passed from one generation to the next.

- can be controlled by choosing which pairs of plants reproduced

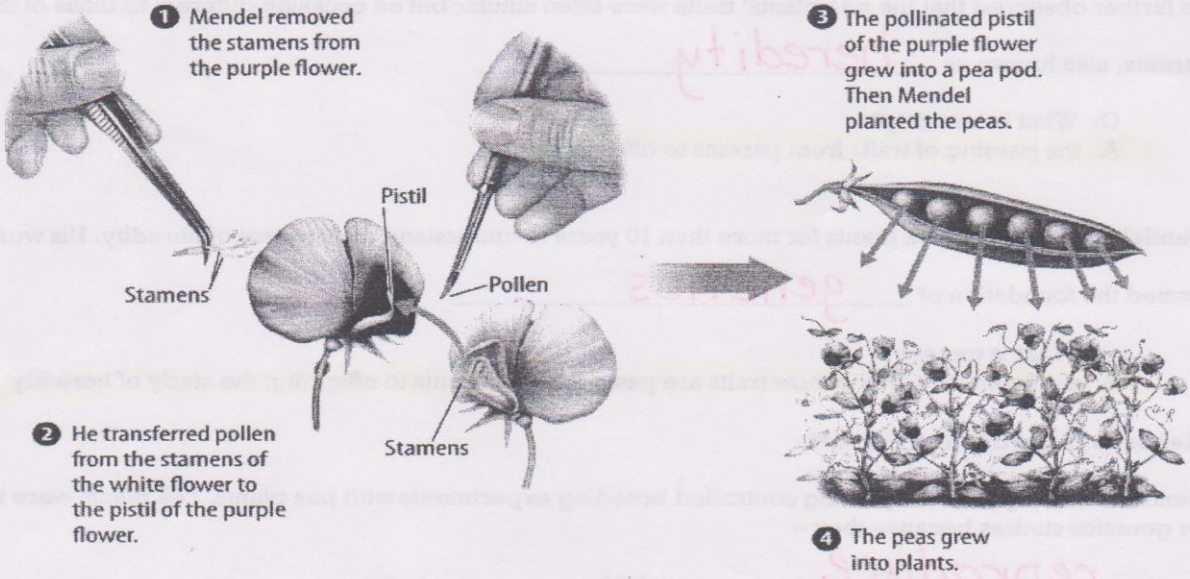
Mendel was able to find out which traits came from which plant pairs.

So how did Mendel study these pea plants?

In nature, plants self-pollinate. This means plants contain both male and female parts.



To eliminate self-pollination by removing the male parts of one flower and the female parts from the other, this way he was in control of the results.



1 Classwork – Q: Why was it important for Mendel to prevent his pea plants from self-pollinating?
A: (answer on your **CW** sheet)

So remember… Mendel wanted to study the inheritance of traits. So how did he do it?

Mendel decided to cross opposite forms of a trait.

Ex. tall plants x short plants

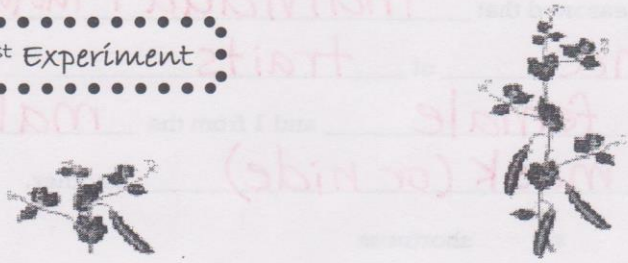
He started his experiments with purebred plants.

Q: What is a purebred plant?
A: a plant that always produces offspring with the same form of a trait as the parent

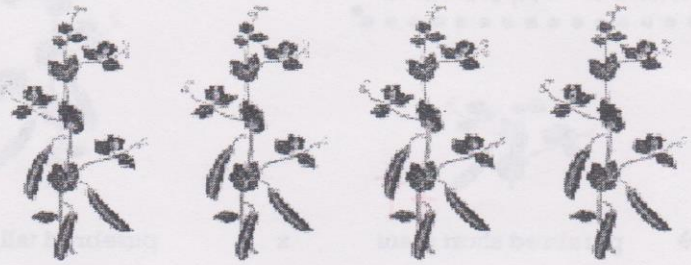
By using purebred plants Mendel knew that the offspring's traits would always be identical to that of the parents.

Mendel's Results

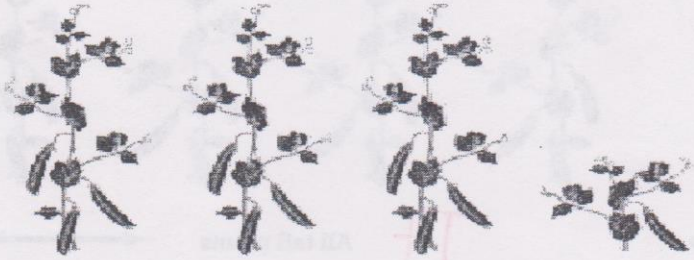
Mendel's 1st Experiment



parental generation → (*P* generation) purebred short x purebred tall



1st *filial* generation → (F_1 generation) all tall plants



2nd *filial* generation → (F_2 generation) 3 tall plants 1 short

2 Classwork – Q: What is a purebred plant?
A: (answer on your **CW** sheet)

Mendel studied 7 total traits in pea plants –

- stem height
- seed shape
- seed color
- seed coat color
- pod shape
- pod color
- flower position

Focus – "Genetics of Pea Plants"

Results of Hybrid Crosses

Characteristics	Flower Color	Flower Position	Seed Color	Seed Shape	Pod Shape	Pod Color	Stem Length
Dominant Trait; # of Offspring	Purple; 705	Axial; 651	Yellow; 6022	Round; 5474	Smooth; 882	Green; 428	Long; 781
Recessive Trait: # of Offspring	White; 224	Terminal; 207	Green; 2001	Wrinkled; 1850	Bumpy; 299	Yellow; 152	Short; 277
Ratio	3.15 : 1	3.14 : 1	3.01 : 1	2.96 : 1	2.95 : 1	2.82 : 1	2.84 : 1

3 Classwork – Q: Is yellow seed color controlled by a dominant allele or a recessive allele?
A: (answer on your **CW** sheet)

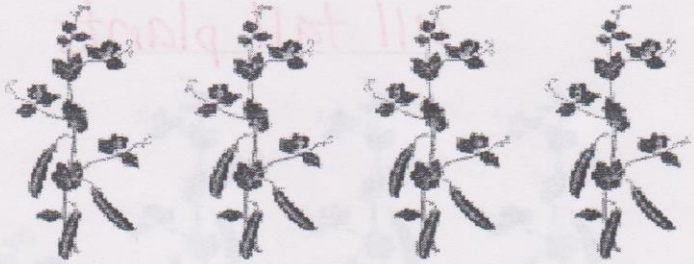
Mendel's Conclusions

From his results, Mendel reasoned that individual factors must control the inheritance of traits in pea plants. These factors exist in pairs – 1 from the female and 1 from the male. 1 factor in each pair can mask (or hide) another.

Ex. tallness vs. shortness

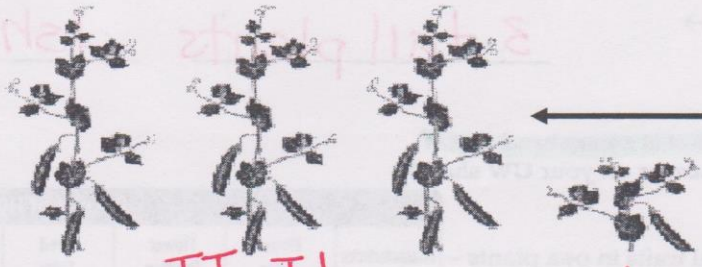
Mendel's 1st Experiment

parental generation → purebred short plant x purebred tall plant
(*P* generation)



1st *filial* generation → Tt All tall plants
(F_1 generation)

This F_1 generation are known as hybrids because they have 1 allele for each trait.



2nd *filial* generation → 3 tall plants 1 short
(F_2 generation)

This F_2 generation has 1 dominant, 2 hybrid and 1 recessive plants.

Remember, each organism has a combination of 2 alleles from its parents. Therefore, individual alleles control the inheritance of traits.

Traits are either –

- dominant
- recessive

Q: What is a dominant trait?
A: a genetic factor that blocks another genetic factor; a trait that always shows up in the organism when it is present

Q: What is a recessive trait?
A: a genetic factor that is blocked by the presence of a dominant factor; a trait that is masked or covered up whenever the dominant factor is present

A trait controlled by a recessive trait will only show up if the organism does not have the dominant trait.

In pea plants, the trait for tall stems is dominant over the trait for short stems.

Therefore, only pea plants that inherit 2 recessive traits for short stems will be short.

4 Classwork – Lesson 1 Review p. 158 (answer on your **CW** sheet)