

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

## **Incomplete Dominance and Codominance**

1. In Japanese four o'clock plants red (R) color is incompletely dominant over white (r) flowers, and the heterozygous condition (Rr) results in plants with pink flowers. For each of the following construct a Punnett square and give phenotypic and genotype ratios of the offspring.
  - a) a red plant and a white plant
  - b) a red plant and a pink plant
  - c) a white plant and a pink plant
  - d) two pink plants

2. In some cats the gene for tail length shows incomplete dominance. Cats with long tails and cats with no tails are homozygous for their respective alleles. Cats with one long tail allele and one no tail allele have short tails. For each of the following construct a Punnett square and give phenotypic and genotype ratios of the offspring.

- a) a long tail cat and a cat with no tail
- b) a long tail cat and a short tail cat
- c) a short tail cat and a cat with no tail
- d) two short tail cats.

3. In some cattle the genes for brown hair (B) and for white hair (W) are co-dominant. Cattle with alleles for both brown and white hair, have both brown and white hairs. This condition gives the cattle a reddish color, and is referred to as Roan (BW). For each of the following construct a Punnett square and give phenotypic and genotype ratios of the offspring.

- a) a roan cow and a white bull
- b) a brown cow and a roan bull
- c) a white cow and a roan bull
- d) a roan cow and a roan bull

4. What should the genotypes & phenotypes for parent cattle be if a farmer wanted only cattle with red fur? Make a Punnett square!
  
  
  
  
  
  
  
  
  
  
5. A cross between a black cat & a tan cat produces a tabby pattern (black & tan fur together).
  - a. What pattern of inheritance does this illustrate?
  
  
  
  
  
  
  
  
  
  
  - b. What percent of kittens would have tan fur if a tabby cat is crossed with a black cat? Make a Punnett square!
  
  
  
  
  
  
  
  
  
  
  - c. What percentage of offspring will have black fur if two tabby cats are crossed? Make a Punnett square!

6. In northeast Kansas there is a creature known as a wildcat. It comes in three colors, blue, red, and purple. This trait is controlled by incomplete dominance. A homozygous (BB) individual is blue, a homozygous (bb) individual is red, and a heterozygous (Bb) individual is purple.
- a. What would be the genotypes and phenotypes of the offspring if a blue wildcat were crossed with a red one? Make a Punnett square!
- b. What are the genotypic and phenotypic ratios of the F<sub>2</sub> generation? Make a Punnett square!
7. The lubber grasshopper is a very large grasshopper, and is black with red and yellow stripes. Assume that red stripes are expressed from the homozygous RR genotype, yellow stripes from the homozygous rr genotype, and both from the heterozygous genotype.
- a. What will be the phenotypic ratio of the F<sub>1</sub> generation resulting from a cross of two grasshoppers, both with red and yellow stripes? Make a Punnett square!

- b. What percentage of offspring will have red stripes from a cross of a grasshopper with both red and yellow stripes and a grasshopper with red stripes? Make a Punnett square!
- c. What genotypes would be produced by crossing a grasshopper with both color stripes and one with yellow stripes? Make a Punnett square!
- d. What phenotypes would be produced by crossing a grasshopper with both color stripes and one with yellow stripes?

8. Suppose you have two rose plants, both with pink flowers. You cross the two plants and are surprised to find that, while most of the offspring are pink, some are red and some are white.
- a. What type of inheritance does this represent?
  - b. You decide that you like the red flowers and would like to make more. What cross would you perform to produce the most red flowered plants? Show the Punnett square!
  - c. Your mother decides she would like some of the pink flowered roses. Which cross would give you the most pink flowered plants? Show the Punnett square!

9. A naturalist visiting an island in the middle of a large lake observes a species of small bird with three distinct types of beaks. Those with short, crushing beaks (BB) consume hard shelled nuts, those with long, delicate beaks (bb) pick the seeds from pine cones, and those with intermediate beaks (Bb), consume both types of seeds though they are not as good at either. Assume that this difference in beak morphology is the result of incomplete dominance.
- a. Besides a cross between two birds with short, crushing beaks, which pair of mates will have the best adapted offspring in a year if most of the food available is in the form of hard shelled nuts? Show the Punnett square!
- b. What would be the phenotypic ratio of the  $F_1$  generation resulting from a cross of Bb x bb? Make a Punnett square!
- c. What percentage of offspring of an intermediate x short beak cross will have long beaks?



10. Raccoons have rings around their tails and a habit of washing their food in water before eating it. Suppose that both of these traits are controlled *via* incomplete dominance so that wide bands on the tail are BB, medium sized bands are Bb, and narrow bands are bb and that washing all their food is WW, washing some of their food is Ww, and washing no food is ww.
- a. What are the genotypes of the offspring of a cross between two raccoons that both have medium sized tail bands and wash some of their food? Make a Punnett square!
- b. What percentage of the offspring will have wide tail bands and won't wash any of their food?

- c. What are the genotypes of the offspring of a cross between a raccoon with medium sized tail bands that washes all of their food and a raccoon with narrow tail bands that washes some of their food? Make a Punnett square!

- d. List the percentage of each phenotype present in part C.