

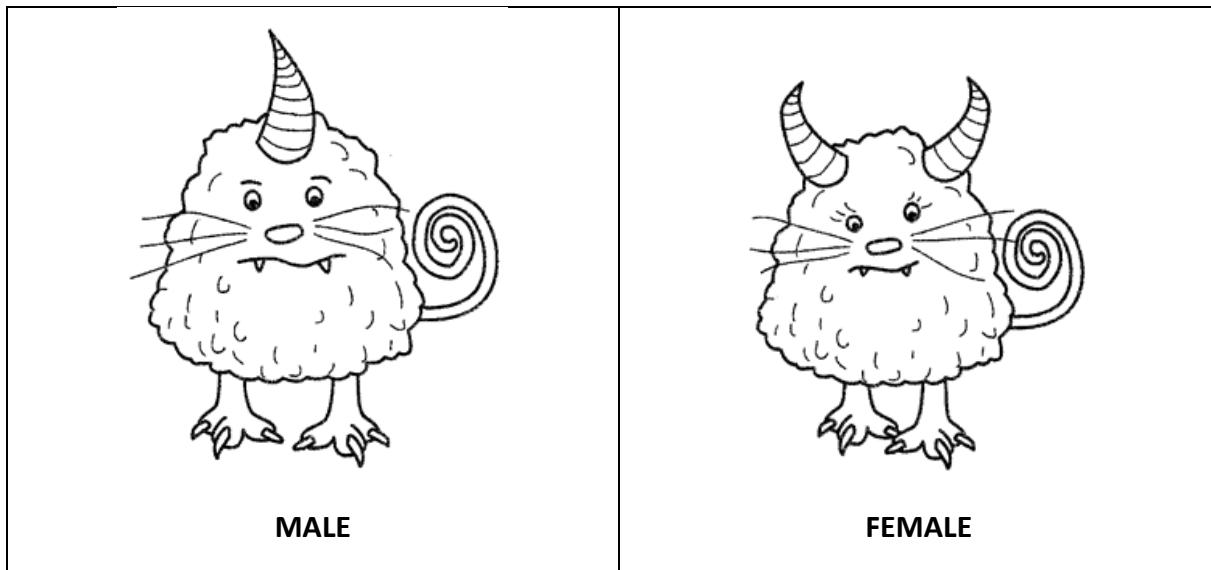
NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

## BIO 100: Lab 4 – Genetics

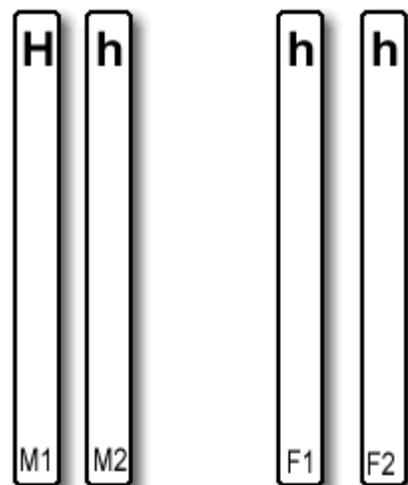
**Complete the following activities. Save or scan your results and submit them to Lab Assignment as an attachment.**

### Activity 1 – Hornimonster Simulation

The image shows a male and female *Hornimonster*, each with different genetic traits. The allele for ONE horn is dominant (H); the allele for TWO horns is recessive (h). If the individual has at least one dominant allele (H), the one horn trait is expressed, therefore, the male is either homozygous dominant (HH) or heterozygous (Hh). Since the female above has two horns, she is homozygous recessive (hh).



1. Which hornimonster shown above has the dominant allele? \_\_\_\_\_
2. Let's now simulate a cross of the two hornimonsters shown above. Obtain four Popsicle sticks to represent their chromosomes. Mark the strips as shown to the right. The male will be heterozygous (Hh). Arrange them so that the male's set (Hh) is on one side and the female's set (hh) is on the other side (as shown). The M1, M2, F1, F2 labels will help you if you get them confused. (Strips of paper may be used if Popsicle sticks are not available.)
3. Flip the sticks over so that you can't see their labels. Choose one chromosome from the mother pile and another from the father pile. This represents the chromosomes each parent is "donating" to the next generation.



4. Repeat the exchange 8 times to produce offspring. Record your data in the table below.

	Genotype (letters – Hh or hh)	Phenotype: One Horn	Phenotype: Two Horns
OFFSPRING 1			
OFFSPRING 2			
OFFSPRING 3			
OFFSPRING 4			
OFFSPRING			
OFFSPRING			
OFFSPRING			
<b>Total of each phenotype:</b>			

5. Determine the percentage of offspring from your data table by dividing the total of each phenotype by the number of offspring (8).

Percentage with two horns: \_\_\_\_\_ Percentage with one horn: \_\_\_\_\_

6. The probability of genotypes in the offspring may be determined with a Punnett square. Below is the genetic cross of Hh x hh:

	H	h
h	Hh	hh
h	Hh	hh

What is the probability of offspring with one horn? \_\_\_\_\_ out of 4 or \_\_\_\_\_ %

What is the probability of offspring with two horns? \_\_\_\_\_ out of 4 or \_\_\_\_\_ %

7. Compare this number to your simulation (where you flipped the sticks). Does the Punnett square prediction match the results of your crosses?

- They are exactly the same
- They are close to the same
- They are very different
- I have no idea (not a good response!)

8. What if the female had the genotype Hh? Show the cross between the new parents: Hh x Hh. (IF you are typing in your response, please be careful of auto-capitalization.)


What percentage has one horn? \_\_\_\_\_ What percentage has two horns? \_\_\_\_\_

9. Show the cross if the parents are: HH x Hh


What percentage has one horn? \_\_\_\_\_ What percentage has two horns? \_\_\_\_\_

## Activity 2: Practice Genetics Problems

Complete the following problems. Most students find it helpful to draw a Punnett square to solve the problems. Show all of your work. Circle the final answer.

- 1. One Trait Problem:** Black fur color in bears is controlled by a dominant allele,  $B$ , and brown by its recessive allele,  $b$ . **Give the genotypes of the parents and offspring of a cross of a black male with a brown female that produces one-half black and one-half brown offspring.**
- 2. Incomplete Dominance:** In carnations red color is dominant and white is recessive. Dominance is incomplete, with heterozygous individuals being pink. Cross a pure red plant with a pure white plant. **What is the appearance of the  $F_1$  generation?** Allow the  $F_1$  generation to interbreed freely. **What will be the appearance of the  $F_2$  generation?**
- 3. Co-dominance:** A person heterozygous for type A blood marries someone who is heterozygous for type B blood. **List the types of offspring they could have and the probability for each blood type in the offspring.**
- 4. Sex-linked:** In humans color-blindness is recessive and sex-linked. A woman heterozygous for color blindness marries a man with normal color vision. **What is the probability that their first child will be color blind?**

### Activity 3: Glossary of Common Genetic Terms for Crossword Puzzle

Review the following common terms used in genetics. Refer to these terms to complete the practice genetics puzzle.

- **Allele** – alternate forms of the same gene. Example: A, a or B, b
- **Dihybrid cross** – a genetic cross involving a study of the inheritance of two different traits or characters. Example: hair color and eye color
- **Dominant** – describing a trait that appears whenever a gene for that trait is present.
- **Gamete** – sperm or egg cell.
- **Gene** – a unit of heredity located on a chromosome.
- **Genome** – the complete set of genes or genetic material present in a cell or organism.
- **Genotype** – the genetic makeup of a trait.
- **Heterozygous** – when members of a gene pair are unlike. Example: Aa, Hh, etc.
- **Homologous chromosomes** – two chromosomes which carry genes controlling the same traits. One member comes from each parent.
- **Homozygous** – when members of a gene pair are identical. Example: AA, aa, BB or bb
- **Monohybrid cross** – a genetic cross involving the study of inheritance for one trait.
- **Phenotype** – the visible characteristics of an organism; traits which can be observed such as color of hair or eyes, texture of skin, etc.
- **Punnet Square** – a diagram used to predict the results of genetic crosses.
- **Recessive** – describing a trait that is hidden by a dominant trait; can only be expressed when the dominant gene (allele) is absent.
- **Segregation** – the separation of genes into different gametes when chromosomes separate during meiosis.
- **Trait** – a physical or chemical expression of inheritance.

## ACTIVITY 4: Practice Crossword Puzzle

### ACROSS

4. Genetic makeup of a trait.
7. The separation of genes into different gametes when chromosomes separate during meiosis.
8. A unit of heredity located on a chromosome.
9. Two chromosomes which carry genes controlling the same traits.
10. When members of a gene pair are identical for a trait.
11. Members of gene pair with alternate alleles.

### DOWN

1. The visible or observable characteristics of a trait.
2. Describing a trait that appears whenever a gene for that trait is present.
3. Egg or sperm cell.
5. A diagram used in the study of inheritance to predict the results of genetic crosses.
6. Alternate forms of a gene.

