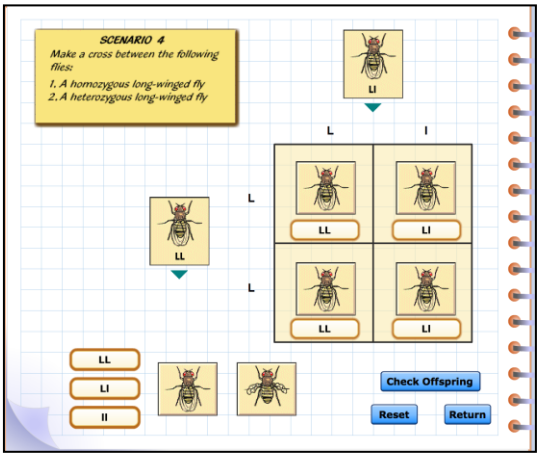
Name _____ Date _____ Period _____

Lab: Punnett Squares

BIOLOGY: UNIT 8(Genetics)



BACKGROUND: The Punnett square is a diagram that is used to predict an outcome of a particular cross or breeding experiment. It is named after Reginald C. Punnett, who devised the approach. The diagram is used by biologists to determine the probability of an offspring having a particular genotype. The Punnett square is a tabular summary of possible combinations of maternal alleles with paternal alleles. These tables can be used to examine the genotypic outcome probabilities of the offspring of a single trait (allele), or when crossing multiple traits from the parents. The Punnett Square is a visual representation of Mendelian inheritance. It is important to understand the terms "heterozygous", "homozygous", "dominant allele" and "recessive allele" when using the Punnet square method. (https://en.wikipedia.org/wiki/Punnett_square)

PROCEEDURE:

1. Open the Virtual Lab: Punnett Squares
http://www.mhhe.com/biosci/genbio/virtual_labs_2K8/labs/BL_05/index.html

2. The virtual lab simulation will be on the right side of the screen, and the "**Question**" column will be on the left side of the screen.

3. Click on the **TV/VCR** and watch the video.

3. Read the background information in the Question Column under "**How can Punnett Squares help predict the traits of offspring?**"

4. Read the background information provided in the virtual lab by clicking on the "**Information**" bar in the lab simulation area.

5. Answer **questions 1-5** in **Part 1** below.

6. Follow the instructions in the "Question" column to complete the Punnett Square simulations. Record your results in Table 1 on page two of this lab.

7. When you have completed the lab answer **Journal Questions 1-4**

Part I: Answer the following questions:

1. Which of the following is most inclusive?
   a. allele
   b. genotype
2. Dominant alleles are represented by:
   a. an upper case letter
   b. a lower case letter
   c. it does not matter what type of letter is used

3. In fruit flies, gray body color is dominant over black body color. Using the letter G to represent body color, what is the genotype of a heterozygous gray bodied fly?

a. GG

b. gg

c. Gg

d. GGgg

4. All of the offspring of two gray bodied flys are also gray. What can you conclude about the genotypes of the parent flies?

a. They are both heterozygous

b. They are both homozygous dominant

c. They are both homozygous recessive

d. You cannot conclude anything definitively about the parental genotypes

5. Some of the offspring of two gray bodied flies are black. What can you conclude about the genotypes of the parent flies?

a. They are both heterozygous

b. They are both homozygous dominant

c. They are both homozygous recessive

d. You cannot conclude anything definitively about the parental genotypes

Part II: Follow the instructions in the Question column to complete the virtual lab scenarios and record your data:

- Complete all ten scenarios and record your results in Table 1.

When you record a ratio, whether it is genotypic or phenotypic ratio, always record the most dominant characteristic first, followed by the recessive.

- *For example, when recording genotypic ratios:*
  If your offspring genotypes include 1 GG, 2 Gg, and 1 gg, the ratio would be:
  1 GG : 2 Gg : 1 gg
- *If your offspring genotypes include 2 GG and 2 Gg, the ratio would be:*
  2 GG : 2 gg (or 1:1 in the reduced form)
- *If your offspring genotypes are 4 gg, then the ratio would be written as: 4 gg*

- When you record phenotypic ratios for a monohybrid cross, there are only two possible phenotypes - either the dominant phenotype or the recessive phenotype. So you do not need to indicate the phenotype, simply put the dominant # first, followed by the recessive #:
  - *If your offspring phenotypes are 3 dominant and 1 recessive, the ratio is: 3:1*
  - *If your offspring phenotypes are 4 dominant and 0 recessive, the ratio is: 4:0*
  - *If your offspring phenotypes are 0 dominant and 4 recessive, the ratio is: 0:4*

Table 1

Scenario #	Genotype of Parent I	Genotype of Parent II	Genotypic Ratio of Offspring	Phenotypic Ratio of Offspring
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Journal Questions:

1. For one of the monohybrid crosses you performed in this Investigation, describe how to use the phenotype ratios to determine the percentage of offspring displaying each trait.

2. Can the genotype for a gray-bodied fly be determined? Why or why not? Describe all of the possible genotypes for a fly with that phenotype.

3. Explain why an organism with a homozygous dominant genotype has the same phenotype as an organism with a heterozygous genotype.

4. What genetic information can be obtained from a Punnett square? What genetic information cannot be determined from a Punnett square?