



**Title:** THE EGG DROP

**Problem:** Where will an egg settle when placed in a density column?

**Introduction:** Floating and sinking all have to do with density. If you think about it, this is why the earth is divided up into layers. The densest layer is in the center of the earth (inner core) and the layers that surround it have progressively lower densities. This is why the earth’s lithosphere (sphere of rock) is below the hydrosphere (sphere of water) and the hydrosphere is below the atmosphere (sphere of air). Rock is below water, which is below air. Imagine if the hydrosphere was less dense than the atmosphere. How would our world be different?

Different liquids often have different densities. Anyone who has shaken Italian dressing knows that sometimes liquids separate. Liquids that are more dense than water will sink in water while liquids less dense than water will float. Water has a very convenient density of 1 g/cm<sup>3</sup> also written as 1 g/ml. You can predict whether materials will sink or float based upon their relative densities. Your objective is to predict what an egg would do when placed in a column of different density liquids. Will your egg sink to the bottom of your column, float to the top, or end up somewhere in between?

**Note:** Careful measurements and calculations will increase your ability to make correct predictions.

**PART 1 General Directions:** Density is the ratio of an object’s mass to its volume. Mass is determined by weighing the object on a scale and volume of liquids is found by measuring the liquid in a graduated cylinder. You will need to calculate the density of given mystery liquids and predict if and how they would separate if placed together in a test tube. After predicting your density column you will mix the liquids to see if your prediction was correct.

**Materials:**

- 4 mystery liquids of different colors
- 4 identical graduate cylinders (10 ml)
- Balance (digital or triple beam)
- Eye droppers (one for each liquid)
- Colored pencils
- Test tube

**Procedure:**

1. Measure the mass of one empty 10 ml graduate cylinder and place this weight in the data table below.  
*Note: The graduate cylinders each have slightly different masses!*
2. Fill this cylinder about 3/4 full with one of the mystery liquids.
3. Record the color of your liquid in the table below.
4. Weigh the cylinder with liquid and record your data with proper units.
5. Subtract the weight of the empty cylinder to find the weight of the liquid and record your data.
6. Record the volume of the mystery liquid.  
*Remember to carefully measure the bottom of the meniscus to the nearest tenth of a milliliter.*
7. Calculate the density of the mystery liquid by dividing the mass by the volume.  
*Be sure to include proper units.*
8. Replace the liquid, clean your graduate cylinder and repeat steps 1-7 for the other mystery liquids.  
**Please do not pour the liquids down the drain.**

Data Table 1

Color of liquid	Mass empty cylinder	Mass of liquid and cylinder	Mass of liquid	Volume of liquid	Density of liquid

## Density Column Prediction and Observations

- Predict how the liquids would settle if placed in a test tube.
- Color your prediction using the same color as the mystery liquids here

How did you base your prediction? Explain. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- Carefully create your density column in a test tube.
- Place the liquids in the test tube in the same order as you predicted.
- Color your ACTUAL density column and compare your results.
- Was your prediction correct? \_\_\_\_\_

Explain why or why not: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- Which one(s) of your mystery liquids would float in water? How do you know?

\_\_\_\_\_

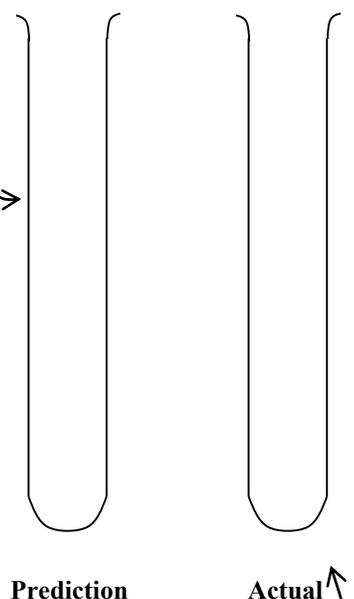
\_\_\_\_\_

- Draw a line and label where you predict the water will settle in your density column in the actual test tube above.
- Add some water to your density column with an eyedropper. Was your prediction correct? \_\_\_\_\_
- What do you notice about the density of the liquids that float on the water compared to those that sink?

\_\_\_\_\_

\_\_\_\_\_

- Empty your test tube into the waste container, clean all materials and place them back in the supply area.



## PART 2: WHERE WILL THE EGG DROP

**General Directions:** You must find the density of an egg and predict where it would settle in your density column. Density is the ratio of an object's mass to volume. In order to find the density of an irregular shaped object (egg) you will need to find the mass and volume of the egg. Volume can be found by measuring the water displaced when the irregular object is placed in water. You can measure the amount the water rises when the egg is placed in a graduate cylinder or you can find the volume of the egg by measuring the amount of water that overflows when the egg is placed in a container that is full with water.

### Materials:

- Egg
- Density Column
- Large graduate cylinder
- Overflow can and catch bucket
- Balance (digital or triple beam)

### Procedure:

- Find the mass of your egg using the scale and record your data in Data Table #2.

**Note:** design a method to make sure your egg does not fall off the balance.

- Find the volume of your egg by finding the amount of water the egg displaces.

**Note:** the more precise you are with this measurement the better your results.

- Calculate the density of the egg and record your results. **Don't forget to include correct units!**

DATA TABLE #2

Mass of Egg	Volume of Egg	Density of Egg

- Color your density columns according to your part A observations.
- Predict where your egg would settle in the density column.
- Bring your lab to your teacher and observe where your egg settles. Were you correct? \_\_\_\_\_
- Draw your observations.
- Clean your area and place all materials away.
- Will your egg float in water? Explain.

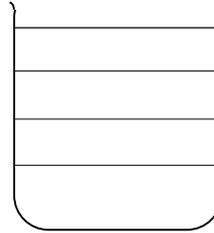
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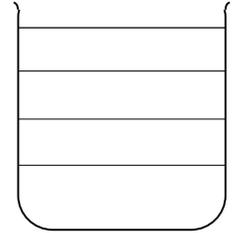
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Prediction

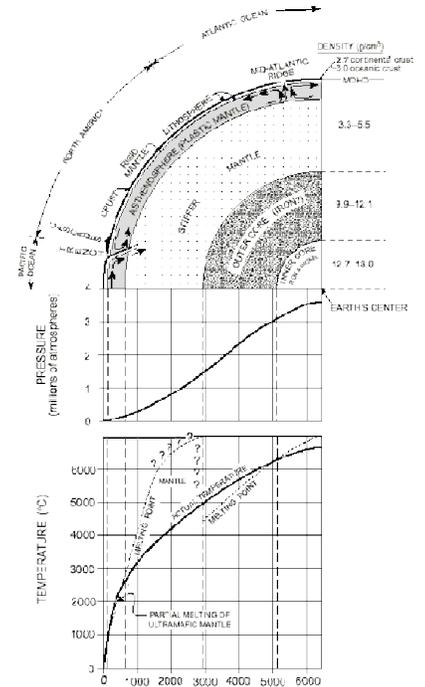


Actual

**Analysis and Conclusions Questions:**

**Layers of the Earth (use your reference tables page 10 if needed)**

- What happens to the density of the earth materials as you go deeper towards the earth's core? \_\_\_\_\_
- Which layer of the earth is least dense? \_\_\_\_\_
- Why is the hydrosphere found on top of the lithosphere? (use density values) \_\_\_\_\_  
\_\_\_\_\_
- If your egg had a density of 8.2 g/cm<sup>3</sup> between what two layers in the earth would your egg settle? \_\_\_\_\_ and \_\_\_\_\_
- What is the depth of this interface? \_\_\_\_\_
- If an object is placed in a graduated cylinder and the water level rises from 21 ml to 38 ml, what is the volume of the object?  
\_\_\_\_\_
- If that same object has a mass of 15.3 grams what is the density of the object?  
\_\_\_\_\_  
\_\_\_\_\_
- What is a problem with finding the volume of the above example? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



This is a picture of a Galileo Thermometer. The small glass spheres of liquid float or sink due to changes in temperature. Examine the Galileo thermometer in the classroom and answer the following.

- What happens to the spheres of liquid when you heat up the thermometer with your hands?  
\_\_\_\_\_
- Why do the small glass spheres move as you heat up the thermometer?  
\_\_\_\_\_  
\_\_\_\_\_

