

Lesson Plan Overview

Recommended Grade Level:	11
Discipline:	Chemistry/Physical Science
Topic:	Density
Lab Activity Title:	Density of Tootsie Rolls

Lesson Objectives:

The student will:

1. Determine the density of 2 different size samples of the same material and compare them.
2. Use a triple beam balance to measure mass.
3. Use water displacement method to find volume.
4. Use correct significant figures when making measurements.
5. Calculate percent error when given the actual density of the material.

National Science Standards:

Change, constancy and measurement; structure and properties of matter

Materials: 2 different sizes of Tootsie Rolls for every 2 students

100-mL graduated cylinder

Triple beam balance

Weighing paper

Water

Time needed: Can be completed in one 45-minute period.

Preparation for Activity:

1. This activity should be preceded by a discussion of density and a few calculations using the formula for density $D=m/V$
2. Have students read through attached Activity prior to beginning activity.
3. Set up lab area for students to work in pairs with the materials listed above available for each pair of students.
4. Give attached pre-lab quiz to determine students' preparation for activity.
5. Instruct students to choose 2 different sizes of Tootsie Rolls and record them (midget, skinny or fat) on activity.
6. Instruct students about disposal of Tootsie Rolls upon completion of activity (they may be dried off and used for more than one class).
7. Remind students that Tootsie Rolls being used for this activity should NOT be eaten. (I provide additional Tootsie Rolls to be eaten following completion of this activity.)
8. Remind students to measure using appropriate significant figures and units and to record all data in data table on attached activity.
9. Remind students to show all calculations on attached activity and summarize in calculations table.

Student Instructions:

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1. Students will follow instructions as written on attached activity.
2. Upon completion of the activity I provide them with the actual density of a Tootsie Roll (which I determine by finding the density of 3 Tootsie Rolls and averaging them $D=1.34 \text{ g/cm}^3$) and instruct them to determine the percent error for their experimental result.

Post-activity discussion:

1. Were the densities of the two different sizes of Tootsie Rolls similar?
2. Is this what you expected? Why?
3. Why do different sizes of Tootsie Rolls have similar densities?
4. What might account for your percent error?

Recommended Ward's Science Materials

[Student Filter Paper](#)

[Item No. 6165512](#)

[Ohaus® Triple Pro Balance](#)

[Item No. 156357](#)

[Graduated Polymethylpentene Cylinders](#)

[Item No. 181743](#)

[Ward's Density Blocks Lab Activity](#)

[Item No. 366859](#)

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Activity

DENSITY OF TOOTSIE ROLLS

PART I

Purpose: To find the density of *Tootsie rolls* of different sizes, compare them, and find the average density of a *Tootsie roll*.

Materials: 2 different sizes of *Tootsie rolls*, filter paper, balance, graduated cylinder, water

Procedure:

1. Obtain 2 different sizes of *Tootsie rolls*.
2. Find the mass of a piece of filter paper and record it in Data Table #1.
3. Place one of the *Tootsie rolls* on the filter paper and find the mass. Record in Data Table #1.
4. Repeat for the second (different size) *Tootsie Roll*.
5. Fill a graduated cylinder with enough water that it will completely cover the *Tootsie roll* when it is added to the cylinder. Record the volume in Data Table #1. (Be sure not to fill it so full that when you add the *Tootsie roll* the water level goes above the markings on the graduated cylinder.)
6. Add the *Tootsie roll* to the graduated cylinder. Record the new volume in Data Table #1.
7. Repeat for the second (different size) *Tootsie roll*.

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DATA TABLE #1

	<i>Tootsie Roll #1 (size _____)</i>	<i>Tootsie Roll #2 (size _____)</i>
Mass of filter paper (g)		
Mass of filter paper and <i>Tootsie Roll</i> (g)		
Volume before adding <i>Tootsie Roll</i> (mL)		
Volume after adding <i>Tootsie Roll</i> (mL)		

Calculations (*show your work*):

1. Find the mass of each *Tootsie roll* by subtracting the mass of the filter paper and record in Calculations Table #1.
2. Find the volume of each *Tootsie roll* by subtracting the first volume from the second volume and record in Calculations Table #1.

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CALCULATIONS TABLE #1

	<i>Tootsie roll #1 (size _____)</i>	<i>Tootsie roll #2 (size _____)</i>
Mass (g)		
Volume (mL)		
Volume (cm ³)		
Density (g/cm ³)		

Average Density = _____

Conclusion:

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