Activity Sheet Answers

Chapter 3, Lesson 1
What is Density?

DEMONSTRATION

1. Look at the drawing of the copper and aluminum cubes and their atoms.
   Copper and aluminum atoms are arranged the same way, but copper atoms are slightly larger than aluminum atoms. Therefore, there are fewer copper atoms in the copper cube than aluminum atoms in the aluminum cube.
   If there are fewer copper atoms in the cube, why does the copper cube weigh more than the aluminum cube?

   The copper atoms are so much heavier than the aluminum atoms that even though there are fewer copper atoms, their greater mass makes the copper cube heavier.

2. The density of a substance like copper or aluminum is its mass divided by its volume (how much space it takes up).
   Density = mass/volume or D = m/v.
   Which is more dense, copper or aluminum? How do you know?
   Copper is more dense than aluminum. The copper must be more dense because when you compare equal volumes of the two substances, the copper has greater mass.

3. How do you find the volume of a cube?
   To find the volume of a cube, you would measure the length x width x height. Since each side of a cube has the same measurement, you could measure just one side in centimeters and then cube that measurement to get the volume in cm^3.

4. How do you find the mass of a cube?
   To find the mass of the cube, just put it on a balance and measure the mass in grams.

5. Once you know the volume and mass of a cube, how do you find the density of the cube?
   Density = mass/volume. To find the density of the cube, you divide the mass by the volume and get the result in g/cm^3.

6. Calculate the density of a cube using the following information:
   - Each side is 4 cm long.
   - The mass of the cube is 128 g.

   Volume = 4 x 4 x 4 = 64 cm^3. Mass = 128 grams.
   Density = mass/volume = 128g/64cm^3 = 2g/cm^3.

ACTIVITY

7. Compare the value you found for density with the given value in the chart below to identify which cube is made out of which material. Write the name of the material in your chart for cubes A–H. (Answers are in the chart in the lesson).

EXPLAIN IT WITH ATOMS & MOLECULES

8. The size, mass, and arrangement of atoms affect the density of a substance.

   If a substance has a *high density*, what can you guess about the size, mass, and arrangement of the atoms that make up the substance?
   If a substance has a high density, it could be that its atoms have a lot of mass, are small, or are arranged very close to each other, or some combination of these.

   If a substance has a *low density*, what can you guess about the size, mass, and arrangement of the atoms that make up the substance?
   If a substance has a low density, it could be that its atoms are not very massive, are larger so not as many can fit in a given volume, or arranged in a way that does not pack them as close as they could be.

9. Now imagine two blocks (Sample A and Sample B) made of different substances that both have the *same mass*, but *different volumes*.

   a. What is the density of Sample A?
   The density of sample A = mass/volume = 200g/100 cm^3 = 2g/cm^3.

   b. What is the density of Sample B?
   The density of sample B = mass/volume = 200g/50 cm^3 = 4g/cm^3.

   c. Give two possible explanations for why one sample is more dense than the other.
   The atoms that make up sample B are more massive than the atoms that make up the samples are the same mass, but the atoms that make up sample B are smaller and closer together so more can fit in a given volume.