

Name:  
Period:  
Date:

# **A.P. Biology Genetics Problem Set I**

## **Mendelian Genetics: Monohybrid and Dihybrid Crosses**

- ◆ After reading a problem, translate words into symbols. (“Let B = Brown eye allele”)
- ◆ Use plenty of paper and write, write, WRITE! Only then can ideas take form.
- ◆ Review the meanings of genetics vocabulary the moment you come across a term that you don’t know the precise meaning of.
- ◆ Never ASSUME! Work each problem out.

ALL WORK MUST BE SHOWN FOR CREDIT, Please attach your scratch paper, number the problems and circle your answers.

### **Monohybrid**

1. Mendel knew that some pea plants made green pea pods, and some yellow pea pods. He crossed a true-breeding green pod plant with a true-breeding yellow pod plant, and all the “offspring” plants had green pods. He then let the offspring self-cross, and tabulated the results: 428 plants with green pods, 152 with yellow pods. What are the genotypes of all the plants mentioned in this problem?
2. Mendel crossed red flowered pea plants with white flowered pea plants. (Red flowers are dominant to white.) Both stocks of plants were true breeding.
  - a. What color flowers will the offspring plants have?
  - b. If Mendel crosses one of these offspring (hybrid) plants with its white flowered parent, what color flowers will *their* offspring have?
3. About seven out of every ten humans has the ability to taste a harmless chemical called PTC (phenylthiocarbamide) as a salty, sweet, sour, or bitter substance. To the others, PTC is tasteless. A taster and a nontaster (both with long family histories of tasting or nontasting, respectively) have a child who can taste PTC. Which form of the trait is dominant – tasting or nontasting?
4. In fruit flies, long wings are dominant to short wings. A long winged fly crossed to a short winged fly produces 27 long winged offspring and 25 short winged offspring. What are the genotypes of the parents?
5. Nearsightedness is dominant to normal vision in people. A man with normal vision marries a nearsighted woman with a long family history of nearsightedness. What fraction of the time would you expect them to have a nearsighted child?

6. Assume that, in people, curly hair is dominant to straight hair. A man with curly hair marries a straight haired woman. They have a straight haired baby. What is the man's genotype? What is the baby's genotype?
7. A spotted bull and a solid colored cow have four calves. Two of these calves are solid colored and two are spotted. If P = allele for spotted and p = allele for solid colored, and if spotted is known to be dominant to solid colored, give the genotype of the bull.
8. Although they are perfectly healthy, Mary and John are told by their geneticist that they each carry a recessive allele for a debilitating disease. What are the "odds" for having a healthy baby?
9. Suppose that the ability to be a gourmet cook is heritable. Gourmet cooking ability (G) is dominant to lousy cooking ability (g). A woman who is a gourmet cook (but whose father was a lousy cook!) marries a man who is a gourmet cook (but whose mother was such a lousy cook, she burned boiling water!). What percentage of their children will be gourmet cooks?

## **Dihybrid**

10. What kinds of gametes can a person with the genotype HhEe make?
11. Write out all the possible gametes for an individual which is ffGgHhIijj. (If we did a genetics problem with this person it would be a **5** factor cross!)
12. In watermelons, the allele for solid green color (G) is dominant to the allele for striped green color (g); the allele for short watermelons (L) is dominant to the allele for long watermelons (l). In a cross between two GgLl watermelon plants, what fraction of the offspring would be expected to have striped, short fruit?
13. In horses, black coat B and trotting gait T are dominant alleles, while the corresponding alleles (white coat, b, and pacing gait, t) are inherited as recessives.
  - a. When a black trotter (BBTT) is mated with a white pacer (bbtt), what will the phenotypes and genotypes of the first generation offspring be?
  - b. If a breeder decided to mate two of the first generation offspring, what are the types and expected proportions of the offspring horses?