SB1-3U: Respiratory System Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **/5 Communication**

 **/10 Application**

**BREATHING DEEPLY**

Lab: Measuring Lung Volumes

**Background:**

There are several different measurements that can be made concerning human lung volumes. These include:

1. Vital Capacity – the largest amount of air that can be exhaled after taking a deep breath.
2. Tidal Volume – the amount of air expelled during a normal breath
3. Expiratory Reserve – the amount of air that remains in the lungs after a normal breath but can be forcibly exhaled

(\*\*NOTE: a certain amount of air (~1 litre) is never exhaled; called the Residual Volume)

**Purpose:**

1. Determine your vital capacity.
2. Compare expected and observed lung volume values and provide reasons why there is a difference.

**Materials:**

Tape Measure

Lung Volume Bag with mouth piece

**Method:**

1. Take as deep a breath as possible, pinch your nose, bend and exhale into the bag. When you have finished, close off the opening to the bag.
2. Roll the bag to squeeze the air to one side.
3. Record the volume of air exhaled into observation table #1 below (value found on bag).
4. Repeat steps 1-3 two more times alternating turns with your partner. Each partner should have three recorded trials total.
5. Measure your height (cm) and record this value into table #2.
6. Select the appropriate multiplication factor and record this in table #2:
	1. Normal female = 20
	2. Athletic female = 22
	3. Normal male = 25
	4. Athletic male = 29

\*\* Note: an athletic person regularly takes part in various sporting activities which require good lung capacity or exercises multiple times a week. People who play a wind instrument are also considered “athletic”.

1. Determine your Expected Vital Capacity by multiplying *height x factor.*
2. Calculate the percent difference between the observed and expected values for vital capacity. Show your work in the chart.
3. Complete the discussion questions.

**Observations:**

Table #1: Observed Vital Capacity

|  |  |  |
| --- | --- | --- |
| Value | Trial  | Lung Volume (mL) |
| Vital Capacity(Observed) | 1 |  |
| 2 |  |
| 3 |  |
| Average |  |
| Total Lung Volume: (V.C. + 1L)  |  |

Table #2: Differences in Expected and Observed Vital Capacity

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Height (cm) | Factor | Expected V.C. | Observed V.C. | Percentage Difference$$\% Difference =\frac{ \left|observed-expected\right| }{expected}x 100$$ |
|  |  |  |  |  |

**Discussion Questions** (Complete these answers on a separate sheet and staple to the handout)**:**

1. What factors could account for differences between observed and expected vital capacity values in your results from the lab as well as other factors discussed in class? **(2)**
2. Why would someone living at a higher altitude have a larger vital capacity (~ 30% greater than those living at sea level)? **(2)**
3. At higher altitudes, your body also produces more of the hormone Erythropoietin (EPO). EPO is responsible for increasing the production of red blood cells. Explain why increased amounts of RBCs would benefit a person living at high altitudes. **(3)**
4. EPO is also used to enhance athletic performance. How would this be beneficial to an athlete? What other controversial ways are athletes known to use to increase performance and how do they relate? **(3)**