PhysioEx Lab Report

Exercise 7: Respiratory System Mechanics
Activity 1: Measuring Respiratory Volumes and Calculating Capacities
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Date: 3 November 2025
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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: 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: the external intercostals.

3. At the beginning of inspiration, the

   You correctly answered: thoracic cavity volume increases.

4. At the beginning of expiration, the

   You correctly answered: pressure in the thoracic cavity increases.

5. A tidal volume refers to the

   You correctly answered: amount of air inspired and then expired with each breath under resting conditions.

Experiment Results

Predict Question

1. 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 (FEV_1) can help a clinician determine the difference between obstructive and restrictive diseases. Specifically, an FEV_1 is the forced volume expired in 1 second.

In obstructive diseases such as chronic bronchitis and asthma, airway radius is decreased. Thus, FEV_1 will

Your answer: decrease proportionately.

Stop & Think Questions

1 Which muscles contract during quiet expiration?

You correctly answered: none of these muscles contract during quiet expiration.

2 **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.

You answered: 7500 ml/min.

3 A useful way to express FEV_1 is as a percentage of the forced vital capacity (FVC). Using the FEV_1 and FVC values from the data grid, calculate the FEV_1 (%) by dividing the FEV_1 volume by the FVC volume (in this case, the VC is equal to the FVC) and multiply by 100%.

Enter the FEV_1 (%) for an airway radius of 5.00 mm.

You answered: 73.9 %.

4 A useful way to express FEV_1 is as a percentage of the forced vital capacity (FVC). Using the FEV_1 and FVC values from the data grid, calculate the FEV_1 (%) by dividing the FEV_1 volume by the FVC volume (in this case, the VC is equal to the FVC) and multiply by 100%.

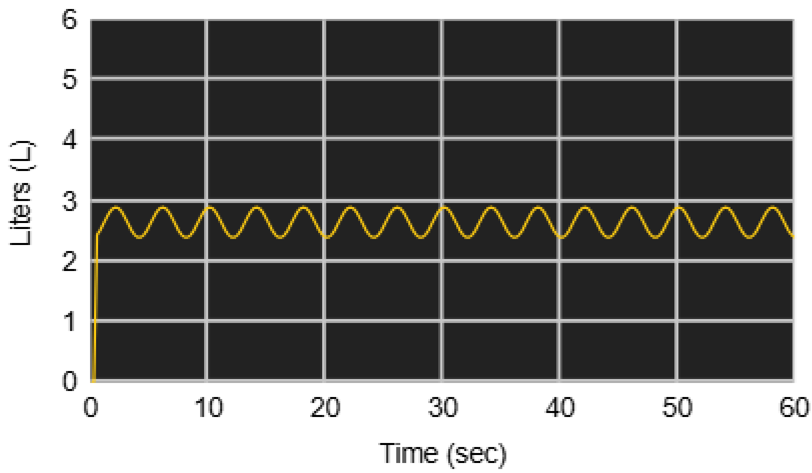
Enter the FEV_1 (%) for an airway radius of 3.00 mm.

You answered: 70.2 %.

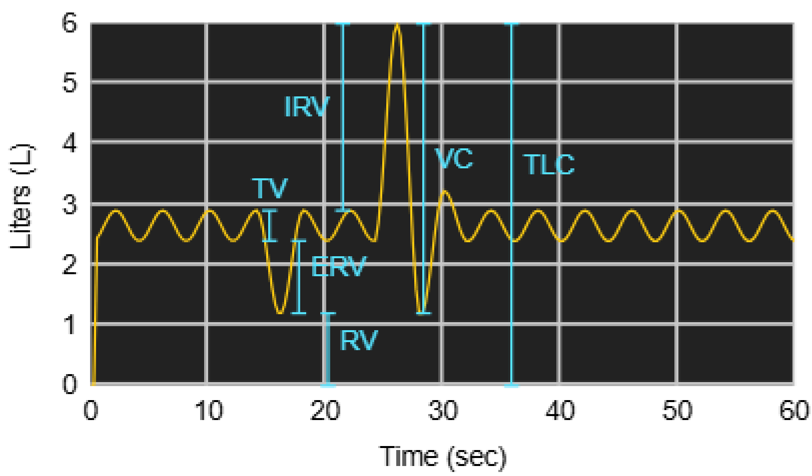
Experiment Data

Radius (mm)	Flow (ml/min)	TV (ml)	ERV (ml)	IRV (ml)	RV (ml)	VC (ml)	FEV_1 (ml)	TLC (ml)	BPM
5.00	7485	499	----	---	---	---	---	---	15
5.00	7500	500	1200	3091	1200	4791	3541	5991	15
4.50	4920	328	787	2028	1613	3143	2303	4756	15
4.00	3075	205	492	1266	1908	1962	1422	3871	15
3.50	1800	120	288	742	2112	1150	822	3262	15
3.00	975	65	156	401	2244	621	436	2865	15

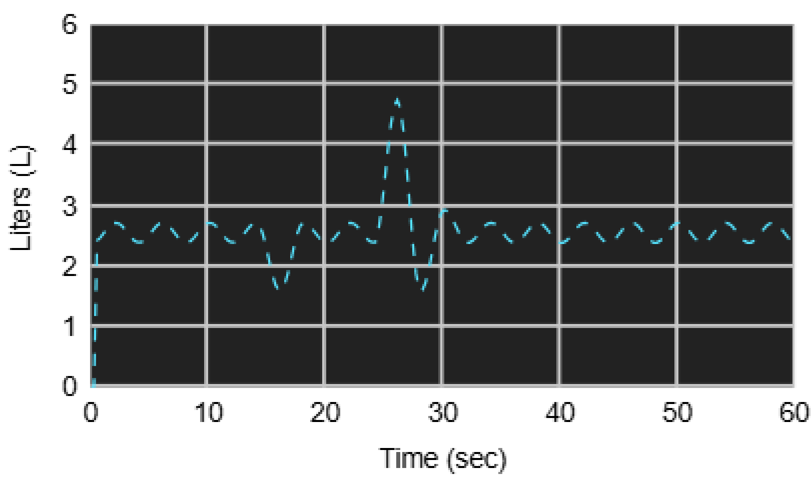
Baseline



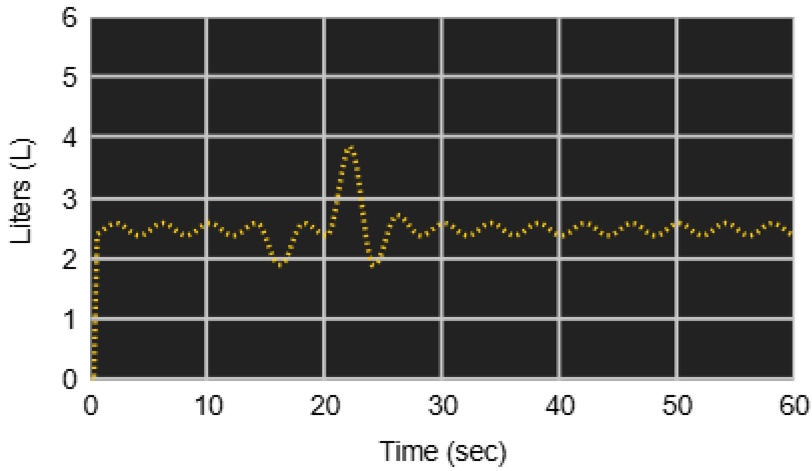
Airway radius = 5.00 mm



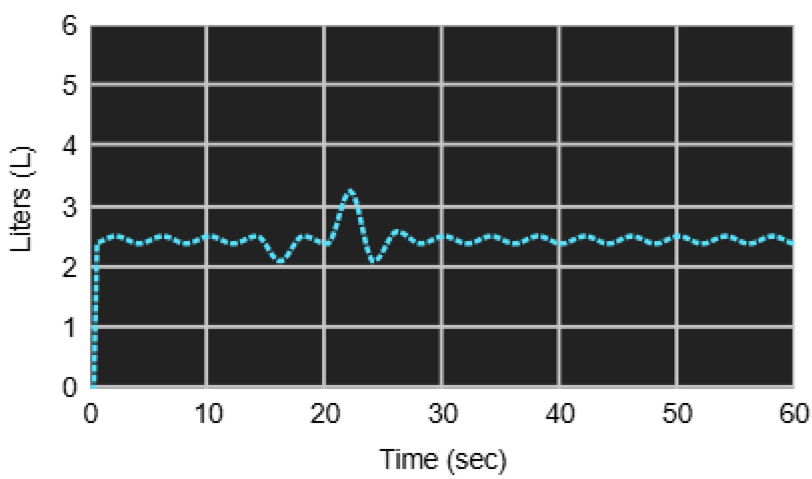
Airway radius = 4.50 mm



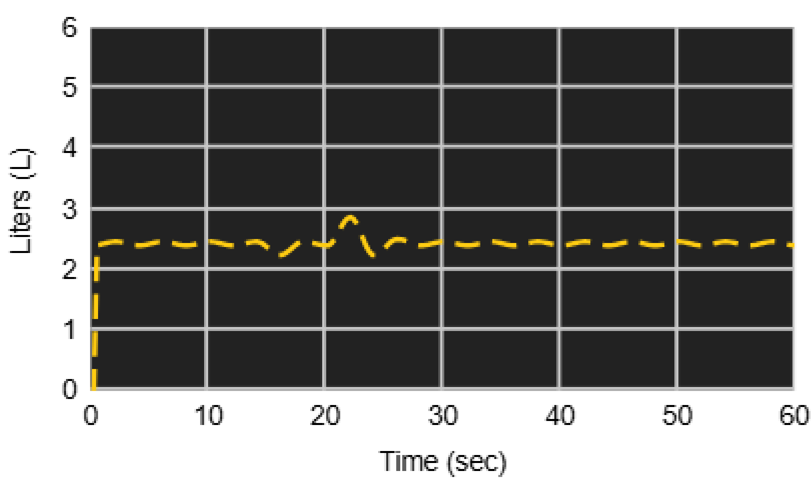
Airway radius = 4.00 mm



Airway radius = 3.50 mm



Airway radius = 3.00 mm



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: IRV.

2 Measuring a person's FVC means that you are measuring

You correctly answered: 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 FEV_1 means that you are measuring

You correctly answered: 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: reduce the airway resistance.

5 Which of the following values does *not* include the ERV?

You correctly answered: TV.

Review Sheet Results

1 What would be an example of an everyday respiratory event the ERV simulates?

Your answer:

Blowing out candles with a single breath.

2 What additional skeletal muscles are utilized in an ERV activity?

Your answer:

Intercostal and abdominals.

3 What was the FEV_1 (%) at the initial radius of 5.00 mm?

Your answer:

FEV1% at 5 mm was 73%.

4 What happened to the FEV_1 (%) as the radius of the airways decreased? How well did the results compare with your prediction?

Your answer:

As the airway radius decreased the FEV1 decreased proportionally. You can see this in the FEV1 column as the radius decreases so does FEV1.

5 Explain why the results from the experiment suggest that there is an obstructive, rather than a restrictive, pulmonary problem.

Your answer:

It suggests that there was an obstructive pulmonary problem.