Name: _____Period: _____ Date: _____

# Genetics Basics

**Introduction**

**Heredity** is the characteristics that are transmitted from 2 parents to their offspring. Depending on the **alleles** that are passed on by the parents, the offspring's **genes** will express certain **traits**. In this activity, you will work to explore the basics of heredity.

**Model 1: Genetics**

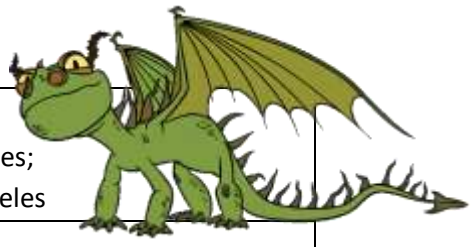
**Gronckles:** Gronckles are gigantic dragons. Gronckles have a gene that controls the trait of wing size. There are 2 variations of that gene: the B allele and the b allele. The B allele expresses the trait of big wing. The b allele expresses the trait of little wing.

1. What is the gene in the paragraph above in charge of? _____
2. How do you represent the 2 alleles that control the size of the Gronckle's wings? _____ and _____
3. What are the two variations of this trait that can be expressed? _____ and _____

**Monstrous Nightmares:** Monstrous Nightmares are dragons that are known for their fire breathing ability, but not all Nightmares can breathe fire. This dragon has a gene which controls the trait of fire breathing ability. There are 2 variations of that gene, the F allele and the f allele. The F allele expresses the trait of fire breathing ability. The f allele expresses the trait of not being able to breathe fire.

4. What is the gene in the paragraph above in charge of? _____
5. How do you represent the 2 alleles that control fire breathing ability? _____ and _____
6. What are the two variations of this trait that can be expressed? _____ and _____
7. Based on the information above, come up with a definition for a **GENE**. _____
   _____
8. Based on the information above, come up with a definition for an **ALLELE**. _____
   _____
9. Based on the information above, come up with a definition for a **TRAIT**. _____
   _____

**Model 2: Dominant and Recessive**



| **Dragon Genetics Key**<br>Capital letters represent **dominant** alleles;<br>lowercase letters represent **recessive** alleles | |
|---|---|
| N = LONG NECK<br>n = short neck | E = RED EYE<br>e = white eye |
| H = HORN PRESENT<br>h = horn absent | F = FIRE BREATHING<br>f = not fire breathing |
| G = GREEN BODY<br>g = grey body | L = LONG TAIL<br>l = short tail |
| S = SPIKES ON END OF TAIL<br>s = no spikes on end of tail | B = BIG WINGS<br>b = little wings |

1. Dominant alleles are represented by _____ letters.
2. Recessive alleles are represented by _____ letters.

3. Which letters are used to represent the gene for body color? _____
4. Which letters are used to represent the gene for neck length? _____
5. Which letters are used to represent the gene for fire breathing ability? _____
6. List 2 dominant dragon traits: _____ & _____
7. List 2 recessive dragon traits: _____ & _____

**Model 3: Heterozygous and Homozygous**

Offspring get 1 copy of each chromosome from their parents. This also means that they get 1 copy of every gene from their parents (because genes are found on the chromosomes); the combination of alleles that an offspring get from its parents represents the offspring's **genotype**. Sometimes, the alleles that the offspring get are the same and sometimes they are different. When the two alleles are the same, they are called **homozygous** or **purebred**. When the two alleles are different, they are called **heterozygous** or **hybrid**. Label the following pairs of alleles are either homozygous (HO) or heterozygous (HE).

SS _____ ff _____ Hh _____ EE _____ Gg _____
Ll _____ hh _____ NN _____ ee _____ RR _____

1. Which genotypes would be considered purebred? _____
2. Which genotypes would be considered hybrid? _____

**Model 4: Genotype and Phenotype**

| Gene A | |
|---|---|
| **Genotype** | **Phenotype** |
| NN | long neck |
| Nn | long neck |
| nn | short neck |

| Gene B | |
|---|---|
| **Genotype** | **Phenotype** |
| EE | red eye |
| Ee | red eye |
| ee | white eye |

1. What do the two genes in the table above control? _____ & _____
2. What are the 2 alleles that control neck length? _____ & _____
3. What are the 2 alleles that control eye color? _____ & _____
4. What is a genotype? (Use the terms: dominant, recessive, heterozygous, and homozygous) _____
   _____
   _____
5. What is a phenotype? _____
   _____
6. What determines phenotype? _____
   _____

**Model Wrap-up: Answer the following questions based on your work with all four models**

7. Based on the information above, what is the definition for a **DOMINANT TRAIT**? _____
   _____
   _____
8. Based on the information above, what is the definition for a **RECESSIVE TRAIT**? _____
   _____
   _____

**Punnett Square Practice**

Remembering that Gronckles have a gene that controls the trait of wing size, create a Punnett square below that represents the breeding of a **homozygous dominant Gronckle (P1)** with a **homozygous recessive Gronckle (P1)**. What would the probability (or ratio) be for a Gronckle offspring (F1) to have small wings? Be sure to explain your thinking.

If a **Gronckle offspring (F1)** was then released to the wild and bred with a wild **heterozygous Gronckle**, what would the probability (or ratio) be for a Gronckle offspring (F2) to have large wings? Create a Punnett square below that represents the breeding of the two Gronckles. Be sure to explain your thinking.

Remembering that the Monstrous Nightmares have a gene that controls the trait for their fire breathing ability, create a Punnett Square below that represents the breeding of a **heterozygous Monstrous Nightmare (P1)** with a **homozygous recessive Monstrous Nightmare (P1)**? What would the probability (or ratio) be for a Monstrous Nightmare offspring (F1) to have the fire breathing ability? What would the probability (or ratio) be for a Monstrous Nightmare offspring (F1) to be a homozygous Monstrous Nightmare? Be sure to explain your thinking.

If a **Monstrous Nightmare without the fire breathing ability** was encountered in the wild, what could we conclude about its parents' fire breathing ability? Create a Punnett Square below that represents all possible parental combinations with an outcome of at least one of these rare Monstrous Nightmares. Be sure to explain your thinking.