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Monster Genetics Lab

You have learned about many different patterns of inheritance. Some are simple dominant or recessive, as in Mendelian traits. Some are more complex, such as incomplete dominant or codominant traits. In this lab you will investigate how a combination of these genes work together to create an organism.

Part 1 Procedure:

1. Flip a coin twice to determine the **genotype** for each trait and record it in the data table. Heads = allele 1, Tails = allele 2 (*Example: if you flipped heads twice, your monster will have two copies of allele 1 for his genotype.*)
2. Determine the **phenotype** resulting from the allele pair for each trait.
3. Repeat steps 1-2 for each trait and complete the female monster's Table 1.

Table 1: Genotypes & Phenotypes for Female Monster

Trait	Allele 1	Allele 2	Genotype	Phenotype
Eye	Two small eyes (E)	One large eye (e)		
Eye Color (incomplete)	Red (R)	White (R')		
Skin Color (codominant)	Green (G)	Blue (B)		
Tail Shape	Curly (C)	Straight (c)		
Tail Color	Purple (P)	Orange (p)		
Tail (regulatory gene)	Have tail (T)	No tail (t)		
Teeth	Sharp (S)	Round (s)		
Feet (incomplete)	Four toes (F)	Two toes (F')		
Horn Color	Purple (W)	White (w)		
Ear shape	Pointy (Y)	Round (y)		
Ears (regulatory)	No ears (N)	Two ears (n)		
Claws	Long (L)	Short (l)		

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Part 2 Procedure:

The female monster (described in Table 1) is married to a male monster (see Table 2 below) and they plan to have baby monsters. They are interested in finding out the probabilities of which traits their offspring will have.

1. Fill in the missing genetic information in the table for the male.

Table 2: Genotypes & Phenotypes for Male Monster

Trait	Genotype	Phenotype
Eyes	ee	
Eye Color (incomplete)		White
Skin Color (codominant)		Green
Tail Shape		Straight
Tail Color	Pp	
Tail (regulatory)		No tail
Teeth		Round
Feet (incomplete)	FF'	
Horn Color	ww	
Ear shape	yy	
Ears (regulatory)		Have 2 ears
Claws		Short

2. Create Punnett squares (attach your work to this handout) to predict what traits would result from a cross between the two monsters for each trait, and answer the following questions:
   a. Eyes – What percent of offspring will have only one eye? _____
   b. Eye Color – What percent of offspring will have red eyes? _____
   c. Skin Color – What percent of offspring will have green skin? _____
   d. Tail – What percent of offspring will have a tail? _____
   e. Feet – What percent of offspring will have three toes? _____
   f. Horn Color – What percent of offspring will have purple horns? _____
   g. Ears – What percent of offspring will have ears? _____
   h. Claws – What percent of offspring will have long claws? _____

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Chapter 12 **Patterns of Heredity and Human Genetics,** *continued*

Reinforcement and Study Guide

Section 12.2 When Heredity Follows Different Rules

In your textbook, read about complex patterns of inheritance.

Answer the following questions.

1. Complete the Punnett square for a cross between a homozygous red-flowered snapdragon (*RR*) and a homozygous white-flowered snapdragon (*R'R'*). Give the genotype and phenotype of the offspring in the F_1 generation.

Key
RR - red
R'R' - white
RR' - pink

F_1

genotype: _____

phenotype: _____

2. When traits are inherited in an incomplete dominance pattern, what is true of the phenotype of the heterozygotes?

_____

3. Complete the Punnett square for a cross between two pink-flowered (*RR'*) F_1 plants. Give the phenotype ratio of the offspring in the F_2 generation.

F_2

phenotype ratio: _____

4. In what type of inheritance are both alleles expressed equally?

_____

5. Complete the Punnett square for a cross between a black chicken (*BB*) and a white chicken (*WW*). Give the phenotype of the offspring in the F_1 generation.

Key
BB - black
WW - white
BW - checkered

F_1

phenotype: _____

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Chapter 12 **Patterns of Heredity and Human Genetics**

Problem Solving

Use with Chapter 12, Section 12.3

Using Genetics to Help Solve Mysteries

ABO blood type in humans is determined by three alleles: I^A, I^B, and i. I^A and I^B are codominant alleles. Both I^A and I^B are dominant to the allele i. Four possible phenotypes or ABO blood types, A, B, AB, and O, are possible when these alleles are combined. The gentotypes and phenotypes for each blood type are summarized in the table at the right.

Genotype	Blood type
$I^A\ I^A$	A
$I^A\ i$	A
$I^B\ I^B$	B
$I^B\ i$	B
$I^A\ I^B$	AB
ii	O

Using this information, give a possible solution for the following problem.

Problem: Four newborn babies in the delivery room of the hospital at the same time were mixed up by the nurse who attached the wristbands. The blood types of the four babies were known to be AB, O, A, and B. How did the doctors find out which baby belongs to which set of parents? Parents #1 had blood types O and AB; Parents #2 had blood types AB and B; Parents #3 both had blood type O; Parents #4 had blood types O and A.

Possible Solution: Use Punnett squares to determine possible genotypes of offspring. Then write the parents of each baby.

1. Baby with type AB blood

_____

2. Baby with type B blood

_____

_____

3. Baby with type A blood

_____

_____

4. Baby with type O blood

_____