Scientists' Consensus Ideas

Properties of Objects and Materials

5

Name Date Class

(Unit 1 Chapter 3, Activities 6–7)

Properties of Objects

1. A **property** of an object is a description of how the object interacts with another object.

Complete the following examples of properties.

a) Materials that are attracted to a magnet are called _____ materials.

b) Materials that allow the bulb to light in an electric circuit are called _____.

2. In everyday life, properties of objects are descriptions of how the objects interact with your senses – eyes (seeing), hands or skin (feeling), ears (hearing), nose (smelling), and mouth (tasting).

List at least three good property words for each sense.

a) Seeing: _____

b) Feeling: _____

c) Hearing: _____

d) Smelling: _____

e) Tasting: _____

3. The senses are not always very reliable. So, scientists use the interaction of objects with **instruments** to extend their senses and measure the properties of objects. For example, a thermometer measures the property of hotness better than the hands.

What measuring instruments did you use (or read about) in this chapter?

a) Activity 2: _____

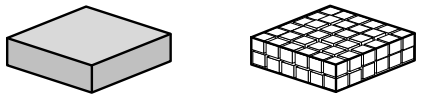
b) Activity 3: _____

c) Activity 4: _____

d) Activity 6: _____

Properties Related to the Amount of Stuff

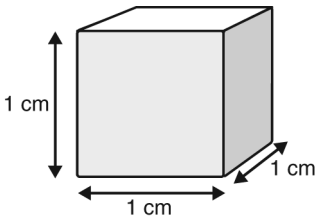
Scientists often want to know how much stuff they have or need. There are two different properties related to the amount of stuff: volume and mass.



4. **Volume** tells you how much room or space an object takes up.

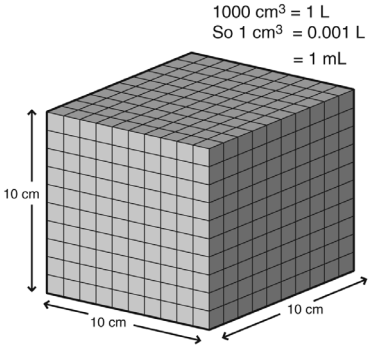
a) The volume of (space occupied by) an object is the number of standard unit cubes that fit inside the object.

b) For small objects, the standard unit volume is a cube one centimeter (1 cm) on each side. The space occupied by the 1-cm unit cube is called one cubic centimeter (1 cm^3).



This cube has a volume of 1 cm x 1 cm x 1 cm = 1 cm^3

If 1000 1-cm unit cubes are piled together, they form a larger unit of volume called a cubic decimeter. This unit is also called a *liter* (L).



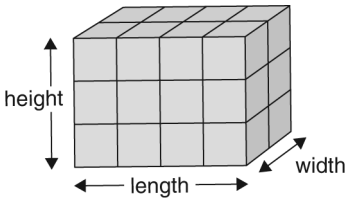
Here are methods for finding the volume of a rectangular solid or a liquid.

c) To find the volume of a cube or rectangular solid:

- Use a ruler to measure the length, width, and height of the solid.
- Multiply the width times the length times the height.

Volume of rectangular solid = length x width x height

- When multiple trials are done, calculate the best value and uncertainty.

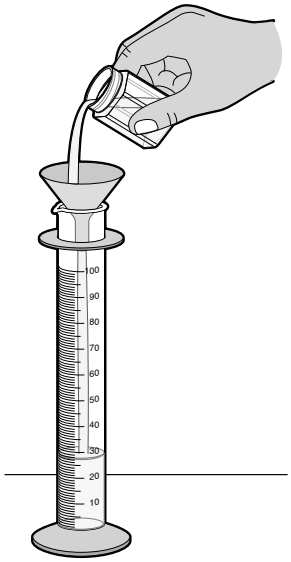


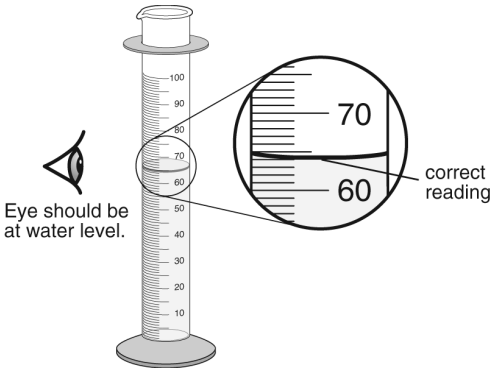
In which activity and experiment(s) did you practice measuring the volume of rectangular solids?

d) To measure the volume of a liquid:

- Pour the liquid into a graduated cylinder. If necessary, use a funnel.
- Read the mark at the bottom of the curve (called the meniscus).
- When multiple trials are done, calculate the best value and uncertainty.

(See *How To Use a Graduated Cylinder*.)

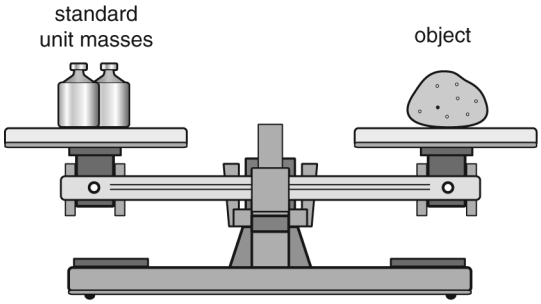




In which activity and experiment(s) did you practice measuring the volume of liquids?

5. **Mass** is the amount of matter that a body contains. The more mass an object has, the more material it has, and the heavier it is. All materials—gases, liquids, and solids—have mass.

   a) The mass of an object is measured by using a mass balance. The mass of an object is the number of *standard unit* masses that balance the object. Many commercial balances have standard masses built into the balance.



   b) The standard unit of mass is the gram (g). A gram is one-thousandth of a kilogram (kg), which is the unit of mass scientists and many countries use to measure the mass of large objects, such as people.

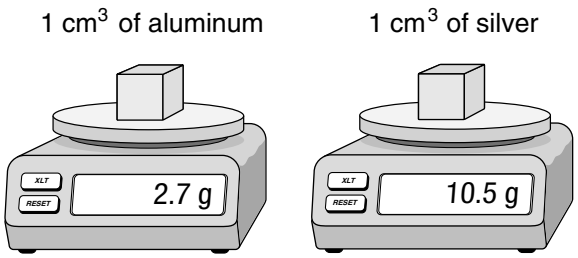
   c) Different types of mass balances have different sets of procedures for measuring mass. See *How To Use Mass Balances* for the procedures to measure mass with a triple-beam balance and an equal-arm balance.

In which activity and experiment(s) did you practice measuring the mass of solids?

Characteristic Properties of Materials

6. **Characteristic properties** help you decide what kind of material an object is made of. Characteristic properties are measurements (numbers) that are different for different kinds of materials. When you measure characteristic properties of materials, you need to do fair tests. Other variables that influence the interaction are kept constant, except the kind of material.

7. **Density** is the measurement of the mass of a standard unit volume of a material. The controlled variable is the volume of the material. The standard unit of volume is either a 1-cm cube (1 cm^3) or 1 mL.



The density of an object can be found if its mass and volume are known. The equation for calculating the density of an object is:

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

The standard unit for density is one gram per cubic centimeter (1 g/cm^3) or one gram per milliliter (1 g/mL).

8. **Electrical conductivity** of a metal wire is a measurement of the electric current through the metal wire in a circuit. The controlled variables are the number of cells (and other circuit devices like bulbs), the length of the wire, and the thickness of the wire.