



ACTIVITIES

Feel the Impact

“Ice Cream Comet” Teacher Guide

Background

This activity is adapted for visually-impaired students from "Deep Impact Make a Comet Model and Eat It!", created for the Deep Impact Mission, A NASA Discovery Mission, by Maura Rountree-Brown and Art Hammon. See the original activity at: http://solarsystem.nasa.gov/educ/docs/Make_A_Comet.pdf

Comets have sometimes been described as dirty snowballs, snowy dirtballs or something in between. But what does that really mean? It means that these dirty snowballs are believed to be a cold mixture of frozen water, dry ice, and other sandy/rocky materials left over from the early formation of our solar system. In this activity, students are going to develop a comet model that they can eat. Students will trade "comets" and pretend to be an instrument on the Deep Impact Spacecraft called a spectrometer. It analyzes the structure and composition of comets by using nine different filters. Students will use their five senses as spectrometers to individually and as a team to decide what is in the ice cream.

National Science Standards Addressed

Grades 5-8

Science As Inquiry

- Understands about inquiry

Physical Science

- Properties and changes in properties of matter
- Transfer of energy

Science and Technology

- Understands about science and technology

History and Nature of Science

- Nature of science and scientific knowledge
- History of science and historical perspective

Grades 9-12

Science As Inquiry

- Understands about scientific inquiry

Earth and Space Science

- The origin and evolution of the universe

Physical Science

- Motions and forces
- Interactions of energy and matter

Science and Technology

- Understands about science and technology

History and Nature of Science

- Nature of science and scientific knowledge
- History of science and historical perspective

View a full text of the National Science Education Standards

<http://newton.nap.edu/html/nses/6a.html>

Materials per group:

Form small research groups of 2 - 4 students. Survey your class ahead for any allergies (milk, peanuts, etc) that you plan to use. You'll need to gather the following materials for each group: Remember to choose food that will not dissolve while the ice cream is setting.

- One sandwich size re-closable plastic bag
- One Gallon size re-closable plastic
- Small cups for eating ice cream (one for each person on your team and one extra cup for feeling the ice cream)
- Plastic spoons (one for each person on your team)
- Pairs of kitchen mitts (comet gets cold!!)
- Ice (enough to fill a gallon size bag ½ full per team)
- Internal comet objects like chunky cookies in black or brown, crushed candies, gummy bears, coconut flakes and peanuts
- 80mL whole milk
- Sugar
- Vanilla extract
- 40mL evaporated milk
- Salt
- Can opener
- Something to crush cookies and other additives

Copies of the

- Student Activity, "[Ice-cream Comet](#)" and the
- "[Ice-cream Comet Student Activity Data Sheet](#)"

for each student in the appropriate format.

Optional: You may wish to make copies of the Student Text, [What is Spectroscopy?](#) in the appropriate format for each student to introduce students to spectrometers and how they operate before starting this activity

Have students **wash their hands** before starting to mix their comets; or, you may choose to have them wear food gloves.

Procedure that students will follow

Step 1:

One student should hold a sandwich-size bag while the other places the following ingredients in the bag:

- One-third cup (40 milliliters) evaporated milk (or cream)
- Two-thirds cup (80 milliliters) whole milk
- 5 level teaspoons of sugar
- Less than one-fourth teaspoon (1 milliliter) of vanilla

Step 2:

First, think of ingredients you might add to the ice cream to represent dust like (Black/brown cookies in fine and large chunks), rocks (peanuts), or carbon dioxide (coconut flakes). You might also want to add some other ingredients to represent different things we might find in a comet. Possibilities are: gummy bears (early organics for life?), peppermint, toffee or other ingredients you might choose from the items provided by your teacher. **Be sure to keep a list of what you put into your comet.**

When you have all the comet elements placed into the bag, gently squeeze all of the extra air out of the sandwich bag and close it. **Be sure it does not leak.** [Turn it upside down to check]

Step 3:

Place the sandwich bag into the bottom of the gallon bag. Put in approximately 10 heaping spoonfuls of salt.

Step 4:

Fill the gallon bag (containing sandwich bag with comet ingredients) 1/2 full of ice.

Step 5:

Close the larger bag tightly to remove as much air as possible. **Check for leaks.**

Observe what takes place as the ice cream comet forms. Record what you discover as you watch this change take place.

Gently shake and roll the bag while keeping it in constant motion for approximately 6 - 10 minutes or until half the ice has turned to water.

Start the experiment with bare hands so you can feel the temperature change. Make sure you have rubber gloves, mitts, cloth towels or some thick fabric to hold the bag because it will get extremely cold.

Gently feel the sandwich bag through the ice-water mixture. When the milk/sugar mixture in the sandwich bag has hardened into soft ice cream, open the gallon bag and remove the sandwich bag containing the ice cream.

Step 6:

Trade your comet with another team so the ingredients are a mystery to them.

Step 7:

When your team receives a mystery comet, be sure to rinse the outside of the sandwich bag with **very cold, fresh water** before opening so that no salt flavor is transferred to the ice cream.

Divide the ice cream comet by spooning some into the cups provided, one for each team member. **Make one extra cup and put it aside. Don't eat this one!**

Pretend that your eyes, hands, nose, ears, and taste buds are spectrometers taking data from your "comet". Gather and record the following "data" on your data sheet:

- a. Have the team member with the visual spectrometer look at the "comet" and see what features can be observed visually. If no one on the team has eyesight, "check out" a classmate with vision to obtain your data. List what can be seen in your data sheet.
- b. Take the extra cup you laid aside and have your team feel the contents with your fingers. Describe what you feel on your data sheet.

The "What is Spectroscopy" Student Text in *Feel the Impact* Part 4 materials describes Spectrometers and the way they work. You may want to distribute copies of these in the appropriate forms before asking students to use their "sense spectrometers."

c. Smell the ice cream for additional information. Record your “odor observations” on your data sheet.

d. Listen for any sounds that might be coming from the comet material. Record your findings on your data sheet.

e. Taste the ice cream and record any final information about what you think its ingredients are on your data sheet..

Step 8:

Compare your results with the team who made the ice cream you tasted and record the following on your data sheet:

a. List the elements you identified correctly.

b. List the elements you missed and explain why you think your "spectrometers" missed them.

Compare what you observed in Step #5 with other teams. List anything that was different from what you observed on your data sheet.

Share your findings about the comet you investigated with your class. Include your explanation of why you think "spectrometers" were or were not correct.

Some Tips For The Teacher:

- There is a danger that the bags may break if the students toss the bags back and forth or bang them against a surface while freezing the ice cream,
- Have dishtowels, cloths or other insulator for hands available to guard against discomfort while they are turning their bags over and over.
- Have a mop available for dripping water. You could also do the activity outside.
- Limit the amount of any material students put into their ice cream to one plastic spoonful so that supplies last.
- Mark one of your serving cups with sugar and salt measurements to pre-load bags faster. Mix all ingredients in class if you want your students to work on measurements.
- Have a large bowl with ice water available for students to wash the salt off the outside of the comet bags of ice cream.

Suggestions for Materials for a class of 20 (10 groups of 2)

- 3 – 4 cans – (12 fl oz each)
- 1 gallon of milk (you'll have some left over)
- 20 cookies
- ¼ lb of sugar
- 1 bag of peanuts and 1 bag of coconut flakes
- ¼ bottle of vanilla or leave this ingredient out
- 10 sandwich size re-closable bags (but best to make a couple extra)
- 10-gallon size re-closable bags
- 2 – 3 containers of table salt (you'll have some left over)