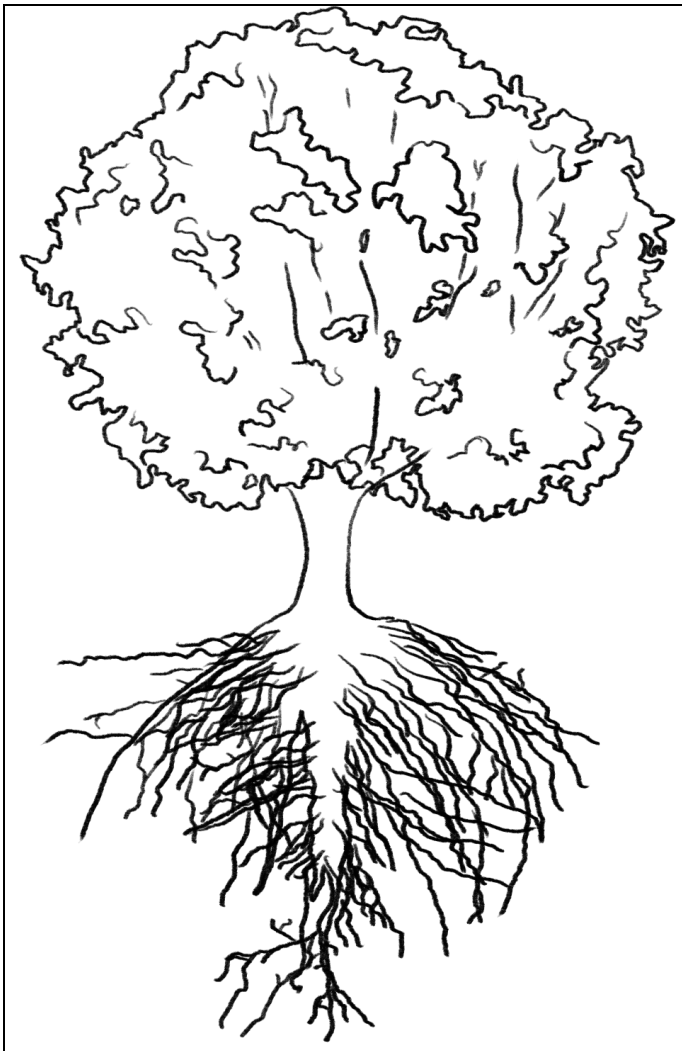
Name _____ Teacher _____ Date _____

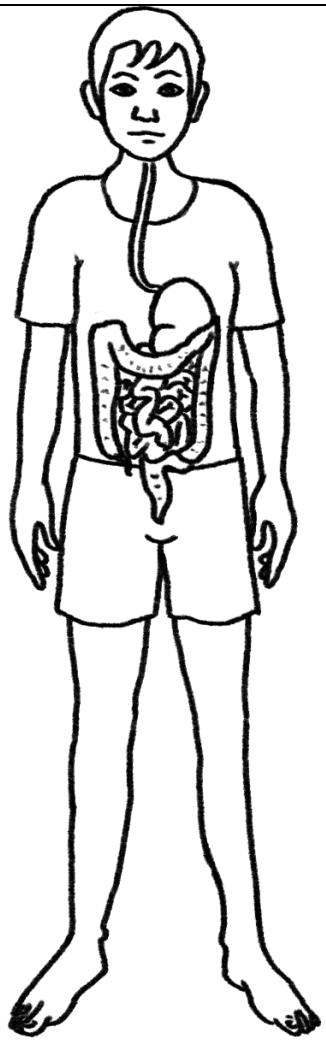
6.3 Grading the Comparing a Growing Tree and a Growing Child Worksheet

*This worksheet has "grading" in the title because at this point, students can be held accountable for correct answers. Level 4 (correct) responses to the questions are in **blue bold italics** below. Red italics suggest ways to grade student responses by giving them points for correct or partially correct answers. There are 10 points total on this worksheet.*

Compare the pathways that carbon atoms take through a growing tree and a growing child.



Draw arrows to show where carbon atoms enter the tree and the pathway through the tree that they take to reach its growing root.



Draw arrows to show where the carbon atoms enter the child and the pathway through the child that they take to reach a growing leg muscle.

Tell the story of what happens to the carbon atoms as they travel through the tree and the child by completing the table on the next page.

Telling the story of the carbon atoms

Use the table below to tell a step-by-step story of what happens to the carbon atoms in the tree and the child.

Stage in the story	***Tree story***	***Child story***
Words to use:	Include these words in your tree story (you can use a word more than once): • Photosynthesis • CO_2 • Glucose • Small organic molecule • Large organic molecule • Biosynthesis • Cellular respiration	Include these words in your child story (you can use a word more than once): • Digestion • CO_2 • Glucose • Small organic molecule • Large organic molecule • Biosynthesis • Cellular respiration
1. Entering the tree or child: Explain where and how carbon atoms enter the tree or child and what kind of molecules the atoms are in.	***Carbon dioxide and water enter into the tree's leaf cells.***	***C atoms come from food (containing organic molecules) that the child eats***
2. First chemical change: Describe the first chemical change that rearranges the atoms into more useful molecules.	***Carbon dioxide and water are changed into glucose and oxygen during photosynthesis in the leaf cells. (Light energy is transformed into chemical energy stored in the C-C and C-H bonds in glucose).***	***Large organic molecules in food are digested into smaller organic molecules. (Chemical energy in C-C and C-H bonds of large organic molecules is still present as chemical energy in small organic molecules.)***
3. Traveling: Explain how the molecules with carbon atoms move…	…to a cell in the root of the tree. ***The sugar made in in the leaves by photosynthesis travels from the leaves to all parts of the tree, including the roots.***[1]	…to a cell in the leg of the child. ***The blood carries small organic molecules to all parts of the child's body, including the leg.***
4. Cellular growth: Explain how the cell changes some molecules to grow and divide into more cells.	***The cells make large organic molecules through a two-step process:*** ***1. Other small organic molecules are made from glucose and atoms in soil minerals such as nitrogen.*** ***2. The small organic***	***Small organic molecules are bonded together inside the cells to make large organic molecules.***

[1] *The vessels carrying the sugar to the roots are called the phloem. You may want students to include this information.*
Although we do not include this in readings or PowerPoints, the sugar traveling through the phloem is actually a disaccharide, sucrose ($C_{12}H_{22}O_{11}$).

	molecules are bonded together to make large organic molecules.	
5. Cellular energy: Explain how the cell changes some molecules to get energy for growth and cellular work.	***Glucose reacts with oxygen to produce carbon dioxide and water: the process of cellular respiration. Chemical energy in glucose (in C-C and C-H bonds) is transformed into motion and heat energy (and energy for other cell functions).***	***Glucose reacts with oxygen to produce carbon dioxide and water: the process of cellular respiration. Chemical energy in glucose (in C-C and C-H bonds) is transformed into motion and heat energy (and energy for other cell functions).***

1 point for each correct cell in the table. 10 points total.