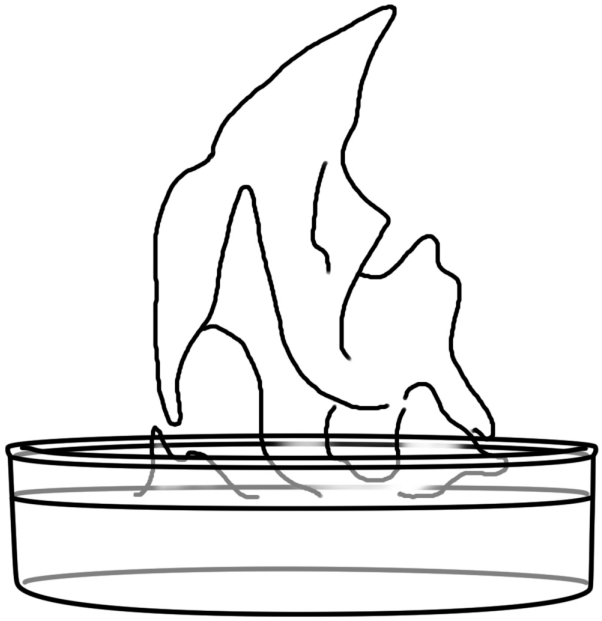
Name _____ Teacher _____ Date _____

6.2 Grading the Comparing Animals and Flames Worksheet

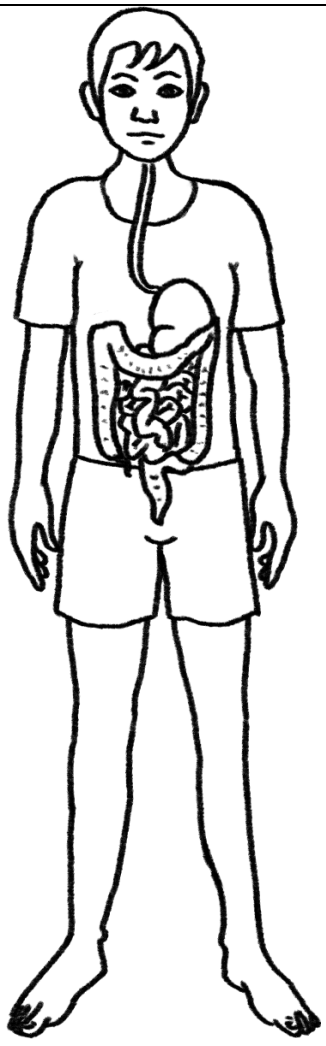
*This worksheet has "grading" in the title because at this point, students can be held accountable for correct answers. Level 4 (correct) responses to the questions are in **blue bold italics** below. Red italics suggest ways to grade student responses by giving them points for correct or partially correct answers. There are 17 points total on this worksheet.*

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



Draw arrows to show where carbon atoms enter the flame and the pathway that they take through the flame.

Label the arrows as organic molecules (OM) or carbon dioxide (CO_2)



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

Label the arrows as large organic molecules (LOM), small organic molecules (SOM) or carbon dioxide (CO_2).

Flame should show:

- ***Organic molecules (OM) going into the flame from below.***
- ***CO_2 leaving the flame going up.***

Child should show:

- ***Large organic molecules (LOM) going through the digestive system***
- ***Small organic molecules (SOM) going from intestine to leg.***
- ***CO_2 going from muscle to mouth or nose (via lungs, not shown in drawing).***

1 point for each correct arrow. 5 points total

Tell the story of what happens to the carbon atoms as they travel through the flame 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 flame and the child.

Stage in the story	***Flame story***	***Child story***
Words to use:	Include these words in your flame story (you can use a word more than once): • Combustion • CO_2 • Organic molecule • Oxygen (O_2)	Include these words in your child story (you can use a word more than once): • Digestion • CO_2 • Oxygen (O_2) • Organic molecule • Cellular respiration
1. Where do the carbon atoms come from? Explain where and how carbon atoms enter the flame or child and what kind of molecules the atoms are in.	***C atoms come from the fuel (made of organic molecules) that vaporizes and enters the flame.***	***C atoms come from food (containing organic molecules) that the child eats***
2. Why do the flame and the child both need oxygen? Explain how oxygen helps the flame to burn and the child to move.	***The flame needs oxygen to react with the fuel in the process of combustion.***	***The child's cells need oxygen to react with organic molecules in the process of cellular respiration.***
3. What energy transformations take place? Explain how energy is transformed when the flame burns or the child moves.	***Chemical energy (in C-C and C-H bonds) is transformed into heat and light energy.***	***Chemical energy (in C-C and C-H bonds) is transformed into energy for movement, cell functions, and heat.***

Stage in the story	Flame story	Child story
4. How is matter transformed when the flame to burns or the child moves? Explain the chemical change that goes with the energy transformation.	***The organic molecules in fuel combine with oxygen to produce CO_2 and H_2O.***	***The organic molecules in food combine with oxygen to produce CO_2 and H_2O.***
5. How do carbon atoms leave the flame or the child Explain how carbon atoms leave the flame or the child.	***Carbon atoms leave in CO_2 molecules going out the top of the flame.***	***Carbon atoms leave in CO_2 molecules carried by the blood to the lungs, then breathed out.***

1 point for each correct answer (10 points total)

Which is more true?

Flames and children can both grow larger. And there are chemical changes when they grow. Compare the chemical changes, then choose one of the statements below that you think is more true than the other:

MORE TRUE ***LESS TRUE*** A growing flame is like a child growing larger and stronger.

MORE TRUE LESS TRUE A growing flame is like a child running faster.

1 point for correct answer.

Explain your reasoning. When a flame grows, is it more like a child growing or a child running faster?

In a flame, organic molecules are oxidized—combined with oxygen to produce CO_2 and H_2O. This is more like cellular respiration when a child runs than like biosynthesis when a child grows.

1 point for correct explanation pointing to similarity between the chemical processes of combustion and cellular respiration.