Name: _____ Date: _____ Per: _____

Assignment 2 – Alternate Inheritance Practice Problems

On a separate sheet of paper complete the following practice problems for different patterns of inheritance. Show all your work and read the information given. Use the symbols for genotypes that we discussed in class. ***NEATNESS COUNTS***

Incomplete dominance and co-dominance

Some pairs of alleles aren't fully dominant or recessive. In these special cases, the heterozygotes seem to have both inherited traits and a blend of both traits. This is because both alleles are expressed equally. "Incomplete dominance" is when the traits appear to blend, but is actually a combination of the 2 traits. Co-dominance is when both traits are independently and equally expressed. An example of incomplete dominance is the Four-o'clock flower, where white-flowered plants crossed with red-flowered plants can produce pink-flowered plants. An example of co-dominance is the color "roan" in horses and other animals, where a red-coated horse crossed with a white-coated horse can produce a foal with a roan coat (both white and red hairs).

The underlying genetics in both cases are the same. For incomplete dominance, instead of **A** or **a** to express dominant or recessive alleles, we usually use two small letters. For example, the allele for red flowers in Four-o'clocks is often expressed as **r,** and the allele for white flowers is **w**. In co-dominance, capital letter will be used. For example **R** for red, **W** for white for horse and cow color.

1. A purebreeding red-flowered Four-o'clock (rr) is crossed with a purebreeding white-flowered Four-o'clock (ww).
    a. What colors will be seen in the resulting offspring? What will their genotypes be?
    b. If two offspring from the above cross are crossed with each other, what colors will be seen in the resulting offspring? What will be the genotypes of the resulting offspring?
2. A pink flower is crossed with a white flower. Determine the genotypes and phenotypes of the offspring. If the flowers produce 1000 offspring, how many are expected to be red? White? Pink?
3. A black cat breeds with a tan cat and their kittens are all black-and-tan tabby (striped or mottled) cats. Set up a Punnett square that shows how this could happen. Is this incomplete dominance or co-dominance?
4. If two black-and-tan tabby cats, with genotypes that are like the kittens in problem 3, are bred, what are the odds of any one of their kittens being tabby? All black? All tan?
5. There are three possible genotypes and phenotypes for wing color in a species of moth: RR = red wings; RY = orange wings; YY = yellow wings. Cross a red moth with a yellow moth and use a Punnett square to answer the following questions:
    a. What is the pattern of inheritance in this example?
    b. What are the genotypes and phenotypes of the parents?
    c. What percent of the offspring will have red wings? Orange wings? Yellow wings?
    d. Moths lay lots of eggs! Suppose the parents produce 1,200 offspring. Predict how many of those offspring will have orange wings.
6. In a fictional species of mice, one gene determines fur color. Let B/b =black fur and W/w = white fur. Cross black mouse with a white mouse and use a Punnett square to answer the following questions.
    a. True or false: The offspring would have more than 2 possible phenotypes.
    b. Suppose the alleles in the examples show incomplete dominance. What would you expect the offspring to look like? Explain your answer.
    c. Suppose the alleles in the example show co-dominance. What would you expect the offspring to look like? Explain your answer.

X-linked traits (more practice)

1. Duchene Muscular Dystrophy (DMD) is a severe form of muscular dystrophy that is caused by a recessive allele on the X chromosome. Children who inherit this disorder usually die in childhood. Suppose that a woman who is a carrier for the disease marries a man who is normal.
    a. From which parent did the boy inherit the DMD allele?
    b. What are the odds that any of their next sons will have DMD?
    c. What are the odds that any one of their daughters be a carrier for DMD?
    d. Why is it virtually impossible for a girl to be born with DMD?