Name: _____ Period: _____ Date: _____

Mouse Genetics Gizmo

Vocabulary: allele, DNA, dominant allele, gene, genotype, heredity, heterozygous, homozygous, hybrid, inheritance, phenotype, Punnett square, recessive allele, trait

Gizmo Warm-up
Heredity is the passage of genetic information from parents to offspring. The rules of **inheritance** were discovered in the 19th century by Gregor Mendel. With the *Mouse Genetics (One Trait)* Gizmo™, you will study how one **trait**, or feature, is inherited.
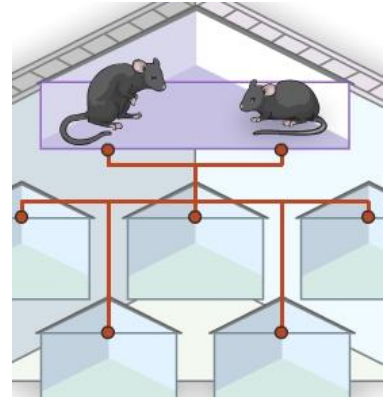
1. Drag two black mice into the **Parent 1** and **Parent 2** boxes. Click **Breed** several times. What do the offspring look like?

   _____

   The appearance of each mouse is also called its **phenotype**.

2. Click **Clear**, and drag two white mice into the parent boxes. Click **Breed** several times. What

   is the phenotype of the offspring now? _____

3. Do you think mouse offspring will always look like their parents? _____

   Explain:

Activity A: **Patterns of inheritance**	<u>Get the Gizmo ready</u>: • Click **Clear**. • Drag a black mouse and a white mouse into the parent boxes, but don't click **Breed** yet.

Question: What patterns are shown by offspring traits?

1. <u>Observe</u>: Click **Breed** several times. What do you see? _____

2. <u>Observe</u>: Drag two offspring into the **Holding Cages**. These mice are called **hybrids** because their parents had different traits. Click **Clear**, and then breed the two hybrids.

   What do you see now? _____

3. Experiment: Turn on **Show statistics**. Click **Breed** until there are 100 offspring.
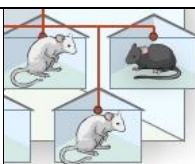
   How many offspring were black? _____   How many were white? _____

4. Explore: Try other combinations of mouse parents. Write the results of each experiment in your notes. When you have finished, answer the following questions. (Note: You can refer to the parents as "pure black," "pure white," or "hybrid.")

   A. Which parent combination(s) yield only white offspring? _____

   _____

   B. Which parent combination(s) yield only black offspring? _____

   _____

   C. Which parent combination(s) yield a mixture of black and white offspring? _____

   _____

	Get the Gizmo ready:	
Activity B: **Genetics basics**	• Click **Clear**. • Drag a black mouse and a white mouse into the parent boxes.	

Introduction: Inherited traits are encoded on a molecule called **DNA** (deoxyribonucleic acid). **Genes** are segments of DNA that control a particular trait. Most genes have several different versions, or **alleles**. The **genotype** is the allele combination an organism has.

Question: How do alleles determine fur color?

1. Observe: Turn on **Show genotype**. Move your cursor over a mouse to see its genotype.

   A. What is the genotype of the black parent? _____   White parent? _____

   These mice are **homozygous** for fur color, meaning both alleles are the same.

   B. Click **Breed**. What is the genotype of the offspring mice? _____

   These mice are **heterozygous** for fur color, meaning the alleles are different.

2. Analyze: **Dominant alleles** are always expressed when present. **Recessive alleles** are not expressed when the dominant allele is also present. Look at the two alleles for fur color.

   A. Which allele is dominant, and which fur color does it produce? _____

   B. Which allele is recessive, and which fur color does it produce? _____

3. Predict: Place two of the *Ff* offspring into the **Holding Cages**. Click **Clear**, and then place them into the parent boxes.

    A. Which allele(s) could the offspring inherit from parent 1? _____

    B. Which allele(s) could the offspring inherit from parent 2? _____

    C. What are the possible genotypes of the offspring? _____

    _____

4. Experiment: Click **Breed** several times, and look at the genotypes of the offspring. Did you find all the predicted genotypes? Explain.

Activity C: **Modeling inheritance**	Get the Gizmo ready: • Click **Clear**. • Drag a black mouse and a white mouse into the parent boxes.	*Escape Door*

Question: How do scientists predict the genotypes of offspring?

	F	F
f	Ff	
f		

1. Model: Scientists use a **Punnett square** to model the different possible offspring genotypes from a parent pair. The parent genotypes are written across the top and side of the square, as shown. The four possible offspring genotypes are then filled in.

The first square is filled in for you. Fill in the remaining squares.

    A. What are the genotypes of the offspring? _____

    B. What percentage of the offspring will have black fur? _____

    C. What percentage of the offspring will have white fur? _____

2. Experiment: Click **Breed** several times. Were your predictions correct? _____

3. Model: Use the Punnett squares below to model each parent combination. After filling in each Punnett square, predict the percentages of black and white offspring.

Parent 1: Heterozygous black (*Ff*)   Parent 1: Heterozygous black (*Ff*)
Parent 2: Heterozygous black (*Ff*)   Parent 2: Homozygous white (*ff*)
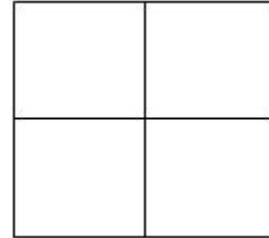
Predicted % black offspring: _____   Predicted % black offspring: _____

Predicted % white offspring: _____   Predicted % white offspring: _____

4. Experiment: Turn on **Show statistics** and **Show as approximate percentage**. For each combination, breed approximately 500 offspring. Record the results in the table below.

(Hint: To obtain an *Ff* mouse, breed an *FF* mouse to an ff mouse. Place two *Ff* offspring into the holding cages, click **Clear**, and then drag the *Ff* mice into the parent boxes.)

Parent 1 Genotype	Parent 2 Genotype	% Black offspring	% White offspring
Ff	*Ff*		
Ff	*ff*		

5. Draw conclusions: How well did the Punnett squares predict the offspring percentages for each parent pair?