# Cool Chemistry Assignment

Name_____

It's the last chemistry assignment of the Year!

Hope everyone is doing great and Looking forward to seeing all of you next year as Seniors! For your last chemistry assignment, with adult supervision, I would like for you to toast a marshmallow. Now if you don't want to toast a marshmallow and just assume you know what will happen, go right ahead. But if you can roast a marshmallow just pretend it is the last Flammable Friday of the year. And if you take physics next year you'll get to see the Flammable Fridays that you missed this year. Now that you have the toasted marshmallow what happens next is up to you. I suggest graham crackers and chocolate, or even a reese's cup. The attached worksheet has some questions that goes along with what happens when a marshmallow burns, and it reviews a little bit about chemistry. Just turn this one in the same way you have the rest: email, google classroom, drop offs, etc.

Name _____ Period ____Date_____

# *The Science of Roasting Marshmallows*

A major part of camping and campfires is roasting marshmallows. But have you thought about the chemistry of roasting marshmallows?

Roast some marshmallows and answer these questions **before** you read about the chemistry of the process on the back of this sheet.

- Why do you think marshmallows burn (or catch on fire) so easily?

- Does this represent a **chemical** or **physical** change?

- If you used a metal skewer, does the metal catch on fire also?
- Why or why not?

- If you used a wooden stick, does the wooden stick catch on fire similarly?
- Why or why not?

- Why do you think marshmallows puff and expand when you roast them?

- Does this represent a chemical or physical change?

Name _____ Period ____Date_____

Below is the chemical formula for the burning of the sugar in a marshmallow:

**Review!**
What elements do the symbols in the equation below represent?

C is the symbol of _____

H is the symbol of _____

O is the symbol of _____

$$C_{12}H_{22}O_{11}\ (solid) + 12\ O_2\ (gas) \rightarrow 12\ CO_2\ (gas) + 11\ H_2O\ (gas) + energy$$

*sugar* *Oxygen* *Carbon Dioxide* *water* *heat*

***Determine if this equation is balanced by counting the atoms on each side:***

| | |
|---|---|
| **C =** | **C =** |
| **H =** | **H =** |
| **O =** | **O =** |

## The science behind roasting marshmallows

When marshmallows are roasted, a chemical change happens. When you toast marshmallows, the heat causes a chemical reaction producing water molecules, which then evaporate, leaving carbon behind (the blackened part of the roasted marshmallow).

Six things happen when you roast a marshmallow:

1. The swelling - as the marshmallow heats up, the moisture inside expands, which causes the marshmallow to swell.
2. The escape - as the moisture expands, it creates tiny holes in the marshmallow, which allow the moisture to escape as steam.
3. The sugar rush - as the marshmallow does not now have moisture, it is a sucrose char. Oxygen in the air rushes to the surface of the marshmallow.
4. The flame stage - oxygen diffuses to the surface of the marshmallow from the surrounding air. At the surface of the marshmallow, carbon reacts with oxygen, which produces a blue flame.
5. The **oxidation** stage - carbon atoms combine with oxygen atoms to produce carbon monoxide, and then carbon dioxide.
6. The **oxyinterruptus** stage - as you remove the marshmallow from the fire and blow the marshmallow out, the oxidation process is interrupted, creating soot which is evidence of incomplete combustion:

hydrocarbon + oxygen → carbon monoxide + carbon + water.