

Lesson 3 Exploring Density

In this lesson you will investigate the concept of density.

STEP 7

A. Define density in your own words. Write the equation used to calculate density.

B. A unit of density contains units of mass and volume. Identify each of the following as a unit of *mass*, a unit of *volume*, or *neither* by writing **Mass**, **Volume**, or **Neither** in the blank. (You may want to use your chemistry textbook as a reference to look up unknown units.)

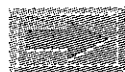
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|--------------------------|-------------------------|
| 1. s _____ | 6. m ² _____ |
| 2. mL _____ | 7. L _____ |
| 3. g _____ | 8. °C _____ |
| 4. cm ³ _____ | 9. kg _____ |
| 5. mole _____ | 10. M _____ |



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STEP 9

- A. What is the mass of the water? _____ g
- B. What volume of water is in the test tube? _____ cm³
- C. Calculate the density of water using the equation, $\text{Density} = \frac{\text{Mass}}{\text{Volume}}$. Show your work and use the proper units.



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STEP 12

- A. Record in Table 1 the mass and volume data for each of the unknown substances. Calculate the density of the solid and liquid in units of g/cm³. Convert the density of the gas from units of g/cm³ to g/l (1000 cm³ = 1 liter). Show your work.

Table 1 Data for the Unknown Substances

Substance	Mass (g)	Volume (cm ³)	Density (g/cm ³ or g/L)
Unknown Solid	1700		
Unknown Liquid			
Unknown Gas		10 L	



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STEP 13

- A. From the density data on the Large Periodic Table, identify each of the unknown substances.

Unknown Solid: _____

Unknown Liquid: _____

Unknown Gas: _____

- B. Search through the density data in the Large Periodic Table to find the element with the greatest density. Record the name, symbol, and density of the element.

- C. Search through the density data on the Large Periodic Table to find the element with the lowest density. Record the name, symbol, and density of the element.

- D. How many times more dense is the element with the greatest density than the element with the lowest density? Show your work. (Hint: You will need to convert g/L to g/cm³. 1 Liter = 1000 cm³.)

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STEP 17

- A. Did zinc float or sink when placed in mercury? What caused the zinc to float or sink?


B. Write a brief statement explaining the relationship between density and sinking or floating.

C. List at least one example of a situation that occurs due to density differences (such as icebergs floating in the ocean). Try to explain why the phenomenon occurs.

D. Table 2 below lists several different substances and their densities. Which of the substances will float in mercury (density = 13.55 g/cm³)? Which of the substances will float in water (density = 1.00 g/cm³)? Complete the table below by writing Yes or No in the blanks. Use the space provided below the table for any work you may need to do.

Table 2 Densities of Several Substances

Substance	Will it float in mercury?	Will it float in water?
Carbon (density = 2.62 g/cm ³)		
Platinum (density = 21.45 g/cm ³)		
Corn oil (density = 0.92 g/cm ³)		
An object with a mass of 787 g and a volume of 100.0 cm ³		

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STEP 18

Use the information on the Large Periodic Table to answer the questions below. The density data on the Large Periodic Table are at STP.

A. Record the densities of the following gases.

Helium (He) _____

Neon (Ne) _____

Xenon (Xe) _____

B. The density of dry air at room temperature and pressure is about 1.2 g/L. Which of the gases above are less dense than dry air?

C. As you see from Part A, some gases are less dense than air (at the same temperature and pressure). Helium has a lower density than air—that's why a helium balloon floats! Would it be possible to use xenon in a balloon intended to carry passengers over the Atlantic Ocean? Explain.

D. Do the densities of the elements tend to increase or decrease as you move down a group (column) on the periodic table?

E. A student measures the mass and volume of a penny in the laboratory, with the following results—Mass: 2.84 g, Volume: 0.40 cm³. Calculate the density of the penny.

F. Is the penny in Part A made of pure copper? Explain your answer. (Copper, Cu, is element number 29.)



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