Modern Genetics

Section I: Complex Patterns of Inheritance

It wasn't until many years after Mendel's death that his work was fully realized for its significance. Biologists recognized that his experiments on peas held true for plants, animals, and humans as well. The patterns of inheritance had many similarities with the behavior of chromosomes, but there were many exceptions to his principles as well.

Many traits are produced from the interaction of genes together. **Polygenic inheritance** refers to a trait that is controlled by two or more genes. These genes are called polygenes and produce specific traits when put together. An example of polygenetic inheritance is skin color, which is determined by the amount of pigment melanin in the skin and the number of dark alleles a person has. There are many possibilities of characteristics that can be determined by these interactions. These traits exhibit incomplete dominance. **Incomplete dominance** is when neither of the parents' alleles is completely dominant. The phenotype of the heterozygous offspring is a mix of both parents.

PARENT 1		AB	AB	AB	AB	B	A	A	O	O	O
PARENT 2		AB	B	A	O	B	B	A	B	A	O
Possible Blood Type of Child	O					🩸	🩸	🩸	🩸	🩸	🩸
	A	🩸	🩸	🩸	🩸		🩸	🩸		🩸	
	B	🩸	🩸	🩸	🩸	🩸	🩸		🩸		
	AB	🩸	🩸	🩸			🩸				

Human blood type is determined by **codominant alleles** or alleles that both show equally. There are three different alleles for human blood type – A, B, and O. Each human has two blood type alleles because we inherit one blood type allele from our mother and one from our father. There are four possible phenotypes, or ABO blood types, when alleles combine: A, B, AB, and O. Like the human gene for blood type, many genes have multiple alleles. **Multiple alleles** are when there are more than two alleles for a genetic trait. For example, a rabbit can have four possible coat colors because of the four different alleles present in a single gene.

Humans, like many animals, have a pair of **sex chromosomes**, designated X and Y that determine whether one is a male or female. XY indicates a male and XX indicates a female. Humans have twenty-three chromosomes. Twenty-two are homologous **autosomes**, which are non sex chromosomes. A gene located on sex chromosomes is called a **sex-linked trait**. Colorblindness, hemophilia, and muscular dystrophy are all sex-linked traits.

Review:

1. Identify an example of polygenic inheritance.
2. How many possible bloody types are there?
3. What is an autosome?