



DRY ICE BOO BUBBLES EXPERIMENT

MATERIALS:

Dry Ice	Hammer	Safety Goggles
Thick Gloves	Dish Soap	2 Liter Soda Bottle
Small Bowl	Water	Funnel
PVC Tubing	Scissors	Cookie Sheet

VOCABULARY:

Dry Ice	Carbon Dioxide	Bubble
Surface Tension	Solid	Liquid
Gas	Sublimate	

DIRECTIONS:

**** This experiment should only be done with adult supervision due to the use of dry ice.**

1. With adult supervision, put your safety goggles and gloves on.
2. Cut a piece of the pvc tubing about one foot long.
3. Place a small funnel into one end of the tubing.
4. Optional: You can push the other end of the tubing through a hole in the bottom of a small cup or funnel.
5. Lay the dry ice, still in the bag, on the ground. Use the hammer to break up the dry ice into smaller chunks.
6. Rip open the bag and remove a chunk of dry ice with a gloved hand.
7. Place a few chunks of dry ice in the soda bottle.
8. Add enough warm water to the bottle to fill it 1/3 full.
9. Add a small amount of warm water to the bowl.
10. Add some dish soap and water to the small bowl.
11. Spread some soapy water onto the plate.
12. Place the funnel over the top of the soda bottle.
13. Dip the other end of the tubing into the bowl of soapy water.
14. Let the bubbles forming at the end of the tubing fall out onto the plate.
15. You can also try catching the bubbles in gloved hands or on a towel.



THE STEAM BEHIND THE EXPERIMENT:

Dry ice is solid carbon dioxide. At its surface temperature of -109.3 degrees Fahrenheit (-78.5 degrees Celsius), a frozen block of dry ice transforms directly into a gas, skipping the liquid phase entirely. Because it doesn't melt, and because it can be formed in solid blocks or pellets, it's already a popular choice for shipping certain foods and medicines.

Despite its many benefits as a refrigerant, dry ice must be handled properly or it poses health risks. Because it's so cold, insulated clothing and gloves should be worn when handling it, and it should never be touched directly, as it can "burn the skin similar to frostbite. It should also never be placed in closed containers as the rapidly expanding gas can cause the container to explode. When dry ice is placed in water, it sublimates rapidly since the water is so much warmer than the dry ice. The solution appears to boil. As the dry ice sublimates to gaseous CO₂, some of the gas bubbles away quickly and some dissolves in the water. A heavy white cloud of condensed water vapor forms above the liquid (due to the coldness of the escaping CO₂ gas). As the CO₂ gas dissolves in the water, the solution becomes more acidic from the production of carbonic acid (H₂CO₃), a weak acid, according to the following equation: H₂O + CO₂ \leftrightarrow H₂CO₃.

When blowing bubbles indoors, you may have noticed the occasional bubble that fell to the carpet but didn't pop. Regular bubbles burst when they come into contact with just about anything. A bubble's worst enemies are oil and dirt, so soap bubbles will bounce off of a surface if it is free of oil or dirt particles that would normally puncture the soap film. This means they won't break if they land on a softer fabric, like gloves or a towel.

NOTE: Whenever you use dry ice, *always* be aware of the rules for handling it safely.

- This is not a toy. It's for demonstration purposes only.
- Use dry ice only with adult supervision.
- Dry ice **must** be handled using heavy gloves or tongs. It will cause severe burns if it comes in contact with bare or unprotected skin.
- Always wear safety goggles when handling dry ice. The debris and shards are extremely dangerous to your eyes. When tapping dry ice with a hammer, first cover it with a towel to keep the pieces in one place.
- **Never** put dry ice in your mouth.
- Never store dry ice in an airtight container. As the dry ice sublimates, gas pressure will build and the container will explode. Make sure your container is ventilated or has a loose-fitting lid.
- Do not store dry ice in your freezer. It will cause your freezer to become too cold and the freezer may shut off. On the other hand, if you lose power for an extended period, dry ice is a good way to keep things cold if you can get it.
- In the unlikely event of a dry ice burn, treat it the same as you would a heat burn. See a doctor if the skin blisters or comes off. Apply antibiotic ointment to prevent infection and bandage mild burns.

MAKE IT AWESOME:

Try the experiment again, but try using different sizes of tubing and bottles.

EXTENSIONS:

1. What happens when you change the temperature of the water?
2. What happens when you change the size of the tubing or bottle?
3. What other changes can you come up with for this experiment?

WEBSITES AND VIDEOS:

1. Video of Making a Boo Bubbles: <https://youtu.be/BJyX3b6-KGk>
2. Video of Dry Ice Balloons: <https://youtu.be/Fzh-D1Qupt0>

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