Edible Asteroids Part I

Objectives

- Students will analyze a piece of “asteroid” given to them
- Students will draw the “asteroid” given to them
- Students will describe the physical properties of the “asteroid”
- Students will develop and state a hypothesis of the type of “asteroid” they have been given

Suggested Grade Level

4^{th}-8^{th}

Subject Area

Science

Timeline

One class period

Standards

Science as Inquiry

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

Earth and Space Science

- Structure of the Earth system
- Earth’s history
- Earth in the solar system

Science in Personal and Social Perspectives

- Natural hazards

History and Nature of Science

- Science as a human endeavor

Background

Making observations and analyzing the physical characteristics of objects is an important skill students must master in order to become effective scientists. The physical characteristics of an object can vary greatly. This lesson focuses on the most common physical characteristics that elementary and middle school students will encounter.

Color-Color is the first thing people notice when observing an object. Color can be an important characteristic when determining chemical composition.
Luster-Luster is how light interacts with an object. Such descriptions include: shiny, dull, fibrous, earthy, metallic, greasy, pearly, or waxy.
Hardness-Hardness describes the resistance to pressure when applied to the object. Normally, you would use Mohs Hardness Scale to determine hardness; but for this activity we will use informal terms.
Odor-Odor can be a powerful tool when determining chemical composition.
Inclusions-Inclusions are added crystals that form in the interior of an object.
Texture-Texture is the characteristic appearance of an object, i.e. rough or smooth.

These are just a few physical characteristics you can use for this activity. Obviously, ***taste*** may be included at the end of the activity; but you don't want students to get into the habit of tasting their science experiments.

During this activity, students will be analyzing simulated asteroids (pieces of candy bars). If students haven't had a good introduction to asteroid classification at this point, it would be beneficial to include that in your introduction to the lesson.

Asteroids are classified according to their chemical composition. Those types include C-type or carbonaceous, S-type or silicaceous, and M-type or metallic. Recently, scientists have classified asteroids into many sub-categories. For the purpose and simplicity of the lesson, we will concentrate on the three main classifications.

C-type asteroids are usually made of carbon. Other elements may include silicon, magnesium, iron, and sulfur. S-type asteroids are usually made of silicates, or rocky material with a little iron mixed in. The elements that make up S-type asteroids are magnesium and iron. Sometimes they have olivine ($MgSiO_4$) + (Fe_2SiO_4), and pyroxene ($FeSiO_3$) + ($MgSiO_3$) + ($CaSiO_3$) a type of igneous rock. M-type asteroids are mostly made of iron and nickel. They are the most dense, but also the most rare.

This lesson, like Part II, is primarily for honing students' observation skills in the scientific process. This skill, above all others, should be the major focus of these two lessons.

Materials

Various types of candy bars (preferably a different candy bar for each student), a small paper plate for each student, pencil, Asteroid Analysis worksheet, wax paper, triple-beam balance, toothpicks, colored pencils

Each candy bar will need to have approximately one cubic inch cut from the end of the candy bar. This will allow students to compare the density of each sample since each sample will be approximately the same size.

Note: If a variety of candy bars is difficult to find, the teacher may use other foods such as brownies, peanut brittle, cupcakes, Twinkies, etc.

Lesson

1. Review with students proper science lab procedures.
2. Review with students the three classifications of asteroids, C-type, S-type, and M-type.
3. Inform students that today they have a special assignment. NASA has asked for their help in a very important science investigation. NASA needs their help analyzing various asteroid samples. It will be up to them to analyze and describe their particular sample.
4. Hand out the Asteroid Analysis worksheet.
5. Hand out a small piece of wax paper and a paper plate to each student. The wax paper will be placed underneath the sample when massing the sample on the triple-beam balance. The paper plate will be used to transport the sample to and from the triple-beam balance and used as the base for the observations.
6. Remind students that they must subtract the mass of their wax paper when they get the mass of their sample. Students can use the toothpicks to move the sample from wax paper to paper plate.
7. Have students start the Asteroid Analysis worksheet. Students may take turns cycling through the area where the triple-beam balances are located.
8. The worksheet has several components. For the first component, students will draw their sample so that the interior of the sample can be seen. Students will then write the mass of their sample. They will then write an overall description of the physical characteristics of their sample.
9. The next page of the worksheet has a table that must be completed. First, students must analyze how many different elements the sample is composed of. For each element included in the asteroid sample, the student will draw that element, describe the physical characteristics, and then estimate the percentage of that element in the sample. Remind students not to forget the outside coating of their sample in the number of elements, and that their percentages must equal 100%.
10. After students have completed their analyses, have them share with the class the description of their sample. Ask students if they can guess the name of each candy bar or food.
11. When the discussion is complete, let the students eat their entire candy bar or food.

Extensions

Post the worksheets on a bulletin board and number them. Have students analyze each worksheet to see if they can guess what type of candy bar or food that was analyzed in the sample.

Evaluation/Assessment

Grade the Asteroid Analysis worksheet. Did the student adequately fill in each part of the worksheet? Did the student take the time to properly draw and analyze each element of the sample?

Resources

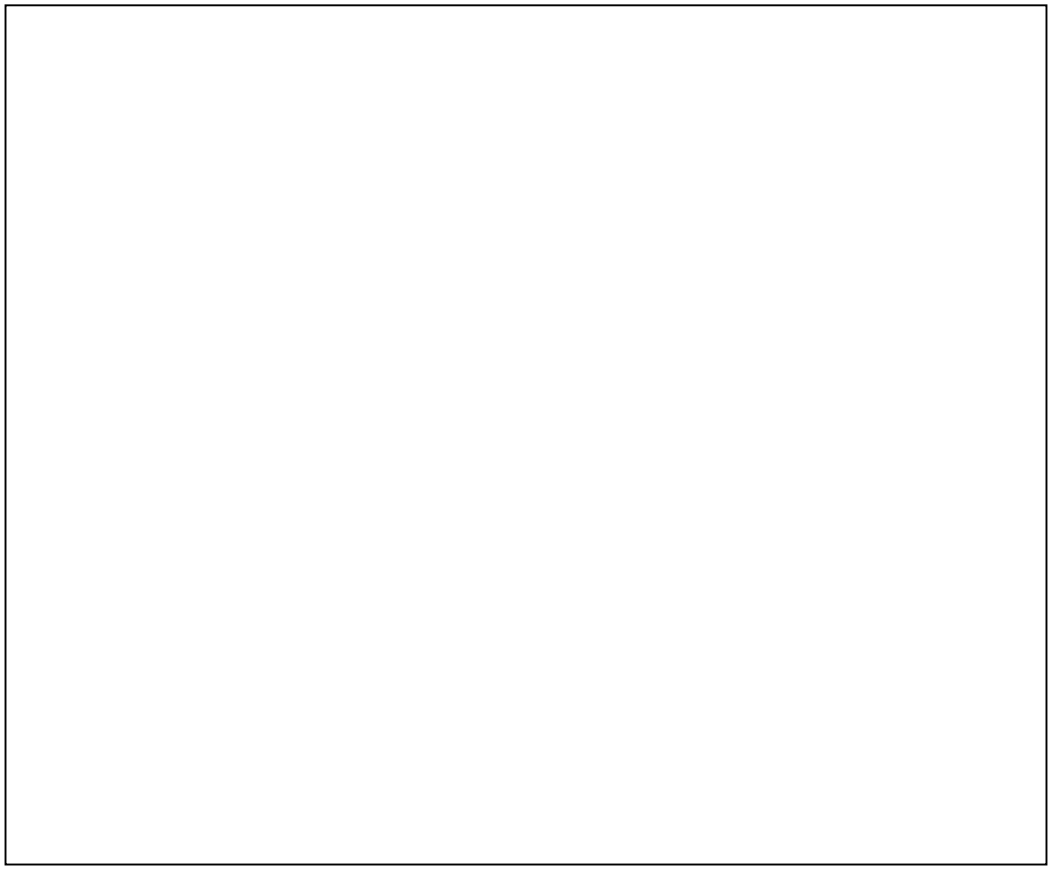
National Science Standards: http://www.nap.edu/readingroom/books/nses/

Asteroid Analysis Worksheet

Name _____

Date _____

In the work space below, draw and label your asteroid sample. Make sure you use correct colors when drawing your sample.



1. Mass of the sample _____
2. Overall physical description of asteroid sample.

   _____

   _____

   _____

   _____

   _____

3. How many different elements does your asteroid have? _____ Use the chart below to describe each element.

Element	Drawing of Element	Physical Characteristics of Element	Estimated % Composition of Asteroid
#1			
#2			
#3			
#4			
#5			
#6			
#7			
#8			