Name: _____ Date: _____

Biology Independent Classwork
Genetics and Heredity

***Complete each exercise.**
Read the paragraph below and answer the questions.

History of Genetics

Even before the beginnings of written history people were aware that certain traits could be passed from parent to offspring. By selectively breeding animals or plants, humans produced livestock and crops that could provide food, pull plows, and supply companionship and protection.

LIVESTOCK

CROPS

1. Where did people first observe that traits could be passed from parent to offspring?

   _____ and _____

But while farmers and breeders learned to control the transmission of traits in agriculture, the actual process of heredity remained a mystery. Many theories were advanced. In ancient Greece, it was thought that traits were transmitted through the blood. In the 17th century (approximately 2,500 years ago) some biologists believed that female eggs contained miniature offspring, with male sperm barely helping the development of the offspring. Other biologists proposed the opposite—that tiny but fully formed offspring were present in the sperm.

1. In the country named Greece, what was believed about how traits are transmitted?

   _____

2. In the 17th century, what did some biologists believe about egg cells?

   _____

3. What did they believe about sperm cells?

   _____

By the 19th century (approximately 200 years ago), three theories on heredity prevailed within the scientific community. One of them was blending inheritance. Blending inheritance proposed that an organism's inherited characteristics are a blend of those in the parents. For example, offspring of a tall plant and short plant would be of medium height.

Charles Darwin (scientist famous for the *Evolution Theory*) said that blending inheritance as a possible explanation for the differences observed in nature.

In 1865 Gregor Mendel, an Austrian monk, wrote a paper that laid the foundation for modern genetics. Mendel was the first to demonstrate experimentally the manner in which specific traits are passed from one generation to the next and to use mathematics to analyze his data. He concluded that discrete, or distinct, hereditary units that passed from parent to offspring determined how traits were inherited.

1. What did blending inheritance propose?

   _____

2. What did Mendel demonstrate?

   _____

More about Genetics

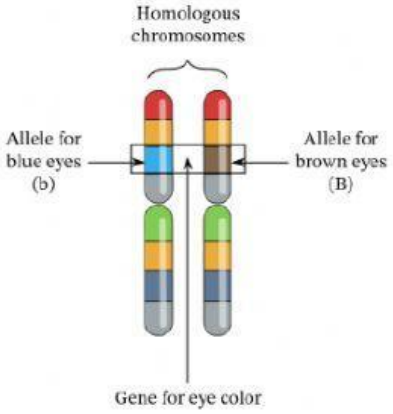
We all have heard how we get certain traits from our parents such as the color of our eyes or how tall we are. These traits are passed on by genes in our DNA. Half of our DNA comes from our mother and half from our father.

1. List two traits that can be passed on by our parents: _____
2. Where does our DNA come from? _____

Scientists have discovered that genes are inherited in certain patterns. What genes your parents and grandparents have, affects what genes you have. We will learn how those patterns work. A few things you should know about genes and inheritance:

Gene - Inside the DNA molecule are sections of information called genes. Each gene tells the cell how to make a certain protein which may determine a trait such as the color of the eyes.

Allele - While the section of DNA is called a gene, a specific pattern in a gene is called an allele. For example, the gene would determine the hair color. The specific pattern of the hair color gene that causes the hair to be black would be the allele.



A section of DNA is called a: _____

A specific pattern in a gene is called an: _____

The alleles in this picture represent the trait of

_____ and _____ eye color.
(b) (B)

Dominant and Recessive Genes

Each child inherits two genes for each trait from their parents. Some genes are more dominant than others. For example, brown eyes are dominant over blue eyes. If someone has a brown

eyed gene and a blue eye gene, they will have brown eyes. They will only have blue eyes if both genes are blue. The brown eyed gene is called the dominant gene and the blue eyed gene is the recessive gene.

1. How many genes for each trait do children inherit from their parents? _____

2. Which is dominant? Blue or brown eyes? _____

Writing out the Genes

In order to write out the specific allele a person has for a gene, you write a letter representing the gene from the mother and a letter for the gene from the father. Dominant genes are written with capital letters and recessive genes with lower case letters. Here is an example: We use the capital letter "B" to represent the dominant brown-eyed gene and a lower case "b" to represent the recessive blue-eyed gene.

Bb - one brown gene, one blue gene (this person will have brown eyes)
BB - both brown genes (this person will have brown eyes)
bb - both blue genes (this person will have blue eyes)

1. How can you represent the specific allele a person has for a gene?

   _____

2. What do the capital letters represent? _____

3. What do the lowercase letters represent? _____

Punnett Square

The main way to figure out the pattern of inheritance that could come from two parents is using a Punnett square. A Punnett square shows all the possible combinations of genes from the parents. We will use the example of a plant that could have a purple flower or a white flower. The purple gene is dominant and we write it "P." The white gene is recessive, so we write it "w." Here is an example of a Punnett square where one parent has two purple genes "P" and the other parent has two white "w" genes. Each child has the same gene pattern "Pw". They all have the dominant P gene and will all have purple flowers.

	P	P
w	Pw	Pw
w	Pw	Pw

Based on this chart, how will the offspring look? What traits will they have?

_____

Here is another example where each parent has a purple gene and a white gene (Pw):
In this case, you can see that 75% of the children will have a dominant "P" gene and will have a purple flower. However, 25% of the children have "ww" genes and will have a white flower.

	P	w
P	PP	Pw
w	Pw	ww

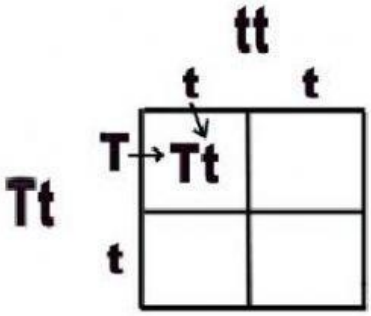
Which letters will represent the 75%? Will the children be white or purple?

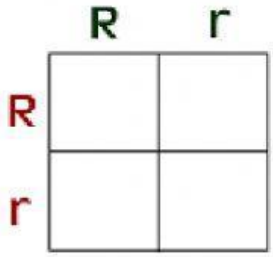
_____

All of an individual's genes together are called the genotype. The physical appearance that results from the alleles (for example, the actual purple flower) is called the phenotype.
If the two genes are the same (for example, ww or PP), this is called homozygous. If the two genes are different (for example Pw), this is called heterozygous. Sometimes gene types have "codominance" meaning that neither gene is dominant over the other. One example of this is blood type where one parent has type A and the other has type B. The child will have blood type AB. Some traits are determined by multiple genes.

1. What is homozygous? _____
2. What is heterozygous? _____
3. What is codominance? _____

*** Complete the Punnett Squares.**





***Show the first generation and the second generation.**