

Practice Genetics Problems III

Incomplete Dominance:

1. In Japanese four-o'clocks red (R) is incomplete dominance to white (r), predict the phenotype ratio of a cross between:

a. a red plant (RR) and white plant (rr)

Phenotypic ratio _____

b. a white plant (rr) and a pink plant (Rr)

Phenotypic ratio _____

2. In some cats the gene for tail length is incompletely dominant. Cats with long tails (LL) and no tails (ll) are homozygous for their respective alleles. Cats that are a hybrid have short tails (Ll). Predict the phenotype ratio of a cross between:

a. a long tail cat (LL) and a cat with no tail (ll)

Phenotypic ratio _____

b. two short tail cats ($Ll \times Ll$)

Phenotypic ratio _____

Codominance:

3. In shorthorn cattle, neither red hair (RR) nor white hair (WW) is dominant. The hybrid is roan, or a mixture of red and white hairs (RW).
- a. Cross a red haired bull (RR) with a white haired cow (WW). What are the genotypic and phenotypic ratios of the F_1 generation?

F_1 Phenotypic ratio _____

F_1 Genotypic ratio _____

- b. Cross the offspring from the F_1 generation. What are the genotypic and phenotypic ratios of the F_2 generation?

F_1 Phenotypic ratio _____

F_1 Genotypic ratio _____

4. In chickens, white feathers (WW) and black feathers (BB) blend in the heterozygote (or hybrid) to yield an organism with speckled feathers, erminette (BW).

- a. Cross a black-feathered (BB) chicken with a speckled (BW) rooster.

- b. What percentage of the offspring will have speckled feathers? _____

- c. What percentage of the offspring will have white feathers? _____

Challenge (+2 points total):

5. 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 in a single locus gene. Which of the mated pairs below will have the best adapted offspring in a year in which most of the food available is in the form of hard shelled nuts? Show the cross with a Punnett square and **explain your reasoning**.

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|-------------------------|--------------------------------|------------------------|
| a. short x short | c. short x long | e. intermediate x long |
| b. short x intermediate | d. intermediate x intermediate | f. long x long |

