Mendelian Genetics Coin Toss Lab

PRE-LAB DISCUSSION:

In heredity, we are concerned with the occurrence, every time an egg is fertilized, of the probability that a particular gene or chromosome will be passed on through the egg, or through the sperm, to the offspring. As you know, genes and chromosomes are present in pairs in each individual, and segregate as they go into the gametes (egg and sperm). There are two possible genes that the egg or sperm might obtain from each pair, but it actually receives only one of them. If the probability of getting either one is equal, this probability can be expressed as 1/2, like the probability of getting heads or tails when you flip a penny. But one cannot examine the genes in a sperm or egg. One must wait until fertilization has occurred and a new individual has been produced, and some characteristic controlled by the genes has had time to develop. Thus, we are faced with the probability that it will go into the sperm, together with the probability that these will combine at fertilization. The following model will help you to see this.

PURPOSE:

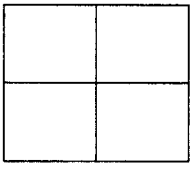
- What is probability?
- What does random mean and how does it apply to genetics?
- How does probability relate to the Punnett Square and the offspring that are shown?

PART A:

PROCEDURE:

1. Use 2 pennies. One penny represents a pair of genes in a parent. The other penny represents the same pair of genes on the other parent.
   P= head = dominant gene (purple)
   p = tail = recessive gene (white)
2. Both parents are heterozygous (Pp)
   1. Pp= the pair of genes in one parent
   2. Pp= the other pair of genes in other parent.
3. Record the resulting offspring from a Punnett Square under the expected probability on your data chart.
4. Toss the coins together. They can only turn up-PP, Pp, pp
5. Remember: each coin represents each parent and each toss can only turn up one way, therefore, a parent can give only one gene of a pair.
6. Toss the coins 50 times and record under "tally" on the data chart.
7. Determine the percentage and record under experimental probability on your data chart.
8. Record the results on your data chart.

Punnett Square



Data Table

	Expected Probability	Tally	Actual Probability
(HH) PP			
(HT) Pp			
(TT) pp			

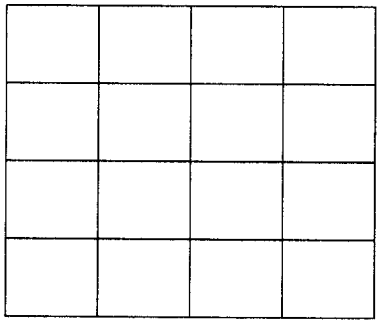
PART B:

PROCEDURE:

1. Use 2 pennies, 2 nickels
2. 1 penny and 1 nickel represent 2 pair of genes in a parent. The other penny and nickel represent the same pair of genes in the other parent.
3. Y = head on the penny (yellow), y = tail on the penny (white)
   R = head on the nickel (rough), r = tail on the nickel (smooth)
4. Both parents are heterozygous for both traits.
   YyRr x YyRr
5. Record the resulting offspring from a Punnett square under the expected probability on your data chart.
6. Toss all four coins (at the same time) 50 times and record results on your data chart.
7. Determine the percentage and record under experimental probability on your data chart.

DATA:

1. Use a Punnett square to determine the expected probability.
2. Use the data table to tally your coin tosses.



DATA TABLE:

	Penny	Nickel	Tally	Experimental	Expected
1st Dominant and 2nd Dominant	HH (YY) HH(YY) HT(Yy) HT(Yy)	HH(RR) HT(Rr) HH(RR) HT(Rr)			
1st Dominant and 2nd Recessive	HH(YY) HT(Yy)	TT(rr) TT(rr)			
1st Recessive and 2nd Dominant	TT(yy) TT(yy)	HH(RR) HT(Rr)			
1st Recessive and 2nd Recessive	TT(yy)	TT(rr)			

ABSTRACT: Your abstract must include the following:

Background – Define important concepts being examined.

Statement of purpose – What were you attempting to do in this lab?

Summary of Procedure – What methods did you use to complete this investigation? This should be a summary, not a detailed procedure like the one you completed earlier.

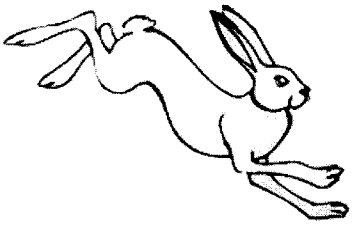
Summary of Results – What happened? Summarize observations and results of calculations and graphs.

Significance of Findings – What important concepts are reinforced by your results? What experimental errors or limitations might have negatively influenced your results?

Name _____

Genetic Crosses that Involve 2 Traits -- Biology 2A

In rabbits, grey hair is dominant to white hair.
Also in rabbits, black eyes are dominant to red eyes.



GG = gray hair
Gg = gray hair
gg = white hair

BB = black eyes
Bb = black eyes
bb = red eyes

1. What are the phenotypes (descriptions) of rabbits that have the following genotypes:

Ggbb _____ ggBB _____
ggbb _____ GgBb _____

2. A male rabbit with the genotype GGbb is crossed with a female rabbit with the genotype ggBb The square is set up below. Fill it out and determine the phenotypes and proportions in the offspring.

	Gb	Gb	Gb	Gb
gB				
gB				
gb				
gb				

How many out of 16 have grey fur and black eyes? _____

How many out of 16 have grey fur and red eyes? _____

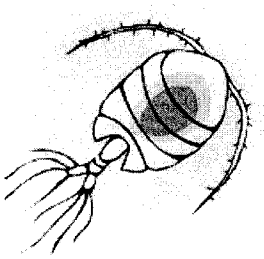
How many out of 16 have white fur and black eyes? _____

How many out of 16 have white fur and red eyes? _____

3. A male rabbit with the genotype GgBb . Determine the gametes produced by this rabbit (the sperm would have these combinations of alleles) Hint there are 4 combinations.

4. Use the gametes from #3 to set up the punnet square below. Put the male's gametes on the top and the female's gametes down the side. Then fill out the square and determine what kind of offspring would be produced from this cross and in what proportion. Use the back of this page for more room.

6. An aquatic arthropod called a Cyclops has antennae that are either smooth or barbed. The allele for barbs is dominant. In the same organism, resistance to pesticides is a recessive trait. Make a "key" to show all the possible genotypes (and phenotypes) of this organism. Use the rabbit key to help you if you're lost.



7. A Cyclops that is resistant to pesticides and has smooth antennae is crossed with one that is heterozygous for both traits. Show the genotypes of the parents. _____ x _____

8. Set up a punnet square for the cross and show the phenotypic ratios.