

Why are there so many pieces of apparatus for measuring volume?

Education in Chemistry

Hazards, safety and apparatus

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In every school laboratory there is a huge variety of pieces of equipment for the simple process of measuring the volume of a liquid. In lots of experiments you will be told which to use. As you get more skilled in chemistry, you will need to understand more about the factors that determine which piece of apparatus is needed for a particular purpose.

Theory

All liquids have a specific density. This is the mass of 1 cm³ of the liquid. This means we can use mass as an accurate way of determining volume.

In this experiment, you must try to measure 25.0 cm³ of water. The density of water is 1.00 gcm⁻³. If exactly 25.0 cm³ of water has been measured, the mass of water measured would be 25.0 g.

Method

1. Get a plastic cup. Zero/tare the balance, then weigh the cup on the balance and record its mass in the table below.
2. Measure out 25 cm³ of water using one of the pieces of apparatus listed in the table. Pour the water into the cup.
3. Reweigh the cup and record the mass of the cup and water in the table.
4. Calculate the mass of water in the volume measured and record this in the table.
5. Repeat the experiment for the other pieces of apparatus. You don't need a new cup each time and you don't need to dry your cup in between readings. Think carefully about how you will use each piece of equipment. You may need to use a piece of equipment more than once in order to get the volume needed.

| Measuring apparatus | Mass of empty cup (g) | Mass of cup with water (g) | Mass of water (g) |
|---|-----------------------|----------------------------|-------------------|
| Big (250 cm ³) beaker | | | |
| Small (100 cm ³) beaker | | | |
| Measuring cylinder (5 cm ³ size) | | | |
| Measuring cylinder (10 cm ³ size) | | | |
| Measuring cylinder (25 cm ³ size) | | | |
| Measuring cylinder (50 cm ³ size) | | | |
| Measuring cylinder (100 cm ³ size) | | | |
| Small conical flask | | | |
| Burette | | | |

Follow up questions

1. Which pieces of apparatus were most difficult to use? Give reasons for your answer.
2. Which piece of apparatus gave the most accurate measurement? How do you know?
3. Why might using a piece of apparatus a number of times be a disadvantage?
4. Why did you not need to dry the cup in between each measurement? [Hint: How was this accounted for when you processed your data?]