Name_____

PREDICTING TRAITS

Directions: Read the information below.

We all know that children grow up to look similar to their parents. A baby whose parents both have brown eyes will also likely have brown eyes. If the child has straight hair the parents are the reason for that trait. The way we look is called our phenotype. This could include whether or not our hair is straight or wavy, the color of our eyes, our height, and everything about our physical makeup. The portion of our DNA that determines this is called our genotype, or the genetic information that acts as the directions for our phenotype. Think about a recipe for a cake. By mixing in the ingredients (in this case, the genes of both parents) you get a new mixture (a genotype). Flour, eggs, and sugar all combine to form a batter in a cake. When that cake it baked, it has a specific look to it. Will the ingredients cause it to rise tall or remain flat? This is like a phenotype.

It is possible to predict the likelihood of what a child will look like if the genotype of the parents are known. To understand this we must first understand how genes work. Humans have 23 pairs of chromosomes that make up our DNA. Each chromosome contains two alleles. These two alleles may match or not. Let's consider the example of eye color.

A father has two alleles for eye color: brown (B) and blue (b), which can also be written as Bb. We give each of these a letter. The capital letter (in this case brown) is dominant, meaning if it's put up against a blue allele it will win and be the person's eye color. The allele for blue eyes (b) is a lowercase letter meaning its recessive. It's less likely this gene will be expressed. Now look at the mother — she has a genotype of BB. This means both her alleles for eye color are brown eyes.

When both alleles are the same it is called being homozygous. If they are both dominant alleles (BB) then it is dominant homozygous. If they are both recessive (bb) they are called recessive homozygous. When they are different, like Bb for example, they are heterozygous.

It may make more sense to use a tool called a Punnett square. This is a diagram that helps us predict the likelihood of a baby's traits based on the parental genotype.

Inside each box of a Punnett square is a different possible outcome for the baby's genetics. We can use this to determine the probability of different traits.

Directions: Answer the questions below. Use the key to understand what each genotype means.

Height	
Tall: T	**Short: t**
Handedness	
Right handed: R	**Left handed: r**
Freckles	
Freckles: F	**No freckles: f**

1. Create a Punnett square for the following genotypes.

a. Mother: Tt Father: TT

a. Mother: RR Father: rr

c. Mother: ff Father: ff

2. What is the probability that a child with the mother and father above will be tall, left-handed and have freckles?