

Activity Sheet
Chapter 3, Lesson 1
What is Density?

Name _____

Date _____

DEMONSTRATION

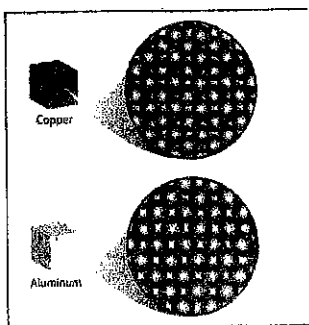
Your teacher placed a copper and an aluminum cube on a balance. Even though the cubes are the same size and shape, the copper has a greater mass than the aluminum. Both cubes are solid and are not hollowed out anywhere inside. The copper cube is made up of only copper atoms and the aluminum cube is made up of only aluminum atoms.

1. Look at the drawing of the copper and aluminum cubes and their atoms. What are two possible explanations for why the copper cube has a greater mass than the aluminum cube?

Hint: Just because the aluminum atoms are larger, they are not necessarily heavier.

Explanation 1:

Explanation 2:



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?

You saw an animation about how to find the volume, mass, and density of a cube.

3. How do you find the volume of a cube?
4. How do you find the mass of a cube?
5. Once you know the volume and mass of a cube, how do you find the density of the cube?
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.

ACTIVITY

Your group will work with eight cubes each with the same volume, but made of a different material. Carefully measure the mass of each cube and calculate the density. Then use density to correctly identify each of the 8 cubes.

Question to investigate

Can you use density to identify eight cubes made of different materials?

Materials for the class

- Set of eight cubes of equal volume - share with groups (1-4 + 5-8)
- Calculator

Materials for each group

- Cubes marked A-H that you will share with other groups
- Balance that can measure in grams
- Calculator

Procedure

1. The volume of each cube is given in the chart. It is 15.6 cm³.
2. Find the mass in grams of each cube using a scale or balance. Record this mass in the chart.
3. Trade cubes with other groups until you have measured the mass of all eight cubes
4. Calculate the density using the formula $D = m/v$ and record it in the chart.

Do NOT
DO UNTIL
Finished with all cubes

Sample	Volume (cm ³)	Mass (g)	Density (g/cm ³)	Material
A	15.6			
B	15.6			
C	15.6			
D	15.6			
E	15.6			
F	15.6			
G	15.6			
H	15.6			

5. 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.

Material	Approximate Density (g/cm ³)
Aluminum	2.9
Brass	8.8
Copper	9.3
Steel	8.2
PVC	1.3
Nylon	1.2
Oak	0.7-0.9
Pine or poplar	0.4-0.6

EXPLAIN IT WITH ATOMS & MOLECULES

7. 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 *low density*, what can you guess about the size, mass, and arrangement of the atoms that make up the substance?