

**Chapter 8 Density and Buoyancy****Density, Mass, and Volume**

**8. a.** *Students know* density is mass per unit volume.

The physical property of matter that determines the buoyancy of an object is density. **Density** is mass per unit volume. **Volume** is the amount of space an object takes up. **Mass** is a measure of the amount of matter an object contains. Mass differs from weight in that **weight** is a measure of the force of gravity on an object. For example, the weight of an astronaut walking on the moon is much less than the astronaut's weight on Earth because the force of gravity on the moon is less than the force of gravity on Earth. The mass of the astronaut, however, does not change. The amount of matter making up the astronaut's body remains the same.

Because the density of a substance is based on the amount of mass per unit of volume, density is expressed in a combination of units for mass and volume. The SI unit of density is the kilogram per cubic meter ( $\text{kg}/\text{m}^3$ ). In practice, density is more often expressed in grams per cubic centimeter ( $\text{g}/\text{cm}^3$ ) for solids and grams per milliliter ( $\text{g}/\text{mL}$ ) for liquids. In each case, the numerator is a measure of mass and the denominator is a measure of volume.

The density of a substance is the same for all samples of that substance no matter what size the sample is. For example, the density of pure gold is  $19.3 \text{ g}/\text{cm}^3$  in both gold bricks and gold foil. Density is a physical property that is a characteristic of the substance itself. For this reason, density is used to determine the purity of substances and to identify unknown substances. The table lists densities of some common substances.

**Densities of Some Common Substances**

<b>Substance</b>	<b>Density (<math>\text{g}/\text{cm}^3</math>)</b>
Air	0.001
Ice	0.9
Water	1.0
Aluminum	2.7
Gold	19.3

**Chapter 8 Density and Buoyancy****Standard 8. a. Check**

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| <p><b>1</b> The density of a substance is based on the substance's</p> <ul style="list-style-type: none"><li>A height and weight.</li><li>B weight and mass.</li><li>C mass and volume.</li><li>D length and volume.</li></ul> <p><b>2</b> Which unit is used to express the density of a substance?</p> <ul style="list-style-type: none"><li>A <math>\text{m/kg}^3</math></li><li>B <math>\text{g/cm}^3</math></li><li>C <math>\text{mL/cm}^3</math></li><li>D <math>\text{kg/cm}</math></li></ul> | <p><b>3</b> When a sample of liquid is divided in half, its density</p> <ul style="list-style-type: none"><li>A is half as much.</li><li>B stays the same.</li><li>C is two times greater.</li><li>D is four times greater.</li></ul> <p><b>4</b> Density is used to determine all of the following <i>except</i></p> <ul style="list-style-type: none"><li>A the force of gravity.</li><li>B the buoyancy of an object.</li><li>C the purity of a substance.</li><li>D the identity of an unknown substance.</li></ul> |
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