

Topic: ABO Blood Types Worksheet

Summary: Students will learn about multiple alleles and Codominance. Students will learn about the ABO blood types, blood transfusions, and blood antibodies.

Goals & Objectives: Students will be able to predict which blood type is inherited. Students will be able to explain how the immune system affects blood transfusions.

Standards: CA Biology 2g. *Students know* how to predict possible combinations of alleles in a zygote from the genetic makeup of the parents. 10b. *Students know* the role of antibodies in the body's response to infection.

Time Length: 20 minutes

Prerequisite Knowledge: Students know how to complete a punnett square for a single trait. Students know vocabulary words like homozygous, heterozygous, dominant, recessive, genotype and phenotype. Students know the basics about blood cells and antibodies.

Materials:

- Textbook for reference
- Handouts and pencils

Procedures:

1. Students work on the handout by themselves.

Accommodations: Students with an IEP can take the handout home if they need extra time, and/or do the even number questions and the punnett square.

Evaluation:

Each question is worth 1 point each for a total of 12 points. Correctly completed punnett square is worth 3 points. This assignment is worth a total of 15 points.

ABO Blood Types

A blood type or blood group is a classification of blood based on antigens on the surface of red blood cells. There are two major blood type systems, ABO and Rhesus.

The ABO blood group system has an A antigen and B antigen that are inherited. Blood type A has the A antigen on the surface of the red blood cell. Blood type B has the B antigen on the surface of the red blood cell. Blood type AB has both of the antigens on the surface of the red blood cell. Blood type O does not have any antigens on the surface of the red blood cell.

1) What are the four different blood groups? _____

The purpose of understanding the different antigens found on red blood cells is because of blood transfusions. Blood transfusion is the process of transferring blood from one person into another person's circulatory system. Blood transfusions can be useful when the recipient loses a large amount of blood due to trauma or surgery. For blood transfusions to work, blood must be donated from people with matching blood types. If the blood is not matched, then the immune system of the recipient will attack the donated blood.

After birth, the immune system then makes antibodies against the antigens not found on the red blood cells. Antibodies are present on the B white blood cells. Below is a table containing information about antigens, antibodies and blood transfusions.

Blood Type	Red Blood Cell Antigen	Antibodies in Blood	Receive Blood From	Donate Blood To
A	A	anti-B	O, A	A, AB
B	B	anti-A	O, B	B, AB
AB	A, B	None	O, A, B, AB	AB
O	None	anti-A, anti-B	O	O, A, B, AB

For questions 2 – 7, use the data table above.

2) Which blood type would you have if antibodies A and B were made during your first year of life? _____

3) Which blood type is the universal donor? _____

4) Which blood type is the universal recipient? _____

5) Which ABO blood type has two different antigens on the surface of red blood cells?

6) Which ABO blood type has the A antigens on the surface of red blood cells?

7) If the blood plasma had antibody A, what type of blood would the immune system attack? _____

8) How are antibodies related to the type of blood a person can receive? _____

A single gene controls ABO blood type system with three alleles. Two of the alleles are dominant (I^A , I^B) and the third allele (i) is recessive. The gene encodes an enzyme glycosyltransferase that modifies carbohydrates that make up the red blood cell antigens. Since there are two of the dominant alleles, $I^A I^B$ genotype expresses codominance. The three genotypes result in four phenotypes, A, B, AB, and O. Fill in the punnett square below and then answer its corresponding questions.

	I^A	I^B	i
I^A			
I^B			
i			

9) What genotypes would create the phenotype blood type A? _____

10) What genotypes would create the phenotype blood type B? _____

11) What genotypes would create the phenotype blood type AB? _____

12) What genotypes would create the phenotype blood type O? _____