

**WHY IS THE EARTH LAYERED?**

- Objective:**
1. To demonstrate an ability to follow written instructions.
  2. Recognize the parts of a well written procedure.
  3. To determine what causes layering to take place.

- Materials:**
- 3 unknown fluids
  - 3 beakers
  - graduated cylinder
  - balance
  - pencil (use of pen is an automatic deduction)

**Precautions:** You MUST use safety goggles while completing this lab...even if you already have glasses on.

**Procedure:**

1. Observe the layered fluids in the large graduated cylinder. Food coloring has been added to each fluid to conceal its identity. Think about what may cause the fluids to create layers.
2. Using the balance measure and record the mass of the graduated cylinder to the nearest tenth of a g.
3. Pour between 20 and 30 ml of liquid A into the graduated cylinder.
4. Record the volume of the liquid in the graduated cylinder to the nearest whole ml.
5. Using the balance measure the mass of the graduated cylinder with the liquid to the nearest tenth of a g.
6. Calculate and record the mass of just the liquid by subtracting the mass of the empty graduated cylinder from the combined mass of the liquid and graduated cylinder.
7. Pour the liquid into one of the empty beakers.
8. Dry the cylinder as best as possible.
9. Repeat steps 3-8 for liquids B and C making sure to save C for last.
10. Using the formula  $\text{density} = \frac{\text{mass of liquid}}{\text{volume of liquid}}$  calculate each liquid's density to the thousandths place.
11. Based on your data pour each of the liquids into the graduated cylinder in the order you think they should be layered. If you are right they will stay layered...if not mixing will take place.

**Observations:**

Show the layered liquids in your graduated cylinder to the teacher and get their initials here: \_\_\_\_\_

Liquid	mass of empty cylinder (g)	volume of liquid (ml)	mass of cylinder with liquid (g)	mass of liquid alone (g)	density of liquid (g/ml)
A					
B					
C					

**Conclusions:**

Using full sentences explain what you believe caused the layering: \_\_\_\_\_

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**Questions:**

1. What are the units used when recording the volume of a liquid? \_\_\_\_\_
2. What is the instrument used to measure the volume of a liquid? \_\_\_\_\_
3. What is the precision of this instrument? \_\_\_\_\_
4. What are the units used when recording the mass of a material? \_\_\_\_\_
5. What is the instrument used to measure the mass of a material? \_\_\_\_\_
6. What is the precision of this instrument? \_\_\_\_\_
7. What are the units used when recording the density of a material? \_\_\_\_\_
8. What is the instrument used to measure the density of a material? \_\_\_\_\_
9. What is the precision of this instrument? \_\_\_\_\_

**Uncertainty Analysis:**

What is one way of improving the procedure used in this lab? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Why would it have been better to measure several samples of each liquid? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Why do all instruments, no matter how good their quality, have some error? \_\_\_\_\_  
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