What Contains Carbon?

GRADE LEVEL	3rd-8th; California Content Standards for 3rd through 8th
SUBJECTS	Life Sciences, Physical Sciences, Investigation and Experimentation
DURATION	Activity: 30 minutes
SETTING	Classroom

Objectives

In this activity, students will:

1. learn that carbon is an extremely common element on the earth.
2. learn that carbon can be found in many forms, in both living and non-living things.

Materials

pencils
What Contains Carbon Worksheet (1 per student)
seashell
piece of wood
plastic
fabric
carbonated beverage
cup of water
other carbon-containing objects (optional)

Vocabulary

- carbon: a naturally abundant, nonmetallic element that occurs in all organic compounds and can be found in all known forms of life
- carbon dioxide: a colorless, odorless gas that is present in the atmosphere, breathed out during animal respiration, produced by decaying plants, used by plants in photosynthesis, and formed when any fuel containing carbon is burned
- hydrocarbon: compound containing only hydrogen and carbon and often occurring in fossil fuels
- carbonate: to add carbon dioxide to a substance, such as a beverage

Teacher Background

Carbon is an extremely common and important element on the earth. It comprises approximately 50% of all living tissues and is present in all four major spheres of the planet: biosphere, hydrosphere, atmosphere, and lithosphere. This activity is meant to show students that we can find carbon in many forms all around us.

Most of us don't go around counting the number of things that contain carbon, but if you do this exercise, you will quickly see that a lot of different objects contain carbon. Your body contains

carbon. The air you breathe contains carbon dioxide. The food you eat contains carbon. The clothes you wear contain carbon.

The objects suggested for this activity also all contain carbon. Seashells come from organisms that extract calcium and carbon from the water around them to form calcium carbonate shells. Wood contains carbon because it comes from a plant that once completed photosynthesis, taking in carbon dioxide to produce glucose. Plastic is derived from petroleum, which contains hydrocarbons, compounds composed entirely of hydrogen and carbon. Different kinds of fabric contain carbon that comes from different places depending on the type of fabric it is. If it is a plant-based fabric such as cotton, the carbon comes from the photosynthetic process. If it is polyester, it is made from two petroleum products, one of which contains carbon. Carbonated beverages are named for the carbon dioxide gas that has been dissolved in the liquid, creating their fizz. Regular water also contains carbon dioxide, although in much lower concentrations than carbonated beverages. This is because carbon dioxide can freely diffuse into water.

Although carbon is not in everything, like aluminum cans and glass windows, it is in many different objects that we encounter in our daily lives. Carbon is present in the living and non-living parts of the planet, as a component in organisms, rocks, atmospheric gases, and water. Not only does carbon occur in all theses spheres, but individual carbon atoms actually cycle between the different spheres, moving from one sphere to another through a variety of processes. Besides the relatively small additions of carbon from meteorites, the amount of carbon on the planet is stable. The amount of carbon in any given sphere of the planet however can increase or decrease depending on the functioning of the carbon cycle.

Activity

Introduction

- ❖ Ask students, “Is carbon good or bad?”
- ❖ Discuss what students already know about carbon, making a table on the board. See the example table below.

What is **Good** about Carbon?	What is **Bad** about Carbon?
• Carbon is an important element in living things. • Plants need carbon dioxide to photosynthesize. • Carbon dioxide in the atmosphere keeps the planet warm and livable. • Some of the things we use everyday contain carbon. For example, the graphite in pencils is carbon.	• Too much carbon dioxide in the atmosphere changes the climate. • Too much carbon dioxide dissolving in the ocean makes it more acidic, which can harm animals and plants that are adapted to less acidic environments. • Carbon dioxide and other gases react with water to form acid rain. • Chlorofluorocarbons deplete the ozone.

- ❖ Tell students that carbon itself is good. It is an integral part of life on earth. But, carbon can cause negative consequences. Although the amount of carbon on the planet remains consistent, there can be more or less in various places on the planet.

For humans, it is important for there to be certain levels of carbon in the atmosphere and ocean. Too much carbon in the atmosphere or in the ocean can be a bad thing.

- "What is it?" *(Carbon is an element that is in both living and non-living things.)*

Procedure

- Ask students, "What kinds of things contain carbon?" and list their responses on the board.
- Show students all of the objects.
- Tell students that they will have to hypothesize about whether these objects have carbon in them or not.
- Pass out a What Contains Carbon Worksheet to each student.
- Have students work in groups to decide whether each object contains carbon or not. Then, have students work individually to fill out their worksheets and explain their answers.
- Once students have finished filling out the worksheet, bring them together as a class to discuss the answers.
- Discuss each object and explain why it contains carbon. See the teacher background section for details.
- At the end of this discussion, ask students what percentage of the objects contain carbon. *(100%)*

Wrap-Up

- As a class, classify the objects into living and non-living groupings, including things that used to be alive as living. *(You can classify the seashell and the wood as living and the plastic, fabric, water, and carbonated beverage as non-living. But, it is a bit more complicated than that as the fabric may have come from living plants such as cotton, and the plastic came from hydrocarbons, which were formed millions of years ago from living things. This complication shows that carbon can be in both living things and non-living things and that it moves from one type of thing to another.)*
- Now that students have a better idea of how common carbon is, ask them to fill in the last three rows of the worksheet with other items in the classroom.

Extension

Follow this activity with the "Carbon Cycle Role-Play" and/or "Carbon Cycle Poster" activities.

References

Adapted from Durrett, G. Carbon: Is too much of a good thing bad? Louisiana Public Broadcasting. Retrieved on January 18, 2008 from http://www.lpb.org/education/classroom/itv/envirotacklebox/nttifiles/etpdf/6gdCarbon.pdf

Mackenzie, F.T. (2003). *Our Changing Planet: An Introduction to Earth Science and Global Environmental Change.* Upper Saddle River, NJ: Prentice Hall.

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Tarbuck, E.J., & Lutgens, F.K. (2002). *Earth: An Introduction to Physical Geology.* Upper Saddle River, NJ: Prentice Hall.

Correlated California State Content Standards

Grade Three
Physical Sciences
1h. Students know all matter is made of small particles called atoms, too small to see with the naked eye.

Grade Five
Physical Sciences
1h. Students know living organisms and most materials are composed of just a few elements.

Life Sciences
2f. Students know plants use carbon dioxide (CO_2) and energy from sunlight to build molecules of sugar and release oxygen.
2g. Students know plant and animal cells break down sugar to obtain energy, a process resulting in carbon dioxide (CO_2) and water (respiration).

Investigation and Experimentation
6a. Classify objects (e.g., rocks, plants, leaves) in accordance with appropriate criteria.

Grade Eight
Life Sciences
6a. Students know carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living organisms.
6b. Students know that living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur.

What Contains Carbon?

Name:_____ **Date:_____**

Object	Carbon	No Carbon	Explain Your Answer
Seashell			
Wood			
Plastic			
Fabric			
Carbonated Drink			
Water			