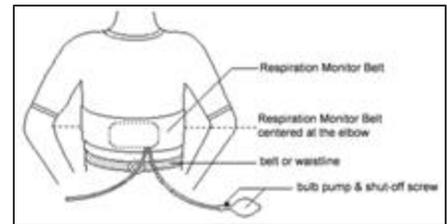


Respiratory Physiology Lab

The Volume of Oxygen available to the capillaries in the lungs is dependant on several variables. One of these is the ventilation rate, which is closely correlated to the physiological needs of the body by certain chemical and autonomic controls. The following exercises will enable you to determine the basis of the chemical control.

1. The following activities are to be performed on only ONE MEMBER of your lab pair. Part 1 - 3 should be done consecutively while connected to a respiration belt on one of the computers. Wrap the belt around your ribs as pictured. Do NOT face the computer screen, it will affect the subjects respiration rate if they watch.



2. Pump air into the bladder using the bulb pump. The pressure reading will vary, depending upon how tightly the belt was initially wrapped around the test subject. Pump until it reads about 30 - 40 mmHg higher than the initial reading.
3. Each respiration should change the reading by about 10 mmHg. If each breath is causing too small a change, you can pump more air in so you can clearly see the shape of each breath.

Part I: Holding of Breath

1. Instruct the test subject to breathe normally. Start collecting data by clicking . When data has been collected for 60 seconds, have the test subject hold his or her breath for 30 to 45 seconds. The test subject should breathe normally for the remainder of the data collection once breath has been released.
2. Examine the respiration rates recorded in the bottom graph by clicking the Examine button, (X=?). As you move the mouse pointer from point to point on the graph the data values are displayed in the examine window. Determine the respiration rate before and after the test subject's breath was held and record the values in Table 1.
3. Select Data, then Clear all Data before moving to page 2.

Part II: Rebreathing of Air

1. Place a small paper bag into a larger plastic bag. Have the test subject cover his or her mouth with the bags, tight enough to create an air-tight seal. The test subject should breathe normally into the bags throughout the course of the data collection process.
2. Click to begin data collection. Again, the test subject should be sitting and facing away from the computer screen. Collect respiration data for the full 300 seconds while breathing into the sack. Important: Anyone prone to dizziness or nausea should not be tested in this section of the experiment. If the test subject experiences dizziness, nausea, or a headache during data collection, testing should be stopped immediately.
3. Once you have finished collecting data in Step 12, calculate the maximum height of the respiration waveforms for the intervals of 0 to 30 seconds, 120 to 150 seconds, and 240 to 270 seconds:
 - Move the mouse pointer to the beginning of the section you are examining. Hold down the mouse button. Drag the pointer to the end of the section and release the mouse button.
 - Click the Statistics button, , to determine the statistics for the selected data.
 - Subtract the minimum pressure value from the maximum value (in mm Hg).
 - Record this value for each section as the wave amplitude in Table 2.

- Select Data, then Clear all Data before moving to page 3.

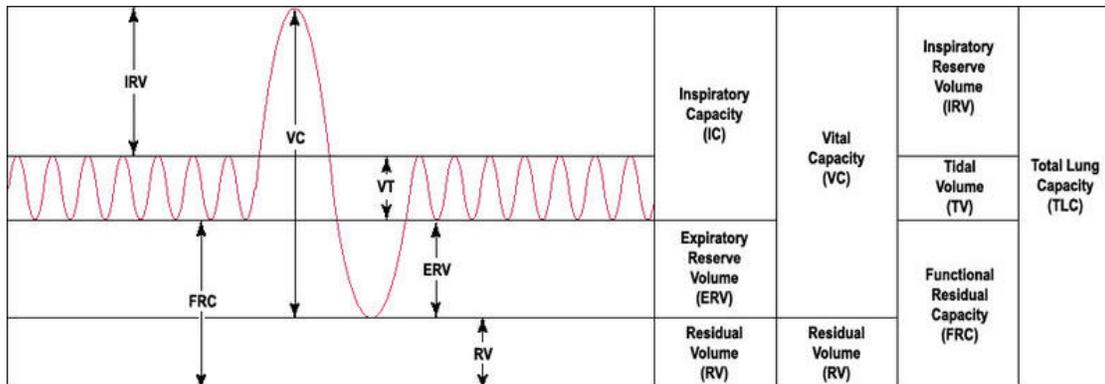
Part III: Hyperventilation and Apnea

- Have the subject breathe normally for 30 seconds. At the end of 30 seconds, have the subject breathe deeply with mouth wide open, at a rate of about 30 breaths per minute for 60 seconds. At the end of that minute, have the subject breathe normally for the next 30 seconds. Click stop at the end of 120 seconds.
- Observe the waveform immediately after the 60 seconds of forced hyperventilation. Measure the length of time until the next visible breath. Record the data on the data sheet.

Finish the rest of these experiments without the computer.

Part IV - Maximal Expiratory Lung Capacity.

Aside from how quickly your respiration and heart rate returns to normal after exercise, the volume of air your lungs can hold is one of the most telling indications of your cardiovascular fitness. You will use a spirometer to measure your maximum lung volume in several ways. You will then compare these to the expected volume for a person of your particular sex, height, and age.



- Tidal Volume (TV) – take 1 natural breath. At the peak of the inhalation, put your mouth around the tube of the spirometer and exhale naturally. Do not exhale more than feels natural. Record the volume as Tidal Volume on the chart.
- Vital Capacity (VC) – take the deepest breath you can. Put your mouth on the tube of the spirometer. Exhale in a controlled way until you have exhaled all that you can. Record the volume as Vital capacity on the chart.

Oxygen consumption

1. Remove the probe from the plastic chamber. Click collect. Wait for the graph to stabilize (at least 15 seconds).

- ❖ RECORD - What percent of the classroom air is oxygen (according to your probe)?
- ❖ STORE RUN by selecting Experiment / Store latest run (or simply press Ctl - L). The line will become lighter.

2. Take 1 natural breath and EXHALE it into the chamber. Quickly cap it up and wait for the graph to stabilize (flat line).

- ❖ RECORD - How much O₂ are you removing from the air at rest?
- ❖ STORE RUN by selecting Experiment / Store latest run (or simply press Ctl - L). The line will become lighter.

3. After the graph stabilizes, HOLD BREATH FOR 30 SEC. At the end of the 30 seconds, exhale the breath you have been holding into the chamber and cap it up. Wait for the graph to stabilize.

- ❖ RECORD - How much O₂ are you removing from the air after holding your breath for 30 seconds?
- ❖ STORE RUN by selecting Experiment / Store latest run (or simply press Ctl - L). The line will become lighter.

4. Hyperventilate (like you did yesterday) for 30 seconds. Exhale the last forced breath into the chamber and cap it. Wait for the graph to stabilize.

- ❖ RECORD - How much O₂ are you removing from the air after hyperventilating for 30 seconds?
- ❖ STORE RUN by selecting Experiment / Store latest run (or simply press Ctl - L). The line will become lighter.