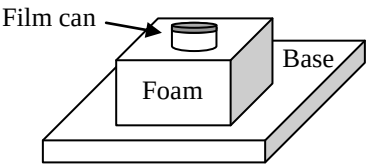
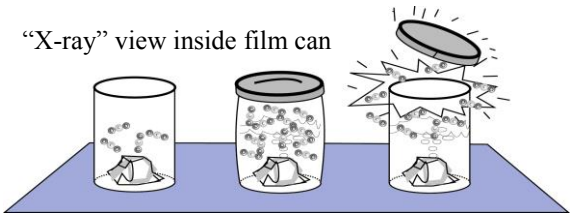
Popping Film Canisters

Dry Ice makes a film canister top go pop!





Engage your students' interest with one of the amazing properties of dry ice!

Topics: States of Matter, Phase Change, Pressure, Volume

Materials List

- ✓ Dry ice (see Yellow Pages under "ice")
- ✓ Film canisters ("film cans")
- ✓ Short tube, block of foam, or equal, large enough for an upright film can to be inserted, (foam will need a suitable hole or slits cut)
- ✓ Wood or cardboard, to use as a base
- ✓ Safety goggles
- ✓ Spoons
- ✓ Optional: Oven mitts
- ✓ Warm water
- ✓ Hammer
- ✓ Ice chest (to transport and to store the dry ice)

This activity can be used to teach:
Next Generation Science:

- Properties of materials (Grade 5, Physical Science 1-3)
- Structure of matter (Physical Science, Grade 5, 1-1; Middle School, 1-1)
- Changes of state (Middle School, Physical Science 1-4)

To Do and Notice

Safety Note: Dry ice is cold enough to cause frostbite when placed in contact with unprotected skin. Observe the following lab procedures during this activity:

- **Avoid contact with bare skin** and **wear safety goggles**.
- **Do not put dry ice in any closed containers** (other than a film canister or ice chest)**.** A tightly sealed container containing dry ice could explode like a bomb!
- Perform the activities and store dry ice in a **well-ventilated area**.

1. Glue a tube or a block of foam to a suitable size base. Cut a hole or slits in foam.
2. Insert a film can into the tube or into the opening in the foam.
3. Pour ~1 cm (~½") of warm water into the open film canister ("film can").
4. Use 1 or 2 spoons to pick up and put a small piece of dry ice into the film can. Bubbles and fog (condensed water vapor) will be produced.
5. Place the lid on the film canister and then immediately move away. There will soon be a **very loud bang** as the film can lid is blown upward with enough force to hit the ceiling. **Caution**: **Beware of the flying lid!**
6. **Clean Up:** Make sure all the remaining pieces of dry ice are put back in the ice chest at the end of the activity. Store the ice chest in a secure location for a day or so and the dry ice will warm up and become gaseous carbon dioxide. Do not pour the dry ice down the drain! To do so could lead to costly repairs!.

The Science Behind the Activity

Dry ice is identical on a molecular level to other forms of carbon dioxide (CO_2) such as atmospheric carbon dioxide and the bubbles in carbonated beverages. However the temperature of dry ice is **minus 78.5°C (-109.3°F)**! When carbon dioxide gas is cooled and compressed sufficiently, it undergoes a phase change and becomes a white solid commonly known as dry ice. When discussing states of matter carbon dioxide exhibits an interesting property: under regular atmospheric pressure carbon dioxide can be a solid or a gas, but not a liquid, hence the name "dry ice". Incredible pressures are required to turn dry ice into a liquid - almost 60 times normal atmospheric pressure, 6 megapascals (MPa) [870 pounds per square inch (psi)]. When dry ice is warmed, it undergoes a phase change known as sublimation, a change in state from a solid directly to a gas (or visa versa). Phase changes from a solid to a gas are often accompanied with huge increases in volume and/or pressure. In the closed film canister the dry ice sublimates, warmed by the water. The pressure inside the container increases as the solid carbon dioxide turns into a larger volume of pressurized carbon dioxide gas until the film can's lid is blown skyward.

Web Resources (Visit www.raft.net/raft-idea?isid=328 for more resources!)
Dry ice activities and safety information - http://www.dryiceinfo.com/science.htm

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