

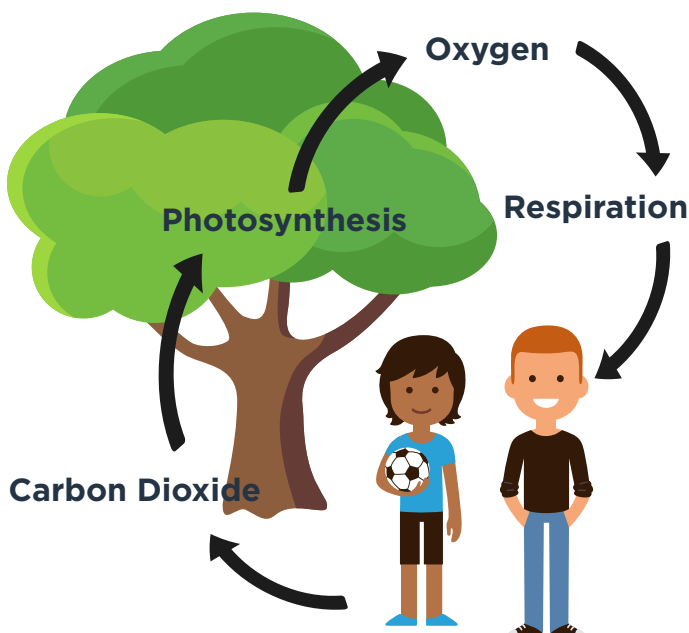


# CARBON ON THE MOVE

## OVERVIEW

The carbon cycle is the movement of carbon in and out of the atmosphere. Carbon is essential for life and helps to keep the Earth warm. One way carbon is removed from the atmosphere is photosynthesis, through which plants transform carbon dioxide into oxygen. Humans can take in this oxygen and turn it into carbon dioxide again, which is breathed out through respiration.

When exercising, a human's body requires more energy and therefore uses more oxygen. When more oxygen is used, more carbon dioxide is produced.



## PH SCALE



pH is a measure of the acidity or alkalinity of a solution. An alkaline solution is also referred to as a base. When carbon dioxide comes into contact with water, carbonic acid is formed. The presence of this reaction can be seen through this experiment.

## RELATED PROJECT AREAS

- Energy
- Environmental Stewardship
- Health/Fitness
- Meteorology/Weather/Climate
- Natural Resources
- Science/Engineering/Technology

## LIFE SKILLS

Critical Thinking, Keeping Records, and Learning to Learn

## STEM ABILITIES

Hypothesize, Observe, Compare/Contrast, and Interpret/Analyze/Reason



# #OK4HSTEM

## MATERIALS

- 0.04% Bromothymol Blue (BTB Solution) \* Note: This can be ordered online or found in most pet stores. It will be labeled a pH test solution (such as API).
- Clear plastic cups
- Straws
- Water
- Eyedroppers
- Stopwatch

## STEPS

1. Pour a cup of water in to a clear plastic container.
2. Add 1 dropper full of BTB solution and stir.
3. Get stopwatch ready and insert straw into solution.
4. Begin timing, blow into solution until it turns greenish/yellow. Record the time.
5. Prepare another cup of BTB solution—as in steps 1 and 2.
6. Conduct 1 minute of exercise (jumping jacks, running in place, etc.).
7. Begin timing, blow into solution until it turns greenish/yellow. Record the time.
8. Compare of the time of the two trials.

## CRITICAL THINKING

Which trial turned the solution to green more quickly? Why?

## ADDITIONAL ACTIVITIES

### More People, More Carbon?

Have two students blow into the BTB solution at the same time. Record time. How does this compare to the other trials?

### Acids and Bases

Add a small amount of baking soda (a base) to the green solution. What happens?

Add a small amount of lemon juice (an acid) to a BTB solution. What happens? Try other acids and bases to see their effects on the pH level. Have fun!

## RESOURCES

Dimenna, F. (2017, September). What effect does exercise have on the amount of carbon dioxide you release? Retrieved from: <https://www.livestrong.com/article/524672-what-effect-does-exercise-have-on-the-amount-of-carbon-dioxide-released-by-the-blood/>

Mission Science Workshop. (2013). Breathing blue. Retrieved from: <http://studylib.net/doc/8786557/breathing-blue--community-science-workshop-network>

National 4-H Council. (2010). 4-H NYSD 2010: 4-H2O. Retrieved from: <https://4-h.org/parents/national-youth-science-day/4h2O/>