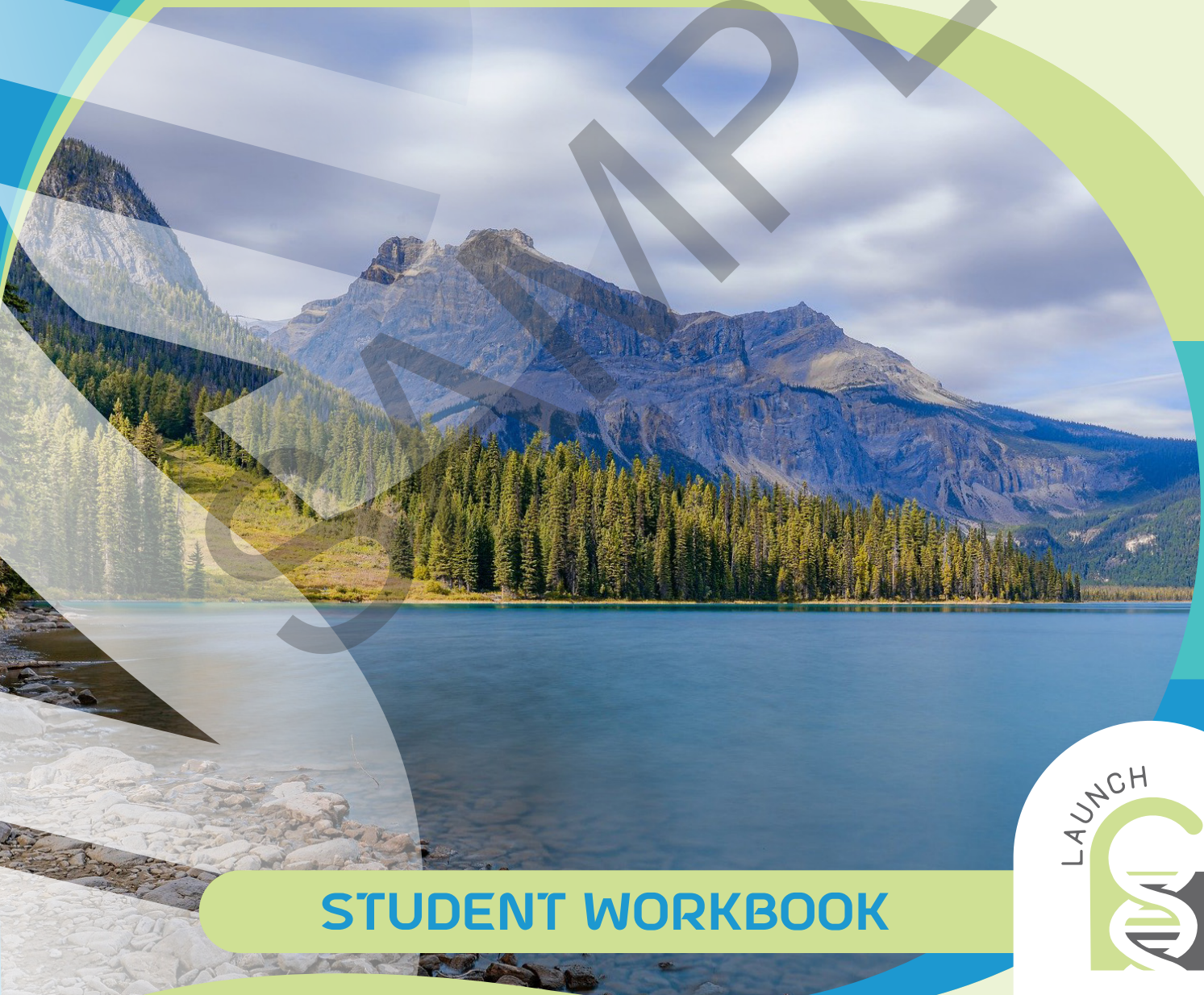
GOING IN CIRCLES



STUDENT WORKBOOK

LAUNCH

ACTIVITY 2

WHAT NATURE TELLS US

Carbon's role in the cycling of matter and energy is more than just the model or a set of fun facts. Just as your car starts and runs because of carbon, our ability to grow and eat food is also affected by carbon.

LEARNING GOALS:

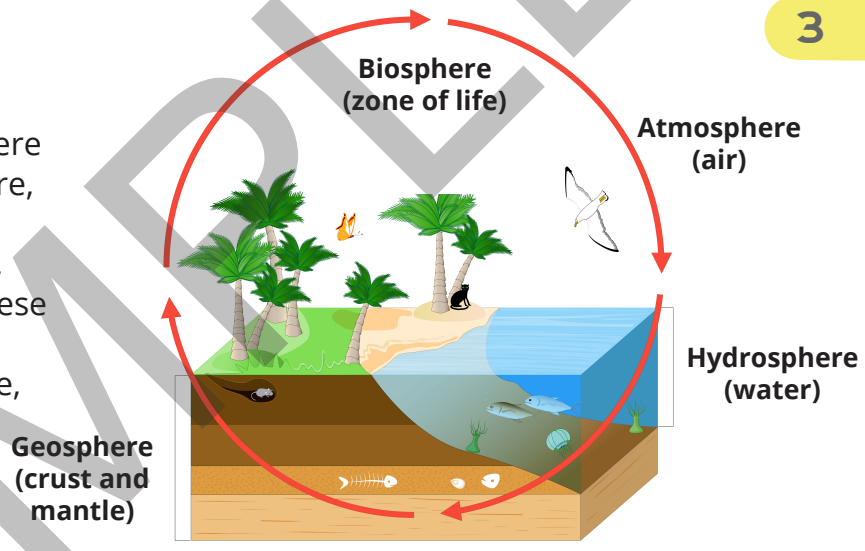
- I can make a model showing how Earth's materials are cycled, including how energy drives the cycle.
- I can make a quantitative model showing how carbon cycles among the hydrosphere, atmosphere, geosphere, and biosphere.

SPHERES, CIRCLES, AND CYCLES, OH MY!

3

Earth's "Spheres"

Traveling Carbon introduced how carbon, a type of matter, cycles through Earth's systems. There were 8 different reservoirs – atmosphere, deep ocean, fossil fuels, marine organisms, ocean's surface, rocks, soil, and terrestrial organisms. These reservoirs can be condensed into four Earth "spheres" – atmosphere, biosphere, geosphere, and hydrosphere.



PREDICT:

Which of the 8 reservoirs do you think falls under each Earth "sphere"?

Atmosphere	Biosphere
Geosphere	Hydrosphere

Not all atmospheric gases lead to the greenhouse effect, as oxygen (O_2) and nitrogen (N_2) make up the majority the atmosphere, and do not trap heat. Carbon, as part of CO_2, is one of the most impactful and abundant greenhouse gases.

Since the Industrial Revolution, as you saw in Traveling Carbon from Activity 1, more carbon has been released into the atmosphere than prior to the Industrial Revolution. Even small increases in the amount of atmospheric carbon can have an effect, which is why many scientists are calling for society to make behavior changes that can reduce carbon output.

While global temperature changes are not always "felt" around the world, we can see the impact of the greenhouse effects when we look to the trees. One impact seen from the greenhouse effect is that the increased warmth leads to increased transpiration from plants, like trees. This results in more water vapor in the atmosphere, thus increasing cloud production. With more clouds, we see more wet weather (i.e. rain, snow, hail) and consequently different weather patterns from year to year.

"Want to know more about transpiration? Keep reading to find out in Activity 3."

Although weather and climate are not synonymous, the changes in weather patterns have been found to change climates around the world.

REFLECT

1. What is your experience with climate change and atmospheric carbon?

2. How was the relationship between the Industrial Revolution and atmospheric carbon made evident in Traveling Carbon?

3. What is the relationship between carbon and climate?

Carbon, found in group 14 on the periodic table, has four valence electrons. Each of those electrons can form a covalent bond with other elements. When carbon covalently bonds to other elements, what is formed is called a **compound**, or a type of matter that has only one type of particle, but each particle is two or more atoms bonded together in the same way every time.

In fact, compounds made mostly of carbon or hydrogen are known as **organic compounds**. Because a carbon atom can form bonds with 1, 2, 3, or 4 other atoms, organic compounds have a lot of variety in their sizes and shapes, which affects their properties. Organic compounds are the polymers, or large molecules, that are present in organisms, such as lipids, proteins, carbohydrates, and nucleic acids.

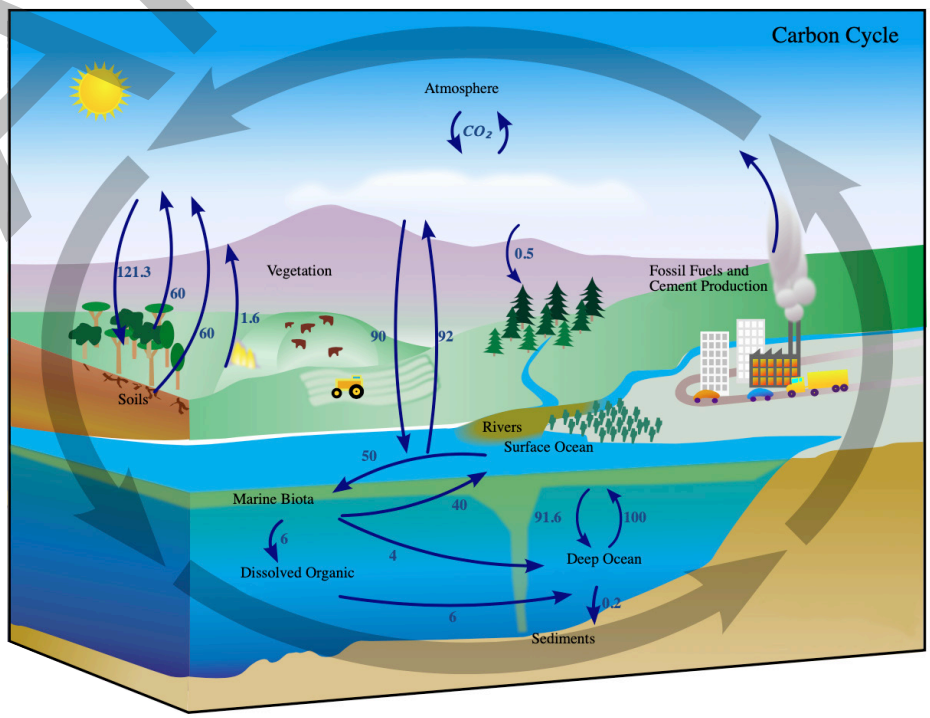
You might be thinking, "Hey! I know what organic means, but it's not the same thing as an organic compound." This is because the word "organic" has many different meanings depending on when and how it is used. For example, organic food is food grown without the use of pesticides and fertilizers. However, all produce is made of organic compounds, which can make the use of the term "organic" confusing.

Another use for the word "organic" is material that is living or was once living. In this way, organic can refer to body tissues, excretions, or even decayed organisms.

Although organic has different meanings, within this kit we will refer to organic in relation to organic compounds, or pure substances made mostly of carbon or hydrogen.

The Carbon Cycle

Now that you have some background information on carbon and organic compounds, let's look at how carbon actually cycles through Earth.



In Traveling Carbon, carbon moved between reservoirs. The carbon cycle is how carbon cycles among these reservoirs. One of those reservoirs that is also one of Earth's "spheres" is the atmosphere.

LAUNCH

SCIENCE UNLOCKED

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Kit	SU-GOCIRC
Instructions	IN-GOCIRCS
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