



Build Your Own Comet

Prep Time: 30 minutes

Grades: 6-8

Lesson Time: 55 minutes

Essential Questions:

- What is a comet composed of?
- What gives a comet its tail?
- What makes a comet different from other Near-Earth Objects (NEOs)?

Objectives:

- Create a physical representation of a comet and its properties.
- Observe distinguishable factors between comets and other NEOs.

Standards:

- MS – PS1-4: Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
- CCSS.ELA-LITERACY.RST.6-8.3 - Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Teacher Prep:

- Materials per comet:
 - 5 lbs. dry ice, ice chest, paper cups, towels, small container (for scooping), wooden or plastic mixing spoon, trash bag, mixing bowl, heavy work gloves, 1 tablespoon or less of starch, 1 tablespoon or less of dark corn syrup (or soda), 1 tablespoon or less of vinegar, 1 tablespoon or less of rubbing alcohol, large beaker, water, 1 c dirt/sand, 1 L of water.
- Additional materials:
 - Hammer or mallet, paper cups, towels, flashlight, hair dryer.
- Most of the dry ice needs to be in a fine powder before the students arrive, so use the hammer to do this ahead of time. There should be about 50-60% fine powder in order to hold the comet together. It is best to separate the dry ice ahead of time with towels.
- This can also be done as a class demonstration.

Teacher Notes/Background:

- This lesson was adapted from NASA's [Make Your Own Comet](#) activity.

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Engage (5 minutes)	<p>Comets vs. Asteroids</p> <p>Students can create a Venn Diagram for Comets and Asteroids as a warm up. This should be a quick warm-up, aimed at getting them thinking about what makes comets unique.</p>	<p>Materials:</p> <ul style="list-style-type: none"> • Writing utensil, paper
Explore (5 minutes)	<p>Review Comets from Let's Launch!</p> <p>Ask students questions to review the basics of comets. What are comets made of? What are the parts of the comet? How is the tail formed?</p>	<p>Materials:</p> <p>N/A</p>
Explain (10 minutes)	<p>Introduce the Comet Activity</p> <p>Students will be working in groups to make their own comet. Comets are more than just ice and rock, they have many components. Set up all the materials at the front of the room or separate them out ahead of time for students. Their lab sheets have all their instructions, but highlight that they will be using dry ice, which is dangerous and should never be touched without gloves. Students must be wearing safety goggles during the lab.</p>	<p>Materials:</p> <ul style="list-style-type: none"> • Full materials listed in teacher prep
Elaborate (25 minutes)	<p>Make a Comet</p> <p>Students should first line their mixing bowls with trash bags. Then they should put in the following ingredients, in order: 1 L of water, 1 cup of soil/dirt, and 1Tbs of starch, dark soda, vinegar, and rubbing alcohol. They should mix these ingredients with their spoon. Then, slowly mix in the dry ice and continue stirring. Once it is all added, pull up the sides of the garbage bag and start to knead the mixture into a clump. This may take a few minutes. It should thicken as the dry ice freezes the water. If it doesn't hold together after kneading, add a bit more water until its firm. Once they finish, have them display it on a pie tin or on their trash bag. Students should be recording observations as they complete steps.</p>	<p>Materials:</p> <ul style="list-style-type: none"> • Full materials listed in teacher prep
Evaluate (10 minutes)	<p>Present Your Comet</p> <p>Have students show their comet and reflect on the main components of the comet. What is it mostly made of? Why does it get called a "dirty snowball"?</p>	<p>Materials:</p> <p>N/A</p>

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Extensions and Enrichment:

- If time allows, turn off the lights in the room and use the best comet to demonstrate how the tail is formed. Have a student hold the flashlight and the hairdryer (on low or cool setting) about two feet away from the comet. What do students see? They should see the water vapor moving in the opposite direction, similar to the comet tail. The hairdryer represents solar wind (although it is not actually moving air; it is moving particles, mostly electrons and protons) and the flashlight represents the Sun.

Additional Resources:

- **Real World: Comet Quest**

What is so interesting about a chunk of ice hurtling through space? NASA is using the information to help us understand why different planets are so different. Find out what a comet's diameter tells astronomers about the life of the comet. Learn about Comet ISON and the new Rosetta Mission. Hitch your own ride on a comet with NASA's SpacePlace game, Comet Quest.

<https://nasaclips.arc.nasa.gov/video/realworld/real-world-comet-quest>

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You will be creating your own comet here on Earth. Read though all the directions carefully before starting to mix your ingredients. Be sure to record your observations after each step.

Note: Dry ice is dangerous. It is important to always use goggles and heavy-duty gloves when using it.

Materials:

- Dry Ice (in a fine powder)
- 1 L of water
- 1 cup of soil/dirt
- 1 tablespoon of dark soda
- 1 tablespoon of vinegar
- 1 tablespoon of starch
- 1 tablespoon of rubbing alcohol
- Bowl
- Trash bag
- Spoon

Directions:

1. Put your trash bag inside of the bowl so it lines the bowl. You will be putting your ingredients into the bag.
2. Put on your goggles and gloves.
3. Get the following materials one at a time pour them into the trash bag: water, dirt, starch, soda, vinegar, and rubbing alcohol.
4. Mix the ingredients together with your spoon. Record your observations below:

5. Slowly pour the dry ice into the trash bag. Record your observations below:

6. Once you have added all the dry ice, close the bag at the top and twist it to keep it closed. Take it out of the bowl.
7. Using your hands (with gloves!) slowly pack together your mixture through the bag. Continue it has formed a hard clump.
8. If it is not staying together after several minutes of packing, add in a little more water.

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9. Once it is in one firm clump, dump it into the bowl and record your observations below:

Reflection:

1. What is the comet mostly made of?

2. What role did the dry ice play in making the comet?

3. Do you think "dirty snowball" is an accurate name for a comet? Explain.
