Biology Section 6.3 & 6.4 Notes Part 1

- Many of your **traits** (distinguishing characteristics that are inherited) resemble those of your parents.
- Heredity is the passing of traits from parents to offspring.

- Gregor Mendel, Austrian monk – began the scientific study of heredity

- Mendel experimented with garden pea plants
  - 1st to develop rules that accurately predict patterns of heredity
  - These patterns form the basis of **genetics,** the study of biological inheritance patterns and variation in organisms.

- The garden pea was a good subject for studying heredity for several reasons:
  1. many traits that have 2 clearly different forms
     ex. Flower color = purple or white
  2. mating of pea plants can be easily controlled, self-fertilization (self-pollination) or cross-pollination is possible
  3. small, easy to grow, mature quickly, many offspring

- Mendel studied 7 Traits (p. 179, figure 6.10)

Flower color	pod color	plant height
Seed color	pod shape	
Seed shape	flower position	

- Mendel's 1st experiments were **monohybrid crosses** – crosses involving 1 pair of contrasting traits
  Ex. Purple flowers crossed with white flowers

- Mendel's experiments had 3 steps:
  1. each garden pea variety was allowed to self-pollinate for several generations, this ensured that the plants were **true-breeding** for a particular trait – these plants were the **P generation (parental)**
  2. 2 P generation plants with contrasting forms of a trait were cross-pollinated – the offspring of this generation were the **F_1 generation**
  3. F_1 generation plants were allowed to self-pollinate – the offspring of these F_1 generation plants were the **F_2 generation**

- The results of Mendel's crosses:
  Only one form of the trait is seen in the F_1 generation, but when F_1 generation plants are allowed to self-pollinate, the missing trait reappears in some plants in the F_2 generation

  F_1 – purple flowers X white flowers = all purple flowers
  F_2 – ration of 3:1 purple flowers : white flowers

- For each of the 7 traits Mendel studied, he found the same 3:1 ratio of plants expressing the contrasting traits in the F_2 generation.

Section 6.3 & 6.4 Notes Part 2

- Mendel developed 4 hypotheses based on the results of his experiments. These 4 hypotheses make up the Mendelian theory of heredity which forms the foundation of genetics.

1. For each inheritable trait, an individual has 2 copies of a **gene** – a piece of DNA that stores instructions to make a certain protein – 1 from each parent
2. there are different forms of genes – these are called **alleles**
3. when 2 different alleles occur together, one may be expressed, while the other may have no observable effect on the organism's appearance
   expressed form = **dominant**
   form not expressed = **recessive**
4. when gametes are formed, the alleles for each gene in an individual separate independently of one another – gametes carry only 1 allele for each inherited trait – during fertilization each gamete contributes one allele

- Dominant alleles – capital letter
- Recessive alleles – lowercase letter
- If the 2 alleles of a particular gene present in an individual are the same – the individual is **homozygous** for that trait
  Ex. YY = yellow pea alleles
- If the alleles of a particular gene present in an individual are different – the individual is **heterozygous** for that trait
  Ex. Yy = 1 yellow pea allele and 1 green pea allele
- In heterozygous individuals, only the dominant allele is expressed
  Ex. Ff F = freckles (dominant)
  F = no freckles (recessive)

* **Genotype** – set of alleles an individual has

* **Phenotype –** physical appearance – determined by which alleles are present
Ex. Pp = genotype purple = phenotype

- Mendel's ideas are often referred to as the Laws of Heredity.
  1. **Law of Segregation –** the 2 alleles for a trait separate when the gametes are formed
  2. **Law of Independent Assortment –** alleles of different genes separate independently of one another during gamete formation
     Ex. Plant height doesn't influence flower color