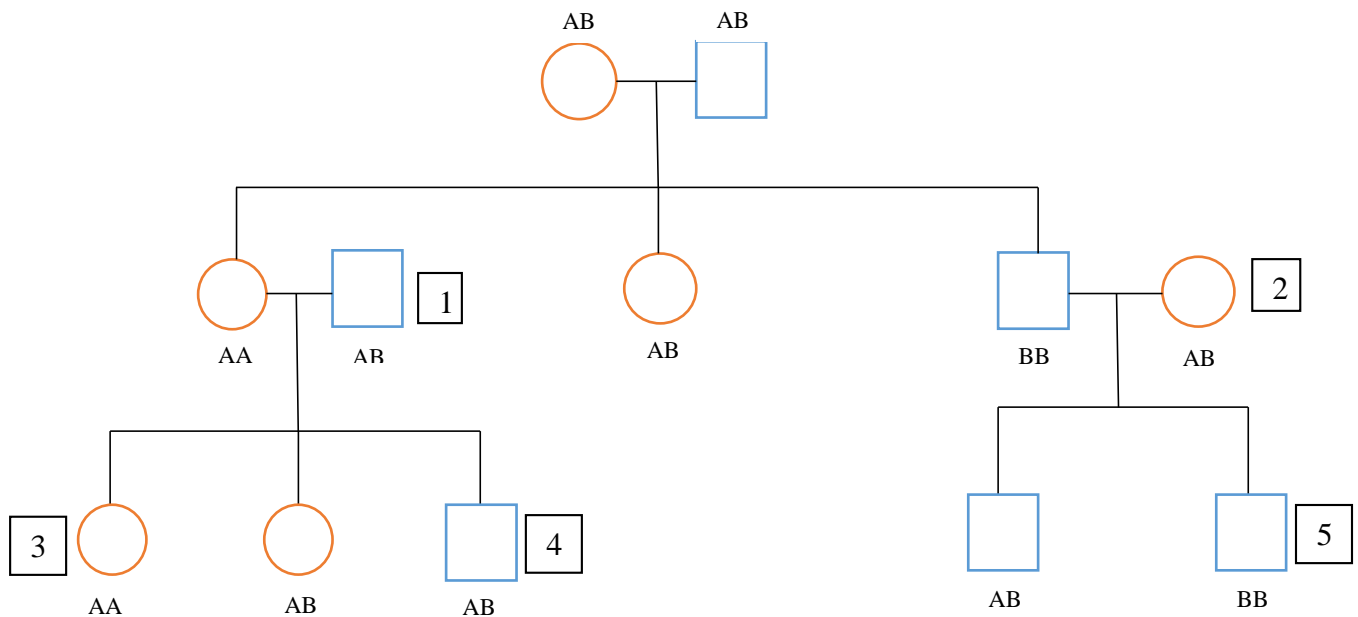


Genetics Worksheet

Genetics is the study of how the codes in our bodies, made from *DNA*, is passed from parents to their children, and how the characteristics of our bodies are expressed. The code for a specific characteristic is called a *gene*. For instance, you may have a gene for eye color, hair color, height, etc. In humans, we usually have a set of two genes per characteristic. These two genes do not have to be the same. For instance, one gene may be for blue eyes, and one for brown eyes. This is where the term *dominance* comes in. Genes are ranked on a scale of strongest to weakest. For instance, the gene for brown eyes may be stronger than the gene for blue eyes. If a person has these two genes, they will express brown eyes. This theory of dominance is called **Mendelian Genetics**. Dominance is not how every characteristic works in the human body, but it is a useful tool in demonstrating how genes work.

By using this theory of dominance we can determine the inheritance patterns in which genes are passed down. *Inheritance* is the passing of genes from the parents to the child. Each child gets one gene from their mom, and one from their dad for every characteristic. These patterns can be visually expressed through the use of *pedigrees*. An example of a pedigree is shown below:



The red circles indicate females, and the blue squares indicate males. In the first generation, which is the top line, we start out with two individuals, each with two genes. Let's say that the gene "A" represents green eye color. "B" represents blue eye color. Green, or "A" in this case is the dominant gene. Since both the male and female are "AB" in the first generation, they both have green eyes because they have the green gene. If you follow the lines down to their children, we see they have three: two females and one male. The females both have green eyes because they both have one or both green ("A") genes. The male, however, has two "B," or blue genes

and therefore will have blue eyes. See if you can correctly determine what gender and color eyes their spouses and children have (the ones with the boxed numbers):

1	_____
2	_____
3	_____
4	_____
5	_____

Using EvolvedTD

Part 1

You will be using the game EvolvedTD to construct a pedigree (like the one above) for the creatures on the screen. Follow the instructions below:

1. Open EvolvedTD on the computer.
2. Press the play button, and pause it using the “P” button on your keyboard.
3. Record below how many creatures are each color:

Blue: _____

Green: _____

Red: _____

4. Right click on a creature. In the right bottom corner there is a window that says “creature” with a number next to it. This is the creature’s identification number. Below, record the color of each creature according to their identification number:

1: _____

6: _____

2: _____

7: _____

3: _____

8: _____

4: _____

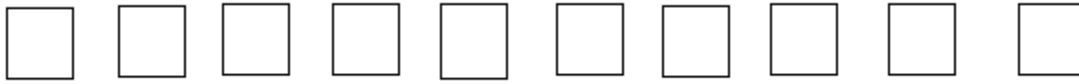
9: _____

5: _____

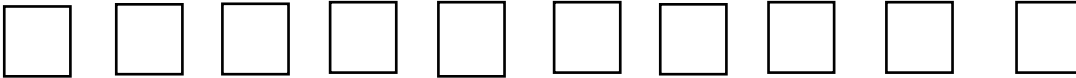
10: _____

5. Transfer this information to the pedigree below for generation 1. Write the identification number and the corresponding color for each creature in one square per creature. You can simply write R for red, B for blue, or G for green.

Generation 1:



Generation 2:



Generation 3:



6. Now unpause the game and let the game run until the dropdown menu shows “Generation: 1.”
7. Record the creatures’ identification numbers and colors in the same way you did in step 5, but this time on the second line of squares on the chart above (Generation 2).
8. Now look at the bottom right box when a creature is selected. Observe the numbers beside the words “Mother” and “Father.” These numbers are the parents’ identification numbers. Draw a line that matches the parents’ identification numbers to the current creature’s number on the pedigree chart above.
9. Repeat steps 6-8 for a third generation.
10. You should now have a complete pedigree!

Please answer the questions below:

1. Which color is the most dominant?
2. Which color is the middle dominant?
3. Which color is the least dominant?

Part 2

For this part of the worksheet you will be imposing what is called *directional selection* on the creatures. Directional selection is a natural process in which a certain characteristic becomes expressed in more of the total number of creatures than there was to begin with. To demonstrate this, you will again be using EvolvedTD. Follow the directions below:

1. Start the game.
2. Choose red, green, or blue as the color you want all the creatures to be.

Which color did you choose? _____

3. Place a gun on the map. Do this by moving your mouse to the bottom of the screen. A window should then appear. Click on the “railgun” and then click again to place it where you want on the map.
4. You will then impose selection by shooting the creatures that are **not** your chosen color. You can manually aim the gun, or use the following automatic targeting systems:

Press “3”: Targets **red** creatures. Use this if you want to get rid of the red creatures.

Press “4”: Targets **green** creatures. Use this if you want to get rid of green creatures.

Press “5”: Targets **blue** creatures. Use this if you want to get rid of blue creatures.

5. Try to eliminate all the creatures except for your chosen color.

Please answer the questions below:

1. Were you able to get the creatures to all be one color?
2. If yes, did any other colors appear after they were all one color?
3. Why do you think this is?