Name _____ **Date** _____

Partner's Name _____

Monohybrid Crosses With Pony Beads

Introduction

The factors that determine the inherited characteristics of an individual are called **genes**. Genes are found on the **chromosomes**, which are located in a cell's nucleus. If chromosomes occur in pairs, then the genes located on those chromosomes also occur in pairs. A pair of genes found at the same location on homologous chromosomes will influence the same trait. However, they may influence that trait differently, and produce alternate forms of the trait. For example, there are two different versions of each of the three genes that represent eye color in humans. Some of the different versions are the blue version, brown version, green version, hazel version, etc. These different versions of the same gene are called **alleles**.

In this lab we will study the transmission of alleles in **monohybrid crosses**. A monohybrid cross is a cross that deals with only one trait at a time. The different combinations of alleles produced during a monohybrid cross are ultimately a matter of chance, since the way chromosomes line up during metaphase I of meiosis can vary (remember the law of independent assortment!). The independent assortment of chromosomes produces a variety of different gametes (eggs or sperm), which when combined at fertilization result in a particular genotype. We will use beads to represent the gametes of two individuals. The color of the bead will tell which allele is present for a particular trait; a red bead will signify a dominant allele and a white bead will signify a recessive allele. You will work with a partner to produce various combinations of those alleles during two monohybrid crosses.

Pre-Lab

Match the following terms with the correct descriptions.

_____	the observable expression of a genotype	a. alleles
_____	the particular genes that represent the traits of an individual	b. diploid
_____	the different versions of a gene	c. dominant
_____	having two chromosomes of each type; a pair of chromosomes	d. genotype
_____	having identical alleles for a trait	e. haploid
_____	an allele that masks another allele for the same trait	f. heterozygous
_____	having different alleles for a trait	g. homologous
_____	an allele that is only expressed in the homozygous condition	h. homozygous
_____	having only one chromosome of each type (like the gametes)	i. phenotype
_____	a pair of chromosomes that have genes for the same traits	j. recessive

Purpose

To demonstrate the outcomes of several monohybrid crosses, calculate the ratios of the genotypes observed, and compare the observed genotypic ratios with the expected ratios

Materials

containers beads of two different colors

Safety Precautions

There are no special safety precautions to be observed during this lab, but be sure to follow all directions given by your instructor.

Case I – Heterozygous Parents (Rr x Rr)

Work the cross for case I on the following Punnett square.

What is the expected genotypic ratio for this cross? _____

Find a partner and obtain a box of beads.

Your box should contain 50 red beads (R) and 50 white beads (r). Set up a place on your table to place the combinations of beads, according to genotype, as you pull them out of the boxes. On the instructor's signal, begin pulling ONE bead out of your box, and your partner will do the same. Place the combination in the designated area on your table, and continue to pull out the beads until the instructor tells you to stop (you will do this for approximately one minute).

Record your data, as well as the class data, in the table below.

Group	# of RR	# of Rr	# of rr
Your Data			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
Totals			

What is your observed genotypic ratio? _____

Determine the class genotypic ratio using the following formulas: _____

Find the sum of all three total columns in the data table (RR total + Rr total + rr total). Divide this number by 4 and write it down here: _____.

Now divide each column total by the number you wrote in the blank to get the correct ratio. For example, divide the RR total by the number in the blank, then the Rr total, and so on. Express all values in the ratio as whole numbers.

What is the observed genotypic ratio for the class data? _____

Case II – Heterozygous Parent x Homozygous Parent (Rr x rr)

Work the cross for case I on the following Punnett square.

What is the expected genotypic ratio for this cross? _____

Modify your box, if necessary, to represent the cross for Case II. The box for the heterozygous parent should contain 50 red beads (R) and 50 white beads (r). The box for the homozygous parent should contain 100 white beads. Set up a place on your table to place the combinations of beads, according to genotype, as you pull them out of the boxes. On the instructor's signal, begin pulling ONE bead out of your box, and your partner will do the same. Place the combination in the designated area on your table, and continue to pull out the beads until the instructor tells you to stop (you will do this for approximately one minute).

Record your data, as well as the class data, in the table below.

Group	# of Rr	# of rr
Your Data		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
Totals		

What is your observed genotypic ratio? _____

Determine the class genotypic ratio using the following formulas: _____

Find the sum of all three total columns in the data table (Rr total + rr total). Divide this number by 3 and write it down here: _____.

Now divide each column total by the number you wrote in the blank to get the correct ratio. For example, divide the Rr total by the number in the blank, then the rr total, and so on. Express all values in the ratio as whole numbers.

What is the observed genotypic ratio for the class data? _____

Analysis

How does the expected ratio for Case I compare to your group's observed ratio? How does it compare to the class ratio?

_____

_____

_____

How does the expected ratio for Case II compare to your group's observed ratio? How does it compare to the class ratio?

_____

_____

_____

What do your answers to questions 1 and 2 tell you about the importance of sample size in an experiment?

_____

_____

Write a paragraph describing your conclusions after completing this experiment.

_____

_____

_____

_____

_____

_____