Name: _____

The Density of Fluids Lab Activity
SPH4C

Part 1: The Density of Liquids

Purpose: To determine the density of water and of vegetable oil.

Materials: water, vegetable oil, graduated cylinder, electronic mass balance

Procedure:

1. Using the electronic mass balance, determine the mass of the graduated cylinder:

   _____ kg

2. Add 20 mL (0.00002 m^3) of water to the graduated cylinder. Using the electronic mass balance, determine the mass of the graduated cylinder with the water added. Record this value (in kilograms) in Table 1 below.

3. Determine the mass of the water by subtracting the mass of the graduated cylinder from the mass of the graduated cylinder with the water added. Record this value in Table 1.

4. Repeat Steps 2 and 3 for volumes of 40 mL, 60 mL, 80 mL, and 100 mL.

5. Repeat Steps 2 – 4, replacing the water with vegetable oil and recording all values in Table 2.

Data:

Table 1: Mass and Volume for Different Quantities of Water

Volume (mL)	Volume (m^3)	Mass with cylinder (kg)	Mass without cylinder (kg)	Density (kg/m^3)
20	0.00002			
40	0.00004			
60	0.00006			
80	0.00008			
100	0.00010			

Calculate your density for each trial (using the mass without the cylinder), recording your results in Table 1, and then calculate your average density of water:

Table 2: Mass and Volume for Different Quantities of Vegetable Oil

Volume (mL)	Volume (m^3)	Mass with cylinder (kg)	Mass without cylinder (kg)	Density (kg/m^3)
20	0.00002			
40	0.00004			
60	0.00006			
80	0.00008			
100	0.00010			

Calculate your density for each trial, recording your results in Table 2, and then calculate your average density of vegetable oil:

Are your results above consistent with the observation that oil floats on water? Explain.

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Part 2: The Density of Air

Purpose: To determine the density of air.

Materials: spherical balloon, masking tape, measuring tape, electronic mass balance

Procedure:

1. Using the electronic mass balance, determine the mass of the balloon: _____ kg (You may wish to use a small piece of masking tape to secure the balloon to the scale for this and later measurements. Use the same piece of tape each time.)

2. Partially inflate the balloon. Do not tie it shut! Simply twist the end of it and secure the end with a piece of tape so that you can remove the tape and inflate it to a different volume later.

3. Using a measuring tape, measure the circumference *C* of the balloon (in metres). Record this value in Table 3 below.

4. Calculate the volume of the balloon using the formula: $V = \frac{C^3}{6\pi^2}$

   Record this value in Table 3.

5. Using the electronic mass balance, determine the mass of the balloon while partially inflated. Record this value in Table 3.

6. Determine the mass of the air inside by subtracting the mass of the balloon from the mass of the balloon while partially inflated. Record this value in Table 3.

7. Repeat Steps 2 – 6 for different volumes of air.

Data:

Table 3: Mass and Volume for Different Quantities of Air Inside a Balloon

Circumference (m)	Volume (m^3)	Mass including balloon (kg)	Mass without balloon (kg)	Density (kg/m^3)

Calculate your density for each trial, recording your results in Table 3, and then calculate your average density of air:

Further discussion:

Inflate a balloon with air and tie it shut. Place the balloon in a freezer for a short length of time. (There is a freezer in Room 303.) What do you notice? Explain why.

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Drop the balloon from standing height above the floor. Now take another, identical balloon, inflate it with water and tie it shut. Drop it from standing height above the ground ***outside***. Identify at least 3 reasons why you got a different result when you dropped the 2nd balloon.

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