

Complex Inheritance

Name: _____

Period: _____

Objective: Practice solving genetics problems for complex patterns of inheritance.

Codominance:

1. A man with blood type O marries a woman who is blood type AB.
 - a. What is the genotype of the man?
 - b. What is the genotype of the woman?
 - c. What are the possible genotypes of their offspring?
 - d. What are the possible phenotypes (blood types) of their offspring?
2. A man has blood type A, but does not know his genotype. He knows his father was blood type AB, but he does not know the genotype of his mother.
 - a. What are the possible genotypes of the man?
 - b. What are the possible genotypes of his mother?
3. The man from question #2 marries a woman with blood type B. Their first child has blood type AB, their second child has blood type O.
 - a. What is the genotype of the man?
 - b. What is the genotype of his wife?
4. A man with blood type AB marries a woman with type A blood. If one particular genotype were to arise in their offspring it would reveal the genotype of the mother.
 - a. What are the possible genotypes of the mother?
 - b. What blood type in the offspring will reveal the genotype of the mother?
 - c. What is the genotype of the mother if this genotype does occur in the offspring?
5. A woman sues a man for child support, claiming that he is the father of her child. The woman has blood type A, the man has blood type B, and the child has blood type O.
 - a. Is it possible for the man to be the father of the child? Show your work.
6. A woman sues a man for child support, claiming that he is the father of her child. The woman has blood type A, the man has blood type AB, and the child has blood type O.
 - a. Is it possible for the man to be the father of the child? Show your work.
7. A wealthy elderly couple dies together in an accident. A man comes forward, claiming that he is their long lost son and is entitled to their fortune. The couple had blood types AB and O. The man has blood type O.
 - a. Could he be the heir to their fortune? Show your work.
8. Mike has blood type AB, Paul has blood type O. Mike knows that his mom had blood type B.
 - a. Could it be possible for Mike and Paul to be brothers? Show your work.

9. Sickle cell anemia is a genetic disorder affecting hemoglobin, a protein in blood that delivers oxygen to cells. It shows codominant inheritance; people with genotype SS make only normal hemoglobin, people with genotype ss make only sickle hemoglobin, and people with genotype Ss make both normal hemoglobin and sickle hemoglobin.

Jerry Smith collapsed while running a race in track. His doctor told him that he had a sickle cell attack caused by the inability of his sickle hemoglobin to deliver oxygen to his cells. The doctor then ran several genetic tests on Jerry's family, the results are shown below:

Individual	Normal Hemoglobin	Sickle Cell Hemoglobin
Jerry	X	X
Jerry's older brother	X	
Jerry's older sister	X	X
Jerry's younger sister	X	
Jerry's father	X	
Jerry's paternal grandfather	X	
Jerry's paternal grandmother	X	X

- a. Use this information to create a pedigree of Jerry's family showing individuals who are affected by sickle cell anemia or who carry the allele for sickle cell anemia:

- b. What is the genotype of Jerry's mother? Show your work AND explain how you know.

Incomplete Dominance:

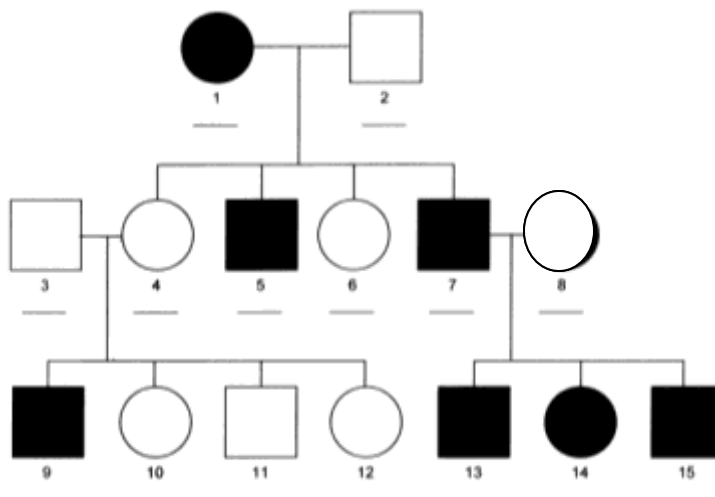
- In horses incomplete dominance can occur in coat color. Black phenotype is dominant to white phenotype, grey is intermediate. A farmer breeds a grey stallion to a black mare.
 - What genotypes are possible in their offspring?
 - What phenotypes are possible in their offspring?
 - What is the expected phenotypic ratio of the offspring?
 - What is the expected genotypic ratio of the offspring?
- In mice brown coat color is dominant to white coat color. Cream is an intermediate phenotype. A pet store owner decides to breed two cream colored mice.
 - What genotypes are possible in their offspring?
 - What phenotypes are possible in their offspring?

- c. What is the expected phenotypic ratio of the offspring?
 - d. What is the expected genotypic ratio of the offspring?
3. Hair texture in humans experiences incomplete dominance. Curly hair is dominant to straight hair, wavy hair is intermediate.
- a. Fill in the genotypes of the following family:

Individual	Phenotype (Hair Texture)	Genotype
Kathy's mother	Curly	
Kathy's father	Straight	
Kathy	Wavy	
Kathy's brother	Wavy	

- b. If Kathy marries a man with straight hair, and they have children:
 - i. What are the possible phenotypes of their offspring?
 - ii. What are the possible genotypes of their offspring?
 - iii. If one of Kathy's children has curly hair is it possible for the man to be the father? Explain your answer.
- c. If Kathy marries a man with wavy hair, and they have children:
 - i. What are the possible phenotypes of their offspring?
 - ii. What are the possible genotypes of their offspring?
 - iii. If one of Kathy's children has curly hair is it possible for the man to be the father? Explain your answer.

Pedigree:



- 1. What pattern of inheritance is demonstrated by the above pedigree?

2. Fill in the genotypes of the pedigree using the lines under each shape, **except for individuals 10 and 12.**
3. What are the possible genotypes of individuals 10 and 12?
4. Individual 10 marries an affected person and has an affected daughter. What is the genotype of individual 10? Explain your answer.

Karyotype and Nondisjunction:

1. Identify the SEX and DISORDER of each individual:

a. _____

