



S'mores Lab



A major part of camping and campfires is roasting marshmallows and eating s'mores. But have you thought about the chemistry of roasting marshmallows and making s'mores?

Purpose:

To review the following topics: physical & chemical properties, physical & chemical changes, endothermic & exothermic reactions, Law of Conservation of Mass, balancing chemical equations, and identifying reactants & products.

Safety:

- Use caution with the flame. Do NOT start the skewer on fire. If you are found “playing with fire” you are done with the lab, and you will have lunch detention.
- Should your marshmallow accidentally catch fire – simply blow it out.

Materials:

- wooden skewer
- 1 graham cracker
- 2 large marshmallows
- ½ chocolate bar

Procedure:

1. Complete the pre-lab questions before making your s'mores.
2. Make the necessary observations that are needed to complete the data section on the back.
3. Heat the marshmallow in the flame using the wooden skewer to hold the marshmallow. 4.

Put together the s'more.

5. Eat.

6. Enjoy. ☺

7. Clean up the lab area.

Pre-Lab Questions:

1. Why do you think marshmallows burn (or catch on fire) so easily? _____

2. If you use a wooden stick to roast your marshmallows, do you think the wooden stick will catch on fire like the marshmallows? Why or why not? _____

3. Why do you think marshmallows puff and expand when you roast them? _____

S'more Data:

Part 1: Physical & Chemical Properties of the REACTANTS

Property	Graham Cracker	Marshmallow	Chocolate
Physical #1			
Physical #2			
Physical #3			
Physical #4			
Chemical #1			

Part 2: Physical & Chemical Properties of the PRODUCTS

Property	Marshmallow	Chocolate
Physical #1		
Physical #2		
Physical #3		
Physical #4		
Chemical #1		

Questions:

1. Describe a physical change that you observed in this lab.

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2. What are three indicators that a chemical reaction has taken place?

- a. _____
b. _____
c. _____

3. The chocolate melts and goes through a phase change. What change is that? a.

_____ to _____

4. "Combustion is a chemical reaction." What word below is a synonym for combustion? a. Extinguish b. flammability c. fire-proof

Using the list of things that happened during your s'more making, circle if it was a chemical or physical change:

1. Marshmallow got warmer CHEMICAL PHYSICAL 2. Marshmallow turned brown

CHEMICAL PHYSICAL 3. Chocolate melted CHEMICAL PHYSICAL 4. Black "stuff"

formed on the marshmallow CHEMICAL PHYSICAL

5. You broke the graham cracker in half CHEMICAL PHYSICAL 6. You bit the s'more

with your teeth CHEMICAL PHYSICAL 7. The s'more was digested CHEMICAL

PHYSICAL

State if the following changes in thermal energy during the lab were endothermic (heat in) or exothermic (heat out).

1. The burning flame: _____

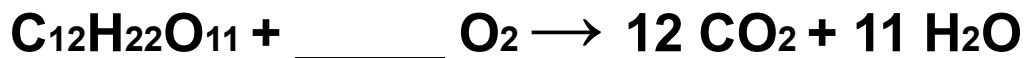
2. The heating of the marshmallow: _____

3. The melting of the chocolate from the hot marshmallow: _____

4. The cooling down of the s'more so it wouldn't burn your mouth: _____

5. The digestion of the s'more: _____

Below is the chemical formula for the burning of sugar in a marshmallow. Count the atoms on both sides of the arrow. Then determine the value for the missing coefficient.



C = C =

H = H =

O = O =

Infographic Questions:

1. What day of the year is National S'mores Day? _____ 2.

What is the contraction "s'more" believed to come from? _____

3. Who can we thank for the 19th century discovery of the "Dutch process"?

4. Who used the "Dutch process" in 1847 to create the solid bars of chocolate?

5. What gives the marshmallows their s'more-friendly shape?

6. What type of fire flame will quickly sear the marshmallow coating, keeping the interior cool and firm? _____

7. When was the graham cracker invented and by whom? _____

8. What percentage of people who have eaten a s'more have only made them over the campfire? _____

9. What percentage of parents say they enjoy s'mores with their kids during the summer? _____

10. What percentage of people say roasting marshmallows is the best part of creating s'mores? _____