

GAS EXCHANGE LAB WORKSHEET

Student Name _____

Teacher _____

Date _____

BACKGROUND:

Body cells use oxygen (O₂) to carry on their life functions and in the process, carbon dioxide (CO₂) is produced as a waste product. The hemoglobin in the red blood cells is the primary carrier for these two gasses. The blood transports the carbon dioxide from the cells to the lungs, where it is breathed out and released into the air. At the same time, the blood absorbs oxygen, which is carried back to the body cells. This process of gas exchange is called respiration.

As cellular activity in the lung increases, the cells increase the production of carbon dioxide, which is absorbed by the blood. This increased carbon dioxide level triggers a complex nerve process, which increases the breathing rate.

OBJECTIVE:

The purpose of this experiment is to measure the relative amounts of carbon dioxide in the air we exhale while at rest and after exercise.

HYPOTHESIS:

How do you think the amounts of carbon dioxide will compare between at rest and after exercising?

MATERIALS:

1. Drinking Straw
2. Universal indicator solution
3. Two plastic cups with 50ml of water
4. Bottle of ammonia with dropper

Procedure:

1. Sit quietly and take a normal breath.
2. Insert the straw into a cup containing 50 ml of water blow through the straw.
3. Add four drops of universal solution to the flask and stir.
4. Add ammonia one drop at a time to the indicator solution. Stir gently, after each drop and count the drops until it turns a light green for thirty seconds. Record the number in your data sheet.
5. With the help from a lab partner, use a chair to complete one minute of step exercises.
6. Repeat the same experiment for the carbon dioxide sample after exercising. Don't forget to count the drops of ammonia. Write down your data and your partner's data. Don't forget to average the results.

Data

	Student Names	Drops of Ammonia While Sitting	Drops of Ammonia After Exercise
I Need			

ANALYSIS: 1. What does the number of drops of ammonia tell us about the amount of carbon dioxide exhaled?

2. What have you discovered about the effect of exercise on the amount of carbon dioxide in your exhaled air?

3. How do your results compare to your predictions?

4. What could you say about the total amount of carbon dioxide you expel in a minute after exercising as compared to a minute at rest? Why?

Conclusion:

What would you conclude about the relationship between exercise and the amount of carbon dioxide you exhale?

PROJECT IDEAS (Implementing the Learning Cycle)

1. Find out how breathing into and out of a paper bag ten times at a normal rate affects the carbon dioxide level in your exhaled air.
2. Find out how holding your breath affects your carbon dioxide level.
3. Does sustained exercise for two or three minutes affect the amount of carbon dioxide in exhaled air?

GAS EXCHANGE LAB WORKSHEET (Possible Answers)

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As cellular activity in the lung increases, the cells increase the production of carbon dioxide, which is absorbed by the blood. This increased carbon dioxide level triggers a complex nerve process, which increases the breathing rate.

OBJECTIVE:

The purpose of this experiment is to measure the relative amounts of carbon dioxide in the air we exhale while at rest and after exercise.

HYPOTHESIS:

How do you think the amounts of carbon dioxide will compare between at rest and after exercising?

Answers will vary

MATERIALS:

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Procedure:

1. Sit quietly and take a normal breath.
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3. Add four drops of universal solution to the flask and stir.
4. Add ammonia one drop at a time to the indicator solution.
Stir gently, after each drop and count the drops until it turns a light green for thirty seconds. Record the number in your data sheet.
5. With the help from a lab partner, use a chair to complete one minute of step exercises.
6. Repeat the same experiment for the carbon dioxide sample after exercising. Don't forget to count the drops of ammonia.

*Write down your data and your partner's data. Don't forget to average the results.

Data

Student Names	Drops of Ammonia While Sitting	Drops of Ammonia After Exercise
	10	6
I Ne	13	7

- ANALYSIS:
1. What does the number of drops of ammonia tell us about the amount of carbon dioxide exhaled? (The greater number of drops of ammonia, the greater amount of carbon dioxide exhaled.)
 2. What have you discovered about the effect of exercise on the amount of carbon dioxide in your exhaled air? (One minute of exercise decreases the amount of carbon dioxide exhaled.)
 3. How do your results compare to your predictions? (Answers will vary. Some predictions will be supported and some will not be supported.)
 4. What could you say about the total amount of carbon dioxide you expel in a minute after exercising as compared to a minute at rest? Why? (The total amount of carbon dioxide is less than the amount at rest after one minute. This happens because oxygen demand increases and carbon dioxide is expelled faster.)

Conclusion:

What would you conclude about the relationship between exercise and the amount of carbon dioxide you exhale?

(As you exercise, your cells require more oxygen to produce more energy. As breathing increases, carbon dioxide is expelled faster and oxygen is taken in faster. The muscle cells will take in more oxygen to produce more energy. As a result, the concentration of oxygen increases and the concentration of carbon dioxide decreases.)