

## Simple Kids Science Fair Project Idea

You can use Charles Law to show a physical change in an ordinary bar of Ivory soap.

Charles Law states that a gas based material has a constant pressure and if the temperature increases so will the gas and if a bar of soap is made of foam this should cause the foam to increase in size because it is made of cell based gas molecules and will also increase in size.

Let us look at this before we proceed.

Soap is a foam. Foam can be any material that has trapped gas inside of it, somewhat like tiny bubbles. You may not think of soap as a foam because it is solid and hard but foam can come in many forms and they can be solid, hard or soft and spongy. You probably think of whipped topping as a foam as well as foam you use to shave.

We are going to test increasing the temperature on a bar of Ivory soap to see if the gas inside of the foam will cause the soap to expand and cause a physical change.

Here is what we need.

1. A bar of Ivory Soap

2. A paper plate

3. Another bar of soap; not Ivory

Now unwrap the Ivory soap and place on the paper plate.

Microwave the soap and watch it closely while it is cooking to see what happens.

Your soap should finish cooking in 1 to 2 minutes. This all depends on the temperature of your microwave. If you cook it too long the soap will not get any bigger.

Let the soap cool off before removing it or touching it. You may want a parent to help you with this so no one gets burned.

After the soap is cool touch it and examine it. The soap is flaky and hard. It is still soap and you can wash your hands with some of the flakes.

Why does this work?

Well, when you cook the soap it makes it soft and you are boiling the water and gas that is whipped inside of the soap. When you boil water it evaporates and as it heats also expands. When water turns to gas it expands and this causes the soft portions of the soap to also expand and makes it now actually look like a foam.

When you cook the soap there is a physical change but no chemical change. It is still soap. This is also why Charles Law is shown because the volume of gas increases as the temperature increases. The microwaves from your oven excite the energy molecules in the soap and cause them to move very fast and when they do this they move away from each other as they bounce off each other.

If you try another brand of soap, you will probably find that it puffs some but basically melts because many other soaps do not contain the same amount of air. I do not recommend cooking another kind of soap as some have lots of perfumes that have strong odors when they are being cooked.

This is why a bar of Ivory soap will float compared to other brands of soap. It has more air whipped into its preparation and just like a kid with a float on their arms full of air that causes them to float in a swimming pool, a bar of Ivory soap will float because it has lots of air packed inside. Test another brand of soap to see if it will float. Now cut the Ivory soap in half and look at it. Do you see the little holes of air? Look at another bar of soap after cutting in half.

When doing this science project:

1.

Stay at the microwave and do not leave it unattended.

2.

Do not put metal items in the microwave

3.

This will not hurt your microwave or the soap. You can still use the soap when done.

4.

You will notice an odor from the soap as it is cooking. This will make your microwave smell fresh and flowery for a few hours. Only use Ivory soap.

Here is the formula for Charles Law

where:

V is the volume of the gas

T is the temperature of the gas (measured in Kelvins)

k is a constant.

$$V = V_0(1 + \frac{\Delta T}{273})$$

Therefore, as temperature increases, the volume of the gas increases.

### About the Author

Bindi a is a contributor to <http://scienceprojects.fetching.us>

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