## Candy Bar Density

## Summary

Once students have had an introductory density lesson and practice calculating density from mass and volume measurements, this lesson serves as follow-up to allow students to think critically about what makes one object more or less dense than another and to conduct an experiment to measure density of similar objects.

Main Core Tie
SEEd - Grade 6
Strand 6.2: ENERGY AFFECTS MATTER Standard 6.2.2

## Time Frame

1 class periods of 60 minutes each
Group Size
Small Groups

## Life Skills

Thinking \& Reasoning

## Materials

balance (one per group)
100 ml graduated cylinder (one per group)
Hershey's miniature candy bars (one of each type per group)
calculator (one per group)
data notebooks

## Background for Teachers

Density: amount of matter (material or "stuff") in a given volume (amount of space).
Density = Mass / Volume
An introductory density lesson should precede this lesson, in which students are exposed to the concept of density and gain experience measuring mass and volume and calculating density (using cubes of the same volume but made from different materials provides a good introduction).
This lesson challenges students to think critically about what actually makes the density of one object different than the density of another similar object using Hershey's miniature candy bars. Other candy bar types would work well, but Hershey's miniatures (milk chocolate, dark chocolate, Mr. Goodbar, Krackel) are convenient because all four candy bar types come in the same package.

## Student Prior Knowledge

Ability to measure mass with a balance.
Ability to measure volume with a graduated cylinder, via volume displacement.
Basic understanding of density as the amount of matter in a given volume.
Understanding that density is calculated as mass / volume.
Intended Learning Outcomes

1. Use Science Process and Thinking Skills
d. Select the appropriate instrument; measure, calculate, and record in metric units, length, volume, temperature and mass, to the accuracy of instruments used.
e. When given a problem, plan and conduct experiments.
2. Demonstrate Understanding of Science Concepts and Principles
d. Solve problems appropriate to grade level by applying scientific principles and procedures.
3. Communicate Effectively Using Science Language and Reasoning
a. Provide relevant data to support their inferences and conclusions.
b. Use precise scientific language in oral and written communication.

## Instructional Procedures

This lesson can be completed in one class period. The experiment should be preceded by a brief review of the procedures required for accurate mass and volume measurements. Students should work in small groups ( $2-4$ students per group) and observe the unwrapped candy bars. Before performing the experiment, students should write down a hypothesis for candy bar density, going from least dense to most dense. Students should discuss the procedures they would use to find the density of the candy bars. Students should recognize that in order to get precise volume measurements, they cannot use length $x$ width $x$ height because the measurements would not account for the irregularities (peanuts, etc) in the volume of the candy bar. The experiment should be followed by a discussion of density data collected by the students, and whether their hypotheses were confirmed or refuted.
Experiment:
Remove wrappers from candy bars.
Measure mass of candy bars using the balance and record data in lab notebook.
Measure volume of candy bars using the graduated cylinders (volume displacement) and record data in lab notebook.
Calculate density and record data in lab notebook.
As a class, compile density data for each type of candy bar, calculate average density for each type candy bar, and record data in lab notebook.

## Strategies for Diverse Learners

Ask students "what keeps a cruise ship afloat when you consider the materials it is made of?" Generate a discussion about open spaces vs. the density of the ship?

## Extensions

Students should be encouraged to think about density of objects they are familiar with. A logical next step is to discuss why some objects float and why others do not. Students could then set up an experiment to measure the density of multiple objects, test whether they float or not, and write a rule to determine whether something will float or not. Rule: if the object has a lower density than the liquid it is placed in, it will float, and if the object has a higher density than the liquid it is placed in, it will sink.

## Assessment Plan

Students should create a data table that clearly presents the results of their experiment, including mass, volume, and density measurements, and average density measurements calculated from data collected by the entire class. Each individual student should use the average densities to test their own hypothesis. Students should write a brief "lab report" that provides interpretation of the results and discussion of results in relation to their hypothesis. For example, one hypothesis could be that Krackel candy bars are the least dense because they contain rice puffs, Mr. Goodbar candy bars are the most dense because they contain peanuts, and milk chocolate and dark chocolate candy bars are
intermediate and of similar density because they only contain chocolate. The concept the students need to include in their writing is that less dense objects have less mass per unit of volume (less matter in a given space), whereas more dense objects have more mass per unit volume (more matter in a given space).

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