Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Class: \_\_\_\_\_\_\_\_ Due Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

**Lab 21:** **Lung Capacity**

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**Purpose**

To observe the volume of air our lungs can hold and compare this to our normal breathing volume.

**Introduction**

Human lung capacity can be measured in several ways. One way is by using a complex piece of laboratory equipment called a spirometer. However, lung capacity can also be measured by using a balloon.

Several different lung volume measurements can be made. The amount of air taken in or expelled during normal breathing is about 500 cm3. This volume of air called the **tidal volume**. The largest possible amount of air which can be exhaled after drawing in a deep breath is the **vital capacity**. The amount of air that remains in the lungs after exhaling normally but which can be expelled is the **expiratory reserve**. A certain amount of air in the lungs cannot be expelled. This is the **residual volume**.

Lung volumes differ with age, sex, body frame and aerobic fitness. Measuring your lung capacity can help you determine how much stamina you have available to go about your daily routine, include sports and other activities.

Usually you need about 1/3 of your lung capacity to carry out routine tasks that do not require exertion. It is also possible for you to increase your lung capacity through regular exercise.

Your lung capacity may be affected by certain disorders such as asthma and emphysema. Cigarette smoking will give you noticeable signs of emphysema after only three years of use. Such things as altitude, the position your body is in, air temperature, weather conditions, and air pollution may also contribute to a decrease in lung capacity.

**Volume** or capacity is measured in liters (l), milliliters (mL) and cubic centimeters (cm3). One mL is equal to one cm3.

**Materials**

* Round balloon
* Metric ruler

**Pre-Lab Questions**

1. State the 4 different volume measurements given to lung capacity and describe each.

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1. Do you think your estimated vital capacity or your measured vital capacity will be higher? Why?

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**Procedure**

**Part A- Normal Blood Sample**

1. Examine Figure 1, which shows a normal blood sample magnified 1,000 times.
2. Count each cell type present and record their density in the **analysis table** in the observations section. Use the following information to help
	1. **Red Blood Cells (RBC)** - round, very numerous, no nucleus.
	2. **White blood cells (WBC)** - round, few in number, larger than red blood cells, nucleus present.
	3. **Platelets** – dot-like cell fragments, fewer in number than red, but greater in number than white, extremely small.
3. After the cells are counted rank them in order from most abundant (1) to least (3), this information will be helpful when determining which disease the individual has.

**Part B- Abnormal Blood Samples**

1. Examine figures 2 to 6. These figures represent human blood samples from people with certain diseases.
2. Count each cell type and record the number for each cell type in the sample in the **analysis table** in the proper column.
3. Complete the rank columns using the numbers 1 to 3, as done with the normal blood smear.

**Part C- Diagnosing Blood Disorders**

1. Read over the following case histories for five hospital patients.
2. Match each case history with the appropriate blood sample (Figures 2-6)
3. Record the name of each disease (Disease diagnosis) in the correct column of the analysis table.



**Analyze and Conclude**

1. Blood cells do not last forever. The regularly wear out and need to be replaced. Where are the new blood cells produced? Where are old blood cells removed from the blood?

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1. In a normal healthy person’s drop of blood, which cells are the most numerous? Least numerous?

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1. Why does a person with anemia often feel tired and easily become short of breath?

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1. The rank and number of blood cells in a normal person and one with sickle-cell anemia is almost identical. How can a doctor conclude that a person has sickle cell anemia?
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2. Why might a person with Thrombocytopenia have many bruises or purple marks?

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