We’re Cookin’ Up a Comet!

To capture students’ attention when starting a unit on comets – why not make a comet in the classroom. You will need:

**Materials:**

- Ice Chest
- Large plastic mixing bowl
- Plastic garbage bag
- 2 pair of work or rubber gloves
- Hammer or meat pounder
- Large wooden mixing spoon
- 1 Gallon size zip-loc freezer plastic bag
- 2 9-ounce plastic cups

**Ingredients:**

- 2 cups water
- 2 cups of dry ice (frozen carbon dioxide)
- 2 Tablespoons of sand or dirt
- 1 Tablespoon of ammonia (chemical compound)
- 1 Tablespoon of honey or corn syrup (organic material)

**Procedure:**

1. Open garbage bag and place inside large plastic bowl.
2. Arrange all utensils and ingredients in front of you. Have students surround table in semi-circle. Utilize students as helpers.
3. Have two students measure 2 cups water in the 9 ounce cups. Pour into plastic bowl lined with garbage bag.
4. Have one student measure the dirt or sand.
5. Have one student stir mixture.
6. Have one student add the ammonia, stir.
7. Have one student add the organic material (honey or corn syrup), stir.
8. Have two students put on work gloves. Teacher places chunks of dry ice in zip-loc freezer bag. Do not seal bag. Explain what dry ice is and why it will burn if you touch it. (It is frozen carbon dioxide. It gets to -109.7 degrees F. It is so cold it can burn you.)

9. One student holds the bag and the other crushes the dry ice with a hammer. Be careful not to make holes in the bag.

10. Use the plastic cup and measure 2 cups of dry crushed ice. Add to the rest of the ingredients and stir vigorously.

11. Continue stirring until mixture is almost totally frozen. Have students be really quiet and listen. You can hear the mixture “cooking”.

12. Lift the mixture from the bowl by holding the garbage bag around mixture. Lightly hold the top and you will see the bag expand. The dry ice is forming a gas. Why? (It is carbon dioxide.)

13. Have two different students put on work gloves. As you hold the bag, have them shape the comet into a ball.

14. When the comet holds its shape, unwrap from the garbage bag and place on the table. Remember to wear work gloves.

The comet will begin to melt and sublimate (turn from a solid to a gas.) This is what carbon dioxide does at room temperature and what comets do in space when they are heated by the Sun.

Although the comet may be safe to touch without being burned by the dry ice, it is best to have the students use a spoon or stick to examine it. As the comet begins to melt, small jets of gas will escape from it. These are locations where the gaseous carbon dioxide is escaping through small holes in the frozen water. Sometimes in space, this same thing will happen and the comet can expel sufficient quantities of gas to make small changes in the comet’s orbit.

Notes:

Ingredients in the comet activity represent items found in the nebula from which our solar system formed.

Inorganic: Water (necessity for all living things), ammonia (contains nitrogen) carbon monoxide and carbon dioxide.

Organic: Some short chain hydrocarbons may be available which were formed from carbon dioxide and hydrogen.

In the outer regions of the solar nebula most of these compounds are found in form of ices, dust grains, or stuck to dust grains.

The main elements found in living things are Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorous, and Sulphur. These are necessary for the formation of many biological
compounds such as amino acids and nucleic acids which are needed to form DNA, RNA, and proteins.

The majority of matter present was Hydrogen and Helium, some Carbon, Oxygen, Nitrogen, and of course all the other elements in very small amounts compared to the rest, but still enough to make the terrestrial planets. Most of the H and He ended up in the Sun and giant planet atmospheres. When the original cloud was still cold the heavier elements formed dust grains (silicon, sulphur, metals) and the lighter elements formed compounds like water, carbon monoxide, carbon dioxide, ammonia, formaldehyde, methanol and some larger organics. There are many more but these are the most common.