

## Activity Sheet Answers

### Chapter 3, Lesson 5

#### Density: Sink and Float for Solids

#### **DEMONSTRATION**

1. Your teacher showed you one candle floating in water and another identical candle sinking in alcohol. Do water and alcohol have the same or different densities? Which liquid is more dense? How do you know?

Alcohol and water do not have the same density. We know that water is more dense than alcohol because the candle floats in water, but sinks in alcohol. Because the candles are identical, the water must be more dense than the candle and the alcohol must be less dense than the candle.

2. Your teacher placed equal volumes of water and alcohol on a balance. Explain how this demonstration proves that water is more dense than alcohol. Be sure to mention both volume and mass.

When equal volumes of water and alcohol are placed on a balance, the water is heavier. This must mean that water is more dense. According to  $D=m/v$ , if the volume of the two samples is the same, the sample with the greater mass must be more dense.

3. Your teacher showed you a graduated cylinder with alcohol, oil, and water. Why does the alcohol float on the oil? Why does the water sink in the oil?

The alcohol floats on the oil because it is less dense than the oil. The water sinks in the oil because it is more dense than the oil.

#### **ACTIVITY**

4. How do the densities you calculated explain why water sinks in oil and alcohol floats on oil?

The calculated density of water is greater than the calculated density of oil. Because substances with greater density sink when they are placed in substances of less density, water sinks in oil.

The calculated density for alcohol was less than the calculated density for oil. Because less dense substances float in substances of greater density, the alcohol floats on the oil.

5. Look at the layered liquids in the illustration. Write *most*, *least*, or *in-between* in the chart below to describe the density of each liquid

Liquid	Density
Dawn	Least
Saltwater	In-between
Corn Syrup	most

## EXPLAIN IT WITH ATOMS & MOLECULES

6. Water molecules are smaller and have less mass than alcohol and oil molecules. Explain why water is more dense than alcohol and oil.

Water is more dense than alcohol or oil because its molecules can pack closely together, in the same volume than either alcohol or oil. In addition, oil is made up of carbon and hydrogen atoms while water is made up of oxygen and hydrogen atoms. Because water contains a heavier atom, we might expect it to be more dense than oil. Although alcohol also contains oxygen atoms, its molecules are not able to pack together as tightly as water molecules, and so it is less dense than water.

## TAKE IT FURTHER

7. A carrot slice sinks in water and floats in saltwater. Is the carrot more dense or less dense than water? Is the carrot more dense or less dense than saltwater?

The carrot is more dense than water. It is less dense than saltwater.

8. Does adding salt change the density of the water? How do you know?

Yes, adding salt made the water more dense. We know because after adding the salt, the carrot which had sunk in fresh water, began to float.

9. What would you expect if you placed equal volumes of water and saltwater on opposite ends of a balance?

If you placed equal volumes of water and saltwater on opposite ends of a balance, the saltwater would be heavier because it is more dense.

10. Adding salt to water increases both its mass and volume; which do you think it increases more, the mass of the water or the volume?

Adding salt to water increases the mass more than the volume, which makes the water more dense. This must be true. If it were the other way around, and adding salt increased the volume more than the mass, the water would actually have become less dense when the salt was added, and the carrot would have remained at the bottom of the cup.