

Homework: Genetics Problems

Please work problems and answer questions on a **separate** sheet of paper – **Write them into your Blue Book**. I will NOT accept late work on this assignment if I have gone over answers already. To receive full credit, **all of your work must be shown**. Please don't wait until the last minute to work these. Get started early so that you may come and ask for help if needed. **I wont grade EC until you attempt ALL credit questions.**

1. In southwest Rhode Island, there is a creature know as a tomcat. It comes in three colors, blue, red, and purple. This trait expresses incomplete dominance. A homozygous dominant individual is blue, a homozygous recessive individual is red, and a heterozygous individual is purple.
 - a. What would be the **genotypes** and **phenotypes** of the offspring if a blue tomcat were crossed with a red one? (2pts)
 - b. What are the **genotypic ratios** of the **F2** generation? (2pts)

* Genotypic ratio is recorded as follows:
(homozygous dominant : heterozygous : homozygous recessive)
 - c. If the **F2** generation consisted of only 8 individuals, how many tomcats would be **purple**? (1pt)
 - d. Why is this considered **incomplete dominance** and not **co-dominance**? (2pts)
2. A normal female whose father was colorblind marries a normal male whose father was also colorblind. (**Colorblindness is a sex-linked recessive gene.**)
 - a. What is the probability that their son will be colorblind? (2pts)
 - b. What is the probability that their daughter will be colorblind? (2Pts)
3. A rancher owns a bull (male) with many desirable characteristics. Unfortunately, the bull also has a **sex-linked trait** in which the recessive form leads to no pigment formation in the iris of the eye. This makes the bull very sensitive to sunlight and could lead to blindness. The rancher wishes to breed him to a cow (female) that will minimize the chances of any offspring showing this trait. Cow 1 is homozygous dominant for the trait, and cow 2 is heterozygous.
 - a. Which of these two cows should the rancher choose as a mate to her bull if she wishes to minimize the occurrence of the non-pigmented eye in his offspring? (1 pt)
 - b. What percentage of the male offspring from the cross you selected above will have non-pigmented eyes? (1pt)
 - c. Crossing the bull with this cow will NOT eliminate the trait from the herd. Why? (2 pts)

[Extra credit, Remember I wont grade EC until you attempt all normal HW Problems.]

Extra Credit (11 points total)

1. A woman with dimples marries a man who does not have dimples. The woman's father does not have dimples, but her mother does. What percent of the newlywed's children can be expected to have dimples? (The presence of dimples is dominant) (2 pts)
2. Two normally pigmented adults, each having had an albino child from a previous marriage, meet at a support group. They have much in common and consider marriage, hopeful of having additional children with normally-pigmented skin to carry on the family lines. What proportion of their children can be expected to be albino? What proportion of their children should be normally-pigmented CARRIERS of albinism? (Normal pigmentation is dominant) (2 pts).
3. Based on what you know about genetics (how parents pass characteristics on to their children), explain how the fish who is introducing her parents could have inherited her skin pattern from the two big fish behind her. (3 pts)
4. **Challenge Question** In humans, hair color is controlled by two interacting genes. The same pigment, melanin, is present in both brown-haired and blond-haired people, but brown hair has much more of it. Brown hair is dominant to blonde. Whether any melanin can be synthesized depends on another gene. The dominant form allows melanin synthesis; the recessive form prevents melanin synthesis. Homozygous recessives for the production of melanin are albino. What will be the expected proportions of phenotypes (Phenotypic Ratio: ____ : ____ : ____ : ____) in the children of the following parents?
 - a. BBMM x BbMm (1 pt)
 - b. BbMm x BbMm (2 pts)
 - c. BbMm x bbmm (1 pt)

