

Matter

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REMEMBER *now* thy **CREATOR**

Man sometimes looks at his scientific advancement and forgets the God Who allows man to have dominion over the earth. Even some everyday situations of life would change greatly without God's perfect plan. Suppose all kinds of matter melted at the same temperature. You would not be able to melt chocolate in a pot on the stove. The pot and chocolate would both melt at the same time. Ice in a glass of water would melt, but so would the glass that holds the water. These things may sound silly, but they are examples of how God created properties of matter to work in useful ways. Man can learn about science and can design technology only because of God's faithful maintaining of His creation.



Measuring Matter

Look around you. You probably see many objects. These may include things such as books, pencils, paper, and carpet. These items are different in many ways, but they are all alike in at least one way. Each is made of matter. **Matter** is anything that has volume and has mass. Volume and mass are characteristics of matter that we can often measure. Sometimes we use the term *substance* to refer to matter.

Volume of a Liquid

The **volume** of a substance is the amount of space that it takes up. The standard unit of metric measurement for volume is the liter (L). Many soft drinks come in two-liter bottles. A smaller unit for volume is the milliliter (mL). Liquid medicine often uses this unit. A teaspoon of medicine is about 5 mL.

We measure the volume of a liquid by using a graduated (GRAJ OO ATE ed) container. *Graduated* means that the container is divided into equally marked parts. A graduated container has the units of measurement marked on its side. A liquid is poured into the container. The level of the liquid is then compared with the numbers on the side of the container. The numbers show the volume of the liquid. Scientists use containers called graduated cylinders, but even the measuring cups in a kitchen are a type of graduated container.



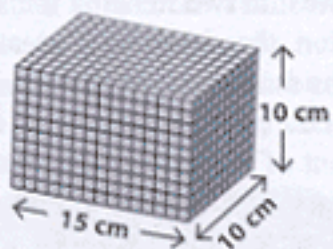
Science and the BIBLE

In 2 Kings 4 the Bible tells us about a widow who owed money. Her sons were going to be taken as slaves unless she could pay her debts. All that the widow had was a pot of oil. The pot held a small volume of oil. The prophet Elisha told the widow to borrow vessels, or large containers, from her

neighbors. She started pouring her little bit of oil into the vessels and kept pouring until all of the vessels were filled. Elisha told her to sell the oil to pay her debts. God caused the small volume of oil to increase to fill many large pots. In this way, He miraculously provided for the widow's needs.

Volume of a Solid

There are two ways to measure the volume of solid objects. To measure the volume of regular shapes, such as cubes and rectangular solids, multiply the measurements of the length, width, and height of the object. The volume is written as a cubic measurement. An object that is 15 centimeters (cm) long, 10 cm wide, and 10 cm high has a volume of 1,500 cubic centimeters. A cubic centimeter is written as cm^3 or cc.



$$\text{length} \times \text{width} \times \text{height} = \text{volume}$$

$$15 \text{ cm} \times 10 \text{ cm} \times 10 \text{ cm} = 1500 \text{ cm}^3$$

However, we cannot always measure a solid object by using its length, width, and height. For instance, it would be difficult to measure a rock or a marble in this way. The volume of irregularly shaped objects can be measured using a method called *water displacement*.

You can see water displacement when you add marbles to the water in a fishbowl. The volume of the marbles is the difference between the beginning level of the water and the level after the marbles were added. The volume can be written in milliliters or liters. For example, suppose a fishbowl contains 1,000 mL of water. After the marbles are added, the level of the water is at 1,250 mL. The volume of the marbles is 250 mL.

$$1250 \text{ mL} - 1000 \text{ mL} = 250 \text{ mL}$$

In the metric system one cubic centimeter is equal to one milliliter. Scientists usually use milliliters to describe the volume of a liquid. They use cubic centimeters to describe the volume of a solid. So the volume of the marbles in the example is also equal to 250 cm^3 .

