



Name: \_\_\_\_\_ Date: \_\_\_\_\_ Group: \_\_\_\_\_

## Carbon Interrupted

(Lexile 1140L)



- 1 The element carbon is one of the most important elements for biological life because it is so versatile. Carbon can form up to four chemical bonds by the nature of the way that it bonds to other elements. This large number of bonding possibilities makes carbon able to form varied, large, and intricate molecules. Some form of carbon is found in all forms of life, and most organisms require some form of carbon for a large part of their food sources. But, where does all of the carbon come from, and where does it go? Let us take a journey and follow a single carbon atom through the many stages and forms in which it may find itself. This carbon atom will be referred to as “our carbon” atom.
- 2 Our carbon atom begins its journey in the atmosphere as an element in the compound  $\text{CO}_2$ , or carbon dioxide gas. As a naturally occurring gas in the atmosphere,  $\text{CO}_2$  is the carbon source for a surprisingly large number of biological organisms. The  $\text{CO}_2$  with our carbon atom will remain in the atmosphere until it reaches the outer surface of a leaf of a tree. Here, the  $\text{CO}_2$  gas will enter the leaf through an opening called a stoma.
- 3 An amazing transformation occurs once the  $\text{CO}_2$  molecule enters the leaf. The carbon dioxide enters a chloroplast within the leaf and is drawn into a photosynthetic process called the Calvin (light-independent) Cycle. Here, the carbon atom from the  $\text{CO}_2$  molecule is added to a sugar molecule that is synthesized during this process. In the leaf of a plant, the carbon is moved from a  $\text{CO}_2$  molecule to a glucose sugar molecule, or  $\text{C}_6\text{H}_{12}\text{O}_6$ .
- 4 The carbon of that sugar molecule may attach to such molecules as starch, cellulose, or lignin inside the tree. On this journey, our carbon atom will remain attached to the glucose sugar and will move to the fruit of the tree through the xylem system. The glucose will remain in the fruit until the fruit drops onto the grass. Animals find the fruit sweet and good to eat. In this case, an animal eats the fruit containing our carbon atom, which is a part of the sugar molecule. The fruit is digested in the stomach and intestine of the animal. Then, the nutrients are absorbed and carried to the cells of the animal. Our carbon atom then goes through another incredible transformation.



- 5 The carbon in the sugar ( $C_6H_{12}O_6$ ) enters a cell of an animal. In the cytosol of the cell, the sugar is broken down into two smaller molecules called pyruvate, one of which holds our carbon. Once the sugar unit is broken down into the smaller molecule pyruvate, it can enter into the mitochondria where it goes through a process of further breakdown. This process is called the Krebs Cycle and breaks the pyruvate into  $CO_2$  molecules. Again, our carbon atom becomes part of a  $CO_2$  molecule. The  $CO_2$  is released back into the atmosphere with the animal's next breath.
- 6 Not long after the animal breathes out the  $CO_2$  molecule, it travels over the surface of a shallow ocean and is absorbed by a photosynthetic phytoplankton, in much the same process as the plant leaf. Our carbon atom is integrated into a sugar molecule again during photosynthesis. It is carried by this phytoplankton until a larger organism, a zooplankton, eats it. This organism is then eaten by a small fish, which is then eaten by a larger fish, a salmon. Once inside the salmon, our carbon atom is incorporated into a protein. The carbon atom is used over and over inside this salmon. For instance, once the original protein degrades into amino acids, it can become yet another protein. Once the amino acids degrade, however, our carbon becomes part of a fat molecule, a hydrocarbon. Here, the carbon stays for quite some time.
- 7 Our carbon atom is carried up a river in the body of the salmon during the salmon "mating run" as hormones signal to the salmon that it is time to mate. As the fat stores of the salmon are consumed during the journey, our carbon atom moves within the cells to become part of the hormone (a lipid or protein) that triggers the salmon to spawn. The salmon eventually dies after spawning in the stream in which it was born. The salmon's body washes ashore and decomposes.
- 8 Our carbon atom from the decomposing biomass of the fish now becomes available in the soil for microorganisms. Bacteria consume the carbon atom in the hormone in the salmon's blood, and our carbon atom finds a resting place in the soil. Eventually, the carbon will return to the atmosphere as either  $CO_2$  or  $CH_4$  (methane), and the carbon atom will begin another incredible journey. Our carbon atom may have been traveling for millions of years, and over the next million years, it will have many new and exciting adventures. The movement from atmosphere to plant to animal to another location is all a part of what we refer to as the carbon cycle.



- 1** Based on a close reading of Paragraphs 2-5, which of the following statements is true?
- A** Carbon atoms move between the atmosphere and organisms connecting Earth's biosphere and atmosphere.
  - B** Carbon atoms move through several locations, but remain in the atmosphere for their long journey.
  - C** Once a carbon atom becomes a part of a sugar, it will remain chemically bonded in that form.
  - D** Carbon can only enter an animal's body when it takes in sugars from photosynthesis in plants.
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- 2** Which of the following statements is NOT true regarding the element carbon?
- A** Carbon can only form a few types of chemical compounds.
  - B** Carbon may be found in many types of molecules.
  - C** Carbon can bond to other molecules in a variety of ways.
  - D** Carbon is a critical element found in all biological organisms.
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- 3** What happened to the carbon atom when it entered the plant through the stoma on the leaf?
- A** It moved from a sugar molecule to a carbon dioxide molecule.
  - B** It moved from a gas molecule to a protein molecule.
  - C** It moved from a carbon dioxide molecule to a sugar molecule.
  - D** It remained a carbon dioxide molecule in the leaf.



**4** Carbon may appear in more than one form on Earth. Several of those forms were discussed here. What was one form that was not discussed?

- A** Carbon dioxide —  $\text{CO}_2$
  - B** Glucose sugar —  $\text{C}_6\text{H}_{12}\text{O}_6$
  - C** Calcium carbonate (limestone) —  $\text{CaCO}_3$
  - D** A hydrocarbon — a CH chain
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**5** Carbon is an important element for biological life because it —

- A** is always attached to oxygen atoms.
  - B** can form varied, large, and intricate molecules.
  - C** it is stable and does not easily go through changes.
  - D** it is only found in plant species such as trees.
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**6** Which of the following statements is false?

- A** Carbon can be stored in the body fat of a salmon.
- B** Carbon can move within the cells of an organism.
- C** Carbon is degraded by amino acids.
- D** Carbon can remain in soil bacteria for a long time.