

Investigation 7.B: Carbon Dioxide and the Rate of Respiration

Question: How can the level of carbon dioxide in the body be altered?

Prediction

Predict what will happen if the level of carbon dioxide in the body is increased.

Safety Precautions

- Students with respiratory and heart disorders should not be subjects in this experiment.
- Do not hold your breath or hyperventilate long enough to cause faintness. At the first sign of faintness or dizziness, stop the experiment and resume normal breathing.
- Do not substitute a plastic bag for the paper bag in this investigation. Do not breathe into a paper bag for any longer than 15 seconds, because carbon dioxide can build up very quickly in the bloodstream. At the first sign of distress, remove the paper bag immediately and take several calm, natural breaths.

Materials

- paper bag
- stopwatch
- materials for recording data

Procedure

1. Work with a partner. Count the number of breaths your partner takes while resting in a sitting position for 3 min. Divide the number of breaths by 3 to calculate the number of breaths per minute. Record this value under “Resting” in the following data table.

Rates of respiration

Condition	Resting	After holding breath	After hyperventilating	While breathing into paper bag
Rate of respiration (in breaths per minute)				

2. Have your partner hold her or his breath for about 45 s. Then count the number of breaths that she or he takes in the next 3 min. Divide the number of breaths by 3, and record this value under “After holding breath” in your data table.
3. Ask your partner to take 10 fast, deep breaths. Then count the number of breaths she or he takes in the next 3 min. Divide the number of breaths by 3, and record this value under “After hyperventilating.”

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HANDOUT		

4. Ask your partner to place a large paper bag over her or his mouth. Then count the number of breaths she or he takes in the next 15 s. Multiply the number of breaths by 4, and record this value under “While breathing into a paper bag” in your data table.
5. Switch roles, and repeat steps 2 to 5.

Analysis

1. What effect did each condition—holding your breath, hyperventilating, and breathing into a paper bag—have on the level of oxygen and carbon dioxide in your body? Explain your results, with reference to the concentration of respiratory gases.

Conclusion

2. Based on your observations, describe the role of carbon dioxide in breathing.

Extension

3. Compare your results with the results of other students. What similarities and differences can you identify? Provide a hypothesis to account for the differences. Write a procedure to test your hypothesis.