Mahidol University International Demonstration School

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Unit 1: The Food Science Lab
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Laboratory Experiment #2: Measuring the Volume of a Liquid

Introduction: Using the proper equipment for experiments in the food science laboratory makes tasks easier and results more accurate and precise. Liquid volumes can be measured using a beaker, graduated cylinder, or a buret. Science requires definite measurements. In order to obtain meaningful experimental results and to develop a procedure that can be duplicated, measurements must be both accurate and precise. In this experiment you'll compare the degree of accuracy allowed by these pieces of equipment.

Purpose: To be familiar with, and learn how to read the different equipment's used for measuring the volume of a liquid.

Materials:

Water	100-mL graduated cylinder	Clamp
100-mL beaker	50-mL buret	Dropper
10-mL graduated cylinder	Ring stand	50-mL graduated cylinder

Procedure:

1. Read the volume of liquid in the beaker, graduated cylinder, and the two burets at the station.
2. Record your readings in your data table. Remember to read from the meniscus if there is one.
3. Using the graduations on the side of the 100-mL beaker, add exactly 45 mL of water to the beaker.
4. Without spilling any, pour this water into your 50-mL graduated cylinder and read the volume to the nearest 0.1 mL. Record in your data table. Empty the graduated cylinder
5. Using the graduations on the side of the beaker, add exactly 7 mL of water to the beaker. Pour this water into your 10-mL graduated cylinder and read the volume to the nearest 0.01 mL. Record in your data table. Empty the graduated cylinder.
6. Look at your buret eye level. Release water until the buret reads 0.00 mL. Discard the extra water.
7. Release exactly 22.00 mL of water from the buret into the 100-mL beaker. Transfer this amount into a 50-mL graduated cylinder. Read the volume as precisely as you can and record in your data table.
8. Release 6.55 mL of water from the same buret into the 100-mL beaker. Transfer this amount into a 10-mL graduated cylinder. Read and record this amount as accurately as possible in your data table.

Data Table #1:

Title: Measuring volume of liquids.

Equipment	Volume (mL)
1. 100-mL beaker	26.00
2. 100-mL glass graduated cylinder	75.00
3. 100-mL plastic graduated cylinder	60.50
4. 50-mL buret #1	18.20
5. 50-mL buret #2	15.80

Data Table #2:

Title: Using lab equipment to measure different volume of water.

Amount of Water	50-mL Graduated Cylinder	10-mL Graduated Cylinder
45 mL from beaker	44.00	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
7 mL from beaker	XXXXXXXXXXXXXXXXXXXXXXXXXXXX	3.90
22 mL from buret	22.00	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
6.55 mL from buret	XXXXXXXXXXXXXXXXXXXXXXXXXXXX	6.90

Discussion (Analyzing Results):

1. Based on the reading from your graduated cylinder, is a beaker suitable for measuring 45 mL of water?

The beaker is not really suitable for measuring 45 mL of water because it is not very accurate. Based on my result, the 50-mL Graduated Cylinder measured 44.00-mL of water, it is 1-mL less than the amount of water measured using the beaker.

2. Based on the reading from your graduated cylinder, is a beaker suitable for measuring 7 mL of water?

The beaker is not suitable for measuring 7-mL of water because 10-mL Graduated Cylinder measured the volume of water to be 3.90-mL. It was hard to estimate where 7-mL is on the beaker because the beaker scale starts at 20-mL.

3. When, if ever, would you use a beaker to measure volume of a liquid in an experiment?

We could use the beaker to measure just approximate volume of liquid; this could be using the same 'approximate' amount of water to boil something in a test tube etc. But we would not use a beaker to obtain a very precise and accurate volume of liquid.

4. Which cylinder (50-mL or 10-mL) or buret measured more accurately? Explain in detail.

The buret measured more accurately because the buret is narrower and it has a higher range of scales, this allows us to read the volume to two decimal points. It is more accurate than a cylinder because a cylinder can only measure 1 decimal.

5. Would you use beakers and graduated cylinders to measure other volumes, such as the volume of sand or oil? Why or Why not?

We could use a graduated cylinder to measure the volume of sand. We could use a graduated cylinder because it measures the volume of water more accurately than a beaker. We would measure the volume of water at the start, then add sand and measure the volume of water after. The differences between the starting volume of water and the final volume of water would be the volume of sand.

Conclusion:

We could conclude that the buret is the most accurate apparatus. This is because it is narrow and it has a very graduated and there are a lot of scales. You can read the measurements up to 0.01 mL so it is much more accurate than other apparatuses. The beaker is the least accurate because when we compare the volume obtained from the beaker to the volume of the same volume of water into a graduated cylinder, we could see that the measurement is very different. In the experiment, our beaker starts at 20 mL so it is really hard to measure 7mL with a 100 mL beaker.