NAME: _____

Measuring the Volume of a Liquid

16

WORD CHECK

volume The amount of space that a substance occupies is its *volume*.

♦ Problem *How do you use a graduated cylinder to measure the volume of a liquid?*

You may have read a food label that stated, "This box of cereal is sold by weight and not by volume." The term **volume** is being used to describe the amount of space taken up by the cereal. The message on the label is intended to reassure customers that they are not being cheated when they see that the volume of the cereal does not completely fill the package.

The word *volume* is used not only to describe solids, such as cereal, but also gases (the amount of air in a balloon), and liquids (the amount of soda in a bottle).

In your work today, you will learn how to use a *graduated cylinder* to measure the volume of a liquid.

EQUIPMENT

Check off the items to make sure you have the following equipment and material. If any item is missing, obtain it from your teacher.

___ [redacted] graduated cylinder 100mL

___ dropper bottle of water

PROCEDURES

As you examine a graduated cylinder, note the series of lines or markings on the side. These markings make up the measurement scale and are called graduations. Therefore, the instrument is known as a **graduated cylinder** (see next page).

1. Next, note the *lip* at the top of the cylinder. Why is a cylinder shaped with a lip advantageous?

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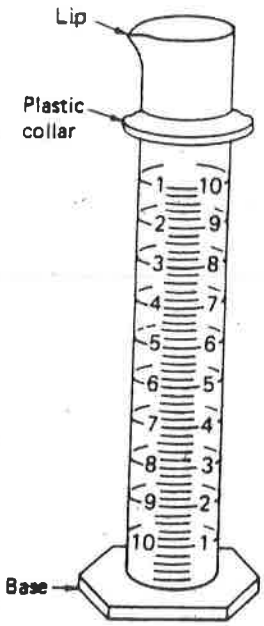


2. A *plastic collar* may be wrapped around the cylinder. Why is this collar a useful safety feature?

_____

_____

3. The base of some graduated cylinders are circular in shape. Others, as shown in the figure, have bases with six sides. Why is the *six-sided base* a useful safety feature?

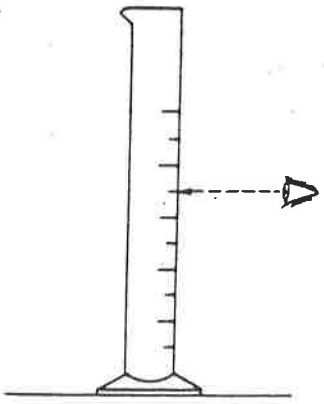
_____

_____

4. The standard unit of liquid volume in the metric system is the **liter (L)**. Just as the standard unit of length, the meter, was divided into smaller units called millimeters, so also is the liter divided into smaller units called **milliliters (mL)**. How many milliliters can your graduated cylinder measure at one time?

_____

5. Use a medicine dropper to fill your graduated cylinder about halfway with water. Then, from the side, look at the upper surface of the water, as shown in the figure. What do you notice about the water's surface that is unusual?



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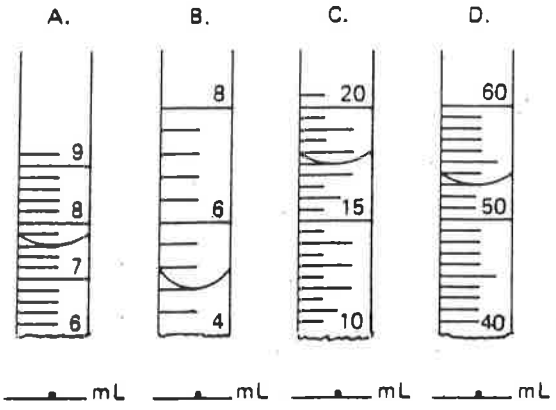
6. Draw the water's surface in the figure. It is called a **meniscus**. When reading the scale on a graduated cylinder, you must always use the *bottom* of the curve of the meniscus.

7. Use your medicine dropper to add exact volumes of water (3.0 mL, 5.0 mL, and 7.0 mL) to your graduated cylinder. Have either your partner or teacher check off your success on this sheet. Remember that the bottom of the meniscus must sit exactly on top of the line or graduation.

3.0 mL _____ 5.0 mL _____ 7.0 mL _____

TEST YOUR UNDERSTANDING

Graduated cylinders are made in many sizes, and the scale on each size may differ considerably. For each of the following graduated cylinders, identify the volume of liquid shown in the figure. It may help you to review the method you used to determine the values of lines and spaces on the metric scale.



GOING FURTHER

1. The graduated cylinder you used today had a series of numbers that started at the base. The numbers increased in value as you read them upward and toward the top of the cylinder (for example, 1 mL up to 10 mL). You used these numbers to determine the volume of the water added to the cylinder. Many cylinders have another set of numbers that increase in value as you read them downward from top to base (for example, 1 mL down to 10 mL). (Check yours ____ yes ____ no) When would this second set of numbers be useful?

_____

_____

_____

2. What are eight examples of liquid products sold by volume?

_____ _____ _____ _____

_____ _____ _____ _____

3. The prefix **milli-** means 1/1,000. How many times would you have to fill and empty a 10-mL graduated cylinder in order to fill a 1-liter soda bottle?

_____ times