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Class Period _____ Lab Days/Period _____ Teacher _____

Blood Volume and Blood Type

(adapted from "Biology: The Study of Life", by Schraer and Stoltze, Prentice Hall Pub., 1999)

Background: There are 4 main types that exist in the human species on this planet: A, B, AB, and O. Your blood is the direct link between your cells and the outside environment, carrying oxygen, carbon dioxide, digested food molecules, wastes, heat, and a myriad of other substances and compounds. Not only does it supply your cells with the necessary nutrients but it helps to maintain your body temperature as part of a homeostatic feedback mechanism.

Blood is commonly "typed" according to the antigens present on the surface of the red blood cells. There are a number of antigens (specifically the Rh antigens) that can affect blood type. We will deal with the simplest ones in this lab: A, B, AB, O, Rh+ and Rh-. Rh+ means that the surface of the red blood cells have the type of Rh antigens that can cause severe agglutination (clumping) during blood transfusions. Rh- means that the surface of the red blood cells do NOT have the type of Rh antigens that cause severe agglutination reactions during blood transfusions. Before a person can receive a blood transfusion, a laboratory test is needed to determine what type of blood a person should receive and whether the donor and recipient are compatible with regard to Rh factors.

Laboratory Safety Precautions: The following symbols represent the precautions that are required for this lab:

There are no precautionary measures needed in this laboratory exercise.

Purpose: The purpose of this laboratory experience is:

- to further understand the science and physiology behind blood donation, transfusion, and allergic reactions.
- to understand how common or uncommon a certain blood type is in our society.
- to understand the importance of transfusing the correct type of blood into a recipient if they need more blood volume.
- to learn to graph the percentages of people with each blood type.
- to learn the approximate blood volume that you have based upon your body mass and calculate the percentage of red blood cells, white blood cells, and platelets that compose your blood volume.

Materials: The following materials are needed to perform this lab experience:

- lab papers
- calculator
- pen and pencil
- graph paper

Procedure: The following procedure is utilized to perform this lab experience:

1. Examine the data table below. This table shows the different blood types and the percentage (approximate) of people that have this blood type. This data is the basis of your graph.

| Blood Type: | O | A | B | AB | Rh+ | Rh- |
|-------------------------------|-----|-----|-----|----|-----|-----|
| % of People having this type: | 45% | 40% | 12% | 3% | 85% | 15% |

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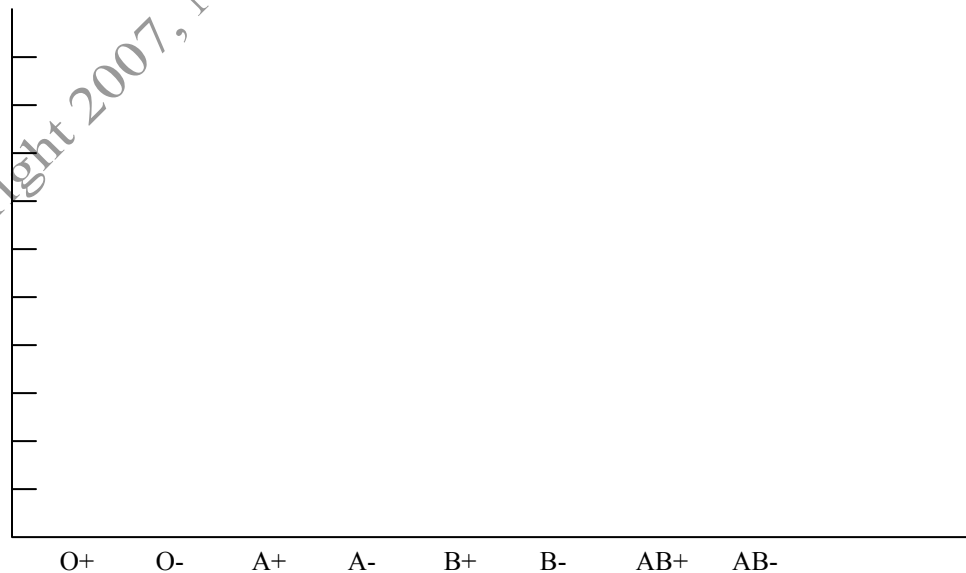
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2. To determine that percent of people having type O who are also Rh+, combine the percents by multiplying them in the work table included.

| Blood Type | % blood type (from previous page) | %Rh (from previous page) | Multiplied together | Expressed as % |
|------------|--------------------------------------|-----------------------------|---------------------|----------------|
| O+ | | | | |
| O- | | | | |
| A+ | | | | |
| A- | | | | |
| B+ | | | | |
| B- | | | | |
| AB+ | | | | |
| AB- | | | | |

Data: the following data was collected during the course of this experience:
Using the data you have calculated, create a bar graph in the circle below. Provide a title for your graph and label the various sections of the graph.

Title: _____



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Data (con't.)

Blood Volume Calculation

The amount of blood in your body is directly related to your body mass (commonly referred to as your “weight”). Therefore, the heavier you are, the more blood you should have in your body. The simple formula of $V=70W$, where V = the volume of your blood in milliliters and W = your weight in kilograms is employed.

Using this formula, calculate the volume of blood in your body in this space:

| | |
|--|----------------------------|
| $V=70W$ | |
| Weight in pounds = _____ | Weight in kilograms= _____ |
| Therefore, your blood volume is _____ (remember to include units) | |

Now, as you know, blood has several different components. We are going to calculate the volume of each of those components, were we able to separate it into individual bottles. Red blood cells comprise about 44% of your volume, Platelets and white blood cells make up about 1%, and plasma makes up about 45%. Calculate the volume of each of these components below. Show how you arrived at your answer for each.

| |
|--|
| Total Blood Volume = _____ |
| Volume of Red blood cells: _____ |
| Volume of White Blood Cells and Platelets: _____ |
| Volume of Plasma: _____ |

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Conclusion: The following can be concluded from this lab experience:

Analysis Questions: Answer the following questions in the space provided:

1. Why can a person's life be saved by simply transfusing a large amount of plasma instead of whole blood (blood loaded with cells)?

2. Why are red blood cells so important? What chemical factors make them especially useful in gas exchange?

3. What are white blood cells used for? ...platelets?

4. What does plasma look like? What is it made of?
