Exercise 7: Respiratory System Mechanics: Activity 1: Measuring Respiratory Volumes and Calculating Capacities Lab Report

Pre-lab Quiz Results
You scored 100% by answering 5 out of 5 questions correctly.

1. Which of the following statements describing the mechanics of breathing is false?
   You correctly answered: d. Ventilation relies exclusively on contracting skeletal muscles.

2. The contraction of which of the following muscles will increase the thoracic cavity volume during inspiration?
   You correctly answered: c. the external intercostals

3. At the beginning of inspiration, the
   You correctly answered: b. thoracic cavity volume increases.

4. At the beginning of expiration, the
   You correctly answered: a. pressure in the thoracic cavity increases.

5. A tidal volume refers to the
   You correctly answered: b. amount of air inspired and then expired with each breath under resting conditions.
Experiment Results

Predict Question:
Predict Question: Lung diseases are often classified as obstructive or restrictive. An **obstructive** disease affects *airflow*, and a **restrictive** disease usually reduces *volumes and capacities*. Although they are not diagnostic, pulmonary function tests such as forced expiratory volume (FEV1) can help a clinician determine the difference between obstructive and restrictive diseases. Specifically, an FEV1 is the forced volume expired in 1 second.

In obstructive diseases such as chronic bronchitis and asthma, airway radius is decreased. Thus, FEV1 will decrease proportionately.

Stop & Think Questions:
Which muscles contract during quiet expiration?
Your answer: c. external and internal intercostal muscles
Correct answer: d. None of these muscles contract during quiet expiration.

6. **Minute ventilation** is the amount of air that flows into and then out of the lungs in a minute. Minute ventilation (ml/min) = TV (ml/breath) x BPM (breaths/min).

Using the values from the second recorded measurement, enter the minute ventilation in the field below and then click **Submit** to record your answer in the lab report.
You answered: 7500 ml/min

11. A useful way to express FEV1 is as a percentage of the forced vital capacity (FVC). Using the FEV1 and FVC values from the data grid, calculate the FEV1 (%) by dividing the FEV1 volume by the FVC volume (in this case, the VC is equal to the FVC) and multiply by 100%.

Enter the FEV1 (%) for an airway radius of 5.00 mm in the field below and then click **Submit** to record your answer in the lab report.
You answered: 73.90

12. A useful way to express FEV1 is as a percentage of the forced vital capacity (FVC). Using the FEV1 and FVC values from the data grid, calculate the FEV1 (%) by dividing the FEV1 volume by the FVC volume (in this case, the VC is equal to the FVC) and multiply by 100%.

Enter the FEV1 (%) for an airway radius of 3.00 mm in the field below and then click **Submit** to record your answer in the lab report.
You answered: 70.2

Experiment Data:

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Post-lab Quiz Results
You scored 100% by answering 5 out of 5 questions correctly.

1. To calculate a person's vital capacity, you need to know the TV, ERV, and
You correctly answered: c. IRV.

2. Measuring a person's FVC means that you are measuring
You correctly answered: d. the amount of air that can be expelled when the subject takes the deepest possible inspiration and then forcefully expires as completely and rapidly as possible.

3. Measuring a person's FEV1 means that you are measuring
You correctly answered: b. the amount of the VC that is expired during the first second of the FVC test.

4. For a person suffering an asthma attack, inhaler medications are expected to
You correctly answered: a. reduce the airway resistance.

5. Which of the following values does not include the ERV?
You correctly answered: c. TV
Review Sheet Results

1. What would be an example of an everyday respiratory event the ERV simulates?
   Your answer:
   Forced expiration is what the ERV simulates, such as physical movement like running or as trivial as chough.

2. What additional skeletal muscles are utilized in an ERV activity?
   Your answer:
   Abdominal-wall muscles
   Internal intercostal
   Internal/external oblique and transverses abdominis

3. What was the FEV1 (%) at the initial radius of 5.00 mm?
   Your answer:
   74 %

4. What happened to the FEV1 (%) as the radius of the airways decreased? How well did the results compare with your prediction?
   Your answer:
   FEV1 was decreased as the airway radius also decreased, like I answered.

5. Explain why the results from the experiment suggest that there is an obstructive, rather than a restrictive, pulmonary problem.
   Your answer:
   Since the airflow is constantly decreasing, it is likely to say that it is obstructive rather than restrictive. If it had been restrictive, the volume and capacities would have been more affected.