

BIO 181 – Spring 2009 - GENETICS PROBLEM SET

NAME \_\_\_\_\_

Score \_\_\_\_\_/40

**DIRECTIONS:** All of the genetics problems below should be worked out NEATLY on this paper. You must clearly show the work you used to justify your stated answer to the question. Answers submitted without the corresponding work shown will not receive credit. Each problem is worth 4 points.

**MONOHYBRID CROSSES**

1. The ability in humans to roll one's tongue is determined by the dominant gene R. From a couple both able to roll their tongues, a child is born. The child is unable to roll her tongue. What are the genotypes of the parents?


2. As seen in lab, the ability to taste the bitter chemical phenylthiocarbamide (PTC) is due to the dominant gene T.
- a. If both parents are homozygous tasters, is it possible for them to have a non-taster child? Show the cross.


- b. If one parent is a homozygous taster and the other is heterozygous, is it possible for them to have a non-taster child? Show the cross.


- c. If both parents are heterozygous, is it possible for them to have a non-taster child? Show the cross.


3. In some breeds of dogs, a dominant gene B controls the trait of barking. If a breeder wants to produce a true-breeding strain of barkers, but knows that the allele for silent dogs (b) is present amongst the barking dogs in his kennels, how could he determine which of his barking dogs to breed? Show your work. Perform a testcross using a homozygous recessive silent dog (bb).



**DIHYBRID CROSSES (With Genes located on different chromosomes)**

4. One gene has alleles D and d. Another gene has alleles B and b. For each genotype, list the possible gametes that can be produced.
- a. DD BB
  - b. Dd BB
  - c. Dd bb
  - d. Dd Bb

5. Tom and Lisa are expecting their first child. Tom is able to roll his tongue, and he is tall. His genotype is  $RrTt$ , where R is the dominant allele that enables one to roll their tongue, and T is the dominant allele for tallness. Lisa is also tall and able to roll her tongue and her genotype is  $RrTt$ . What genotypes can be expected in their child?


What phenotypes can be expected?

6. In humans, a dominant allele H codes for dark hair. The homozygous recessive genotype produces individuals with blond hair. The dominant allele T produces tall individuals; the recessive genotype results in short individuals.

What is the percentage of short kids with dark hair that can be expected from a couple who are heterozygous for both traits? Show the cross.


**CODOMINANCE & MULTIPLE ALLELE SYSTEMS**

7. A man with type A blood & a woman with type B blood, produce a child with type O blood.

What are the genotypes of the:

Man:

Woman:

Child:


**SEX-LINKED TRAITS**

8. Create a Punnett square to determine the offspring that would result from a cross between a woman with normal vision, who carries the allele for color-blindness, and a man who has normal vision. Note: color-blindness is an X-linked recessive trait.

What are the genotypes of the parent?

List all possible genotypes of the offspring.

- male, normal
- male, color-blind
- female, normal vision
- female, carrier

What percentage of their sons would be color-blind?

What percentage of their daughters would be carriers?


9. In humans, the genes for colorblindness (b) and hemophilia (h) are both recessive genes located on the X chromosome with no corresponding gene on the Y chromosome. Create a Punnett square to determine the offspring that would result from a cross between a man with normal vision and hemophilia ( $X^{Bh}Y$ ), and a woman who is colorblind and does not have hemophilia, but carries the allele for hemophilia  $X^{bH}X^{bh}$ .

What percentage of the sons will be colorblind?

What percentage of the daughters will be colorblind?

What percentage of the total offspring (sons & daughters) will have hemophilia?

What percentage of the total offspring (sons & daughters) will be colorblind and have hemophilia?


## PEDIGREES

10. The following is a pedigree of an autosomal recessive disorder. Use A and a to represent the alleles

### Key



Male



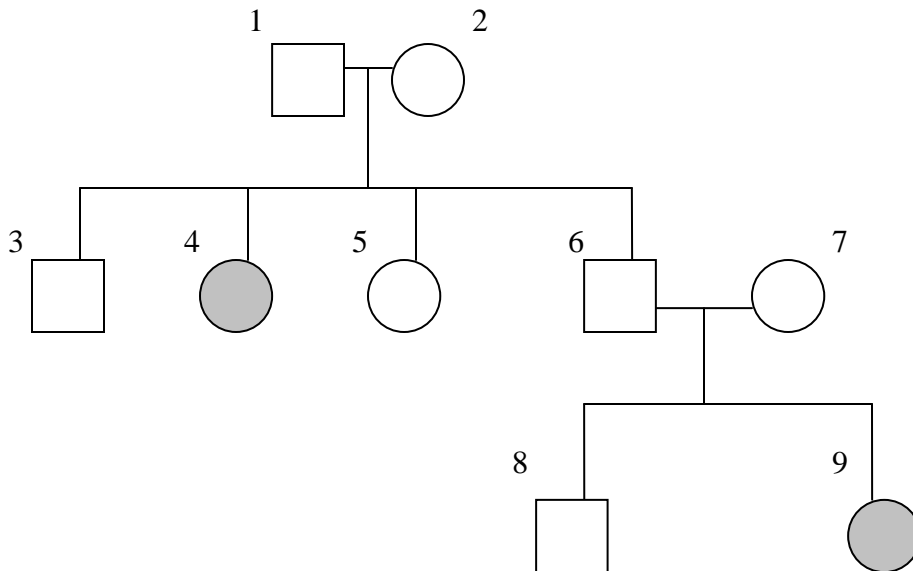
Female



Affected male



Affected female



What is the sex of individuals 8 and 9? (1 point)

What is the genotype of individual 2? (1 point)

What is the genotype of individual 7? (1 point)

What is the genotype of individual 9? (1 point)

**FOR HELP WITH THESE PROBLEMS & MORE PRACTICE WITH GENETICS:**

<http://biology.clc.uc.edu/courses/bio105/geneprob.htm>

<http://arapaho.nsuok.edu/~biology/Genetics/GenTut1/GenTut1.htm>

[http://www.ksu.edu/biology/pob/genetics/mod5\\_class3\\_problems.htm](http://www.ksu.edu/biology/pob/genetics/mod5_class3_problems.htm)