Non-Mendelian Genetics - Practice

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**1.** In plants known as “four o’clocks”, the allele for the dominant red-flower color is **incompletely dominant** over the allele for white-flowers. A gardener allows several heterozygous pink-flowered four o’clocks to self pollinate and collects 200 seeds.

Draw a Punnett square for the cross. Identify the flower color phenotypes and theoretical percentage.

Phenotype Percentages

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* \_\_\_\_\_\_\_\_\_\_ \* \_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_ \* \_\_\_\_\_

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**2.** Skin color in humans is determined by a polygenic inheritance system, possibly involving as many as 9

genes. For simplicity let’s consider the influence of 2 genes: A and B, where the dominant allele darkens skin color. Suppose a woman who is AABb mates with a man who is Aabb.

1. List all of the possible genotypes of the gametes that could be produced by each the parents. Identify the percent ratios.

Genotype Ratio:

Phenotype Ratio:

**3.** In rabbits, white coat color (CW) and black coat color (CB) are **codominant**, and both of these alleles are dominant over albino (c); heterozygotes (CWCB) are spotted.

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Draw a Punnett Square that shows the genotypes and phenotypes of the offspring from a heterozygous black-coated rabbit and a homozygous white-coated rabbit?

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**4.** Mrs. Eryth is carrier of the sex-linked hemophilia allele (XAXa) and Mr. Eryth is normal (XAY)

1. Draw a Punnet square that shows the theoretical genotypes and phenotypes among their children.
2. They actually have 4 male and 4 female children; how many of each sex would be expected to be hemophiliacs, carriers, and normal?

hemophiliac carrier normal

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**5.** If several pea plants with the genotype TTYy are crossed with pea plants with the genotype

Ttyy, what percentage of the offspring will be expected to have the TTYy allele combination?

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**6.** Basic body color for horses is influenced by several genes, one of which has several different alleles. Two of these alleles—the chestnut (dark brown) allele and a diluting (pale cream) allele (often incorrectly called ‘albino’)—display incomplete dominance. A horse heterozygous for these two alleles is a palomino (golden body color with flaxen mane and tail).

1. Is it possible to produce a herd of pure-breeding palomino horses? Why or why not?
2. Use the Punnett’s square for mating a palomino to a palomino to predict the phenotypic ratio among their offspring.

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**7.** In humans, the alleles for blood type are designated IA (A-type blood), IB (B-type blood) and i (O-type blood). What are the expected frequencies of phenotypes in the following matings? Draw a Punnett square showing the results for a).

%A %B %O %AB

a) heter A x heter B : \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

b) IAIB x IAi : \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

c) IAIA x IBIB : \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

d) AB x O : \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_

**8.** Blood type analysis is used frequently as evidence in paternity suits. Consider the following hypothetical cases presented in the table. The blood type of the mother and child are given; indicate which blood type(s) MUST be the father’s for each situation.

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| Mother | Child | Father’s  blood type(s)  (A, B, AB or O) |
| A | O |  |
| B | AB |  |
| O | O |  |
| B | B |  |
| A | B |  |