

Denser Sensor

4th Grade

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Benchmark:

(4th) SLC 3: Students will use metric measurements given for two and three-dimensional objects to determine a size relationship between those objects.

(4th) SLC 8: A.) Students will evaluate and provide written observations of experiments (including measurements, attributes, etc.) from a variety of sources (i.e., other students, books, media, etc.) and determine if results are derived from direct observations or inferences. B.) Students will use observations and data when explaining answers and formulating conclusions.

Objectives:

Students will be able to calculate density, compare densities of solids and liquids, measure liquids, weigh using a balance, and discuss the importance of density.

Materials:

- Clear containers (with a flat bottom that will hold at least 200ml of a liquid)
- Molasses
- Corks
- Water
- Erasers
- Oil
- Triple Beam Balance
- Marbles
- Beaker that measures 50 ml

Procedure:

For a one-day procedure, give the students the raw numbers in the chart below and let them figure out the rest. Pour measured liquids into a container and record observations, then continue with Day 2.

	I. Mass of Empty Test Tube in grams	II. Mass of Container with Liquid (grams)	III. Mass of Liquid (II-I) in grams	IV. Volume of Liquid (ml)	V. Density Mass ÷ Volume (III ÷ IV) g/ml	Liquid's Name
A	35	95		50		Molasses
B	35	85		50		Water
C	35	70		50		Oil

Day 1:

Give each table 3 containers. Have them label the containers A, B, and C. Have the students measure 50ml of water to pour into each container. Have them mark this height with a marker or tape (if you want this to go faster, pre-mark each container with a 50ml line). The students must empty and dry each container before weighing them. Weigh each container, recording results in chart. Add 50ml of molasses to A, 50ml of water to B, and 50ml of oil to C. Reweigh each container separately and record results. Have students do the math to figure out the mass of the liquid, then the density. Discuss which liquid is the densest, which is the least dense. Have students leave the molasses in the container and add the second densest liquid, water. Then have them add the oil on top of that. Record observations on sheet.

Day 2:

Review what density means in simple words (thickness, how crowded together things are) and the order of the liquids' densities. Give each table 3 solids to identify (marble, cork, and eraser). One at a time, carefully drop into container. Let the solids come to rest and compare their densities by filling in #10 on

their sheet. Have them draw and label their containers in #11. This can be done first to help with #10 if they need. Answer the next questions and have a discussion of their answers.

Discussion/Summary:

After discussing that density is mass/volume or how thick something is (#12), review the order of densities found out (#13). Students should be able to tell you that oil floats on water because it is less dense (#14). The additional questions can be held as a discussion or written out. These help to tie in why we care to know about density. A real world tie from what seems like math is always best to make them see a connection.

Target Observations:

- The molasses is the densest liquid, then water, then oil
- The order of densities is: marble, molasses, eraser, water, oil, cork

Target Model:

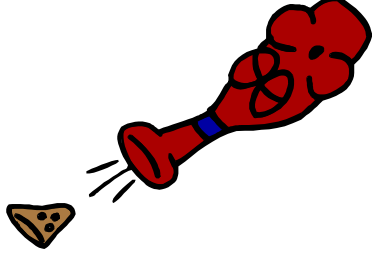
-Density is the thickness of something. For example if there are lots of people in a room, we could say the crowd is dense.

-Objects that are less dense "float" or sit on top of objects that are more dense.

Name:

Date:

Denser Sensor!



1. Circle the densest liquid: water oil molasses
2. Name an object that will float on water: _____
3. Label the 3 containers A, B, and C. Weigh each one empty.
4. Pour 50 ml of liquid into each.
5. Weigh the full containers, subtract, and compute the density of each liquid.

	I. Mass of Empty Test Tube in grams	II. Mass of Container with Liquid (grams)	III. Mass of Liquid (II-I) in grams	IV. Volume of Liquid (ml)	V. Density Mass ÷ Volume (III ÷ IV) g/ml	Liquid's Name
A						
B						
C						

6. Keep the densest liquid in its container. Pour the next densest on top of it. Pour the least dense liquid on top of that. Record your observations.

7. Identify the solids:

#1: _____

#2: _____

#3: _____



8. Drop the solids (one at a time) into the container with the liquids.

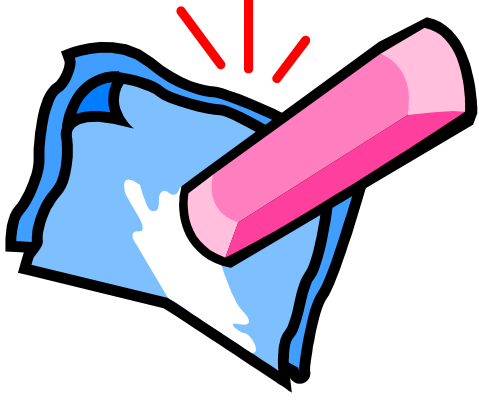
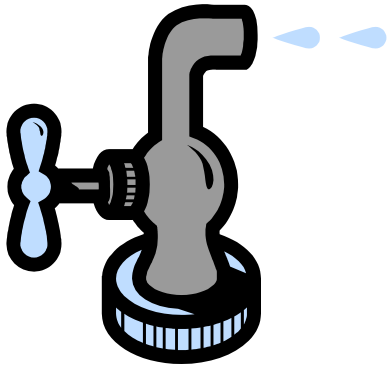
9. Allow them to come to rest.

10. Compare the solids to the liquids by completing the following statements.

The density of solid #1 is greater than _____ and less than _____.

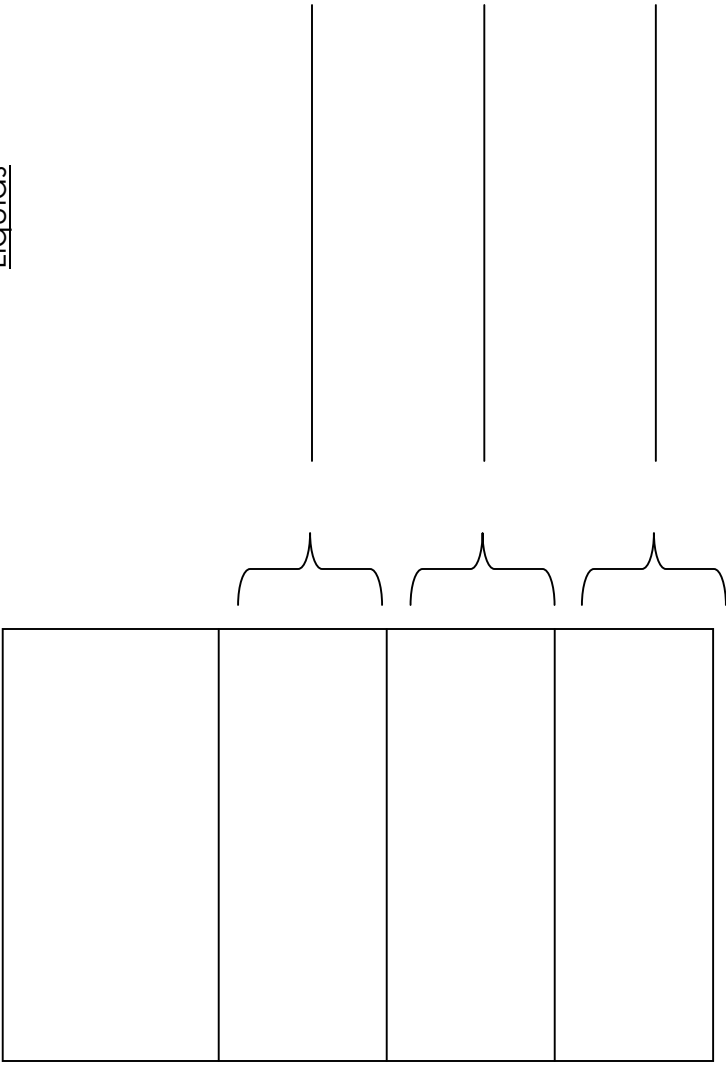
The density of solid #2 is greater than _____ and less than _____.

The density of solid #3 is greater than _____ and less than _____.



11. Draw and label the solids and liquids after you poured and dropped them into your container.

Solids



12. What is the density of an object?

13. Sort the 6 objects/liquids in order of density.

Most dense

Least dense

14. Why does oil float on water?

Additional questions:

15. Under #13, write down your calculated densities for the 3 liquids. Estimate what the densities might be for the 3 solids based on where they fell and what the densities are around them.

16. How do weather and density work together?

In cold fronts?

In warm fronts?

When a large ship spilled lots of oil on the ocean near Alaska, what happened to the oil?

What are some things we could do to clean up the spilled oil?
