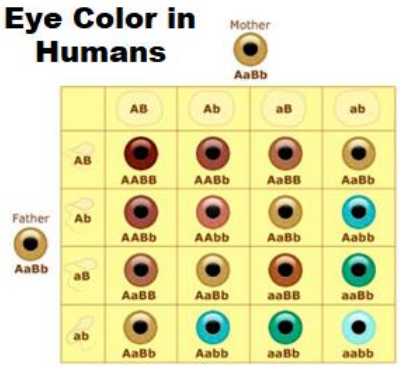
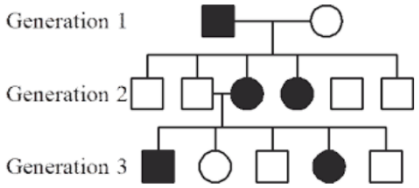
*Fold along the line and glue this side down in your Biology Interactive Learning Log (BILL)*

# Unit 7: Human Genetics




**Learning goals:** While Mendel provided the basics for how inheritance of traits occurs in all organisms, as we continued studying genetics, we noticed that not all inheritance patterns produced the same expected offspring ratios that Mendel had calculated. Something else must be happening! We discovered that some traits had more than two alleles that coded for them, which in others there were different forms of dominance (incomplete dominance and co-dominance). Other traits are impacted by biological sex as their genes are carried on the X or Y chromosomes or influenced by the environment. Still others are coded for by more than one gene. By tracking the inheritance of a trait, like a disease, through a family using a pedigree, we can determine what type of inheritance pattern it follows.




**Key concepts:**

| | | |
|---|---|---|
| Incomplete dominance | Sex-linkage | Epigenetics |
| Codominance | X-inactivation | Pedigree diagrams |
| Multiple Alleles | Polygenic traits | Blood typing |

Can you show what you know?

## Essential Questions:

1. What are some exceptions to Mendel's principles?
2. Does the environment have a role in how genes determine traits?
3. What patterns of inheritance do human traits follow?
4. How can pedigrees be used to analyze human inheritance?
5. How do small changes in DNA molecules affect human traits?

Vocabulary: (**+**) = Can explain it; (**-**) = Only heard it; **0** = No idea

| Term | Pre | Post | Memory Clue |
|---|---|---|---|
| sex-linked trait | | | |
| X-inactivation | | | |
| incomplete dominance | | | |
| codominance | | | |
| roan coloration | | | |
| multiple alleles | | | |
| antigen | | | |
| antibody | | | |
| agglutination | | | |
| Rh factor | | | |
| Polygenic trait | | | |
| pedigree | | | |
| carrier | | | |
| epistasis | | | |
| epigenetics | | | |
| methylation | | | |
| | | | |
| Achondroplasia | | | |
| Hemophilia | | | |
| Sickle Cell trait | | | |
| malaria | | | |
| Red-green colorblindness | | | |
| Muscular dystrophy | | | |
| Marfan syndrome | | | |
| Neurofibromatosis (NF) | | | |
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**Study Guide/Learning Goals:**

1. **Describe** incomplete dominance and **demonstrate** the ability to do the Punnett squares using the appropriate symbols to predict outcomes.
2. **Compare and contrast** incomplete dominance with codominance and **demonstrate** the ability to do Punnett squares using the appropriate symbols to predict outcomes.
3. **Describe** inheritance from multiple alleles and **demonstrate** the ability to do Punnett squares using the appropriate symbols to predict outcomes.
4. **Describe** polygenic inheritance and explain how a polygenic trait is distributed in the population.
5. **Provide examples** of incomplete dominance, codominance, multiple alleles, and polygenic traits.
6. **Explain** how an antigen determines blood type.
7. **Explain** how an antibody causes blood agglutination (clotting).
8. **Describe** how the antibody-antigen reaction is used to determine blood type.
9. **Demonstrate** through use of Punnett squares how ABO blood type is inherited differently from the Rh factor, using the appropriate symbols for each allele.
10. **Define** X-inactivation and **explain** how it results in calico coloration in cats.
11. **Describe** X-linked inheritance and **demonstrate** the ability to do Punnett squares using the appropriate symbols to predict outcomes.
12. **Explain** why X-linked disorders occur more frequently in males**.**
13. **Recognize** and **determine** the meaning of symbols used in a pedigree.
14. **Determine** genotypes of individuals in a pedigree.
15. **Use** a pedigree to determine how a trait is inherited (autosomal dominant, autosomal recessive, or X-linked)
16. **Describe** different gene and chromosomal mutations that can lead to human disease.