Name:
Period:
Date:

A.P. Biology Genetics Problem Set III

Sex Linkage and other stuff Mendel never dreamed of…

ALL WORK MUST BE SHOWN TO RECEIVE FULL CREDIT. ATTACH YOUR SCRATCH PAPER, NUMBER THE PROBLEMS, AND CIRCLE YOUR ANSWERS.

1. A couple really wants to have at least one child of each sex. Their first three children are girls, so they feel certain that their next child will definitely be a boy. But…what are the chances of this offspring (or of any offspring) being a boy?

2. Hemophilia or "bleeder's disease" is a recessive, sex-linked condition. It is possible for women to be hemophiliacs, but it is more common among men.
   a. For a woman to be hemophiliac, what must her dad's phenotype and genotype have been?
   b. There are two possibilities for her mother's genotype and phenotype – give both.

3. At least one type of colorblindness is a sex-linked, recessive condition. A colorblind man marries a woman with a long family history of normal color vision. What will the vision of their children be like? (Assume they have a big family so all "possible" types of kids show up.)

4. A husband and his wife both have normal vision, but their baby girl is colorblind. Because he knows that colorblindness is a sex-linked, recessive trait, the husband is FURIOUS and immediately sues his wife for divorce on grounds of infidelity. YOU, as a world famous GENETICS COUNSELOR, have been served a subpoena to testify in court as an expert witness! Could the baby have been theirs, or must she have been cheating on him?

5. A colorblind man wonders if he "got" his colorblindness allele from his mother or his father. Could knowledge of genetics provide an answer to his question? Remember, colorblindness is a sex-linked, recessive condition.

6. One type of baldness is a sex-linked trait. The gene for baldness (B = has hair, b = bald) is NOT on a sex chromosome, but the person's sex does influence the expression of this trait. All BB individuals have hair, and all bb individuals go bald, but (due to hormonal differences) Bb woman have hair while Bb men go bald. A bald man and a seemingly normal woman have a son who keeps his

hair as he ages, and a daughter who loses hers. What are the genotypes of the man, his wife, their son and their daughter?

7. In cats, the alleles B leads to black fur and b leads to yellow fur. But Bb is tortoise shell color (in other words, B and b are incompletely dominant). The gene for color is on the X chromosome. A tortoise shell female is crossed with a black male.
   a. What kind of kittens would be expected?
   b. Would you expect to find any tortoise shell males?

8. In chickens, there is a sex-linked feather pattern called "barred." In birds, females are XY and males are XX. Bared is dominant to nonbarred. A barred hen is crossed to a nonbarred rooster.
   a. What will be the genotypes and phenotypes of the F1?
   b. If the F1 are allowed to interbreed, what will be the genotypes and phenotypes of the F2?

9. What kinds of offspring, and in what proportions, will be produced when a nonbarred hen is crossed to a heterozygous barred rooster?

10. In *Drosophilia,* yellow body sex-linked and recessive to brown body. If a yellow male is crossed to a true breeding brown bodied female, what color will the bodies of their progeny be?

11. Freckles are dominant to plain skin and the freckle gene is on an autosome; hemophilia (a disease in which blood doesn't clot properly) is a sex-linked, recessive trait. A woman with plain skin and normal blood clotting (long family history of plain skin, but her dad was a hemophiliac) marries a man with freckles and hemophilia. They have a hemophiliac son with plain skin.
   a. What is the son's genotype?
   b. What were the parents' genotypes?