

# Measuring with Pipettes

Graduated pipettes made of glass or plastic are used for accurate measurement of liquid volumes. Most often, you will use them for measuring volumes between 1 ml and 10 ml—for larger volumes, you would use a graduated cylinder, and for smaller volumes, a micropipettor (see page 61) is more convenient.

For your own safety, **never mouth pipette**—that is, never use your mouth to suck liquid into the pipette like a straw. This is a good way to fill your mouth with an undesirable chemical or a concentrated bacterial culture! Even if you're pipetting something you think is safe (like water), can you be certain the pipette was cleaned after whatever it was used for last time? Always use a pipette filler! You should also be careful not to suck liquid into whatever pipette filler you use—it could damage the mechanism or contaminate future samples.

Several kinds of pipette fillers are available, from simple bulbs to fancy electric pumps. In Biology labs, you'll most often use a Pipet-Pump<sup>®</sup> filler which is both easy to use and reliable. This is a plastic tube which fits over the blunt end of the pipette and has a plunger sort of like a hypodermic syringe (see Figure 24).

To fill the pipette, insert its tip into the liquid and use the wheel to raise the plunger. Go slowly, so you don't get bubbles. Remember to read the bottom of the meniscus of the liquid to ensure an accurate measurement. To empty the pipette, simply press the plunger back down. Some Pipet-Pumps have a lever on the side which you can press to let in air and allow the pipette to empty.

One problem you may encounter with the Pipet-Pump is how to blow out that very last drop from the pipette. Here's a hint: don't start with the plunger all the way down. Raise the plunger  $\frac{1}{2}$ " or so before you put the tip in the liquid. That little extra distance will allow you to expel the last drop.

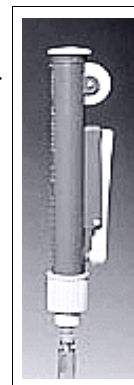


Figure 24. Pipet-Pump

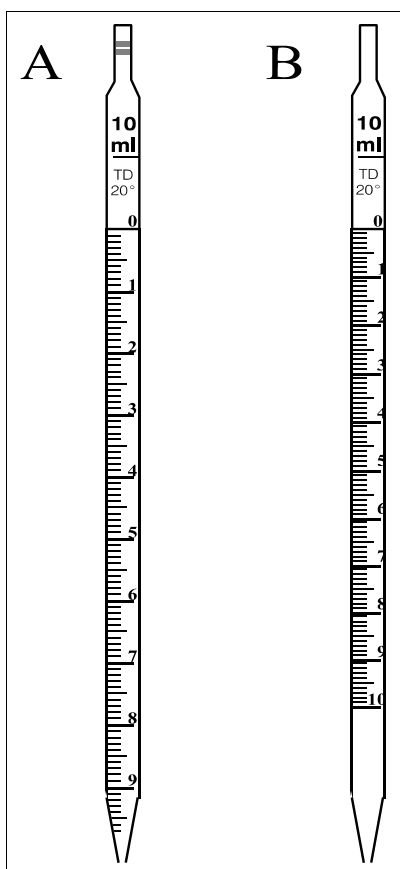


Figure 25. Comparison of (A) a serological pipette and (B) a measuring pipette.

You will encounter two main types of pipettes in Biology labs. Most are the type called **serological** pipettes. These are graduated all the way to the tip (See Figure 25A). For example, if you look at a 10-ml serological pipette, there will be a line at the top marked zero. When you fill the pipette to this line, it contains 10 ml. Below this line, there are ten smaller, unmarked graduations, representing 0.1 ml each, and then a line marked 1 ml. Below that are more 0.1 ml graduations and marked lines for 2 ml, 3 ml, etc. The last marked line will be 9 ml, but there will be 0.1-ml marks below that and down on the tip to indicate that to dispense the full 10-ml volume, you have to go all the way to the tip.

Figure 25B shows the other type of pipette you may encounter, called a **measuring** pipette. Notice that this one isn't graduated all the way to the tip, and there's actually a line for 10 ml. That means that if the pipette is filled to the zero line, it actually contains *more* than 10 ml, and to dispense 10 ml, you don't empty the pipette completely but instead just let out fluid until it reaches the 10-ml line.

In order to measure the volume you want with these pipettes, you may have to do a little mental math. Suppose you need 8 ml of water. You could fill the pipette all the way to the zero line and then dispense 8 ml by letting the water out until it reaches the 8-ml line. However, you then wind up with 2 ml extra in the pipette, and you have to either put it back (not a good idea if you're dealing with sterile solutions) or discard it. A

better way would be to fill the pipette to the 2-ml line and dispense all the way to the tip!

Some of our pipettes actually have two scales to make this easier: one with zero at the top (and 10 at the bottom) and one with 10 at the top. Don't be confused by this; it's just for your convenience. If you need 8 ml, you might be more comfortable using the second scale to fill the pipette to the 8-ml line, rather than filling it to the 2-ml line on the first scale. It's the same line, so you have exactly the same volume either way.

Some students seem to think that micropipettors are so much more "accurate" than glass pipettes that they would rather measure 3 ml by using a 1-ml micropipettor three times than by using a glass pipette. Not so! In fact, anytime you have to make multiple measurements, accuracy decreases dramatically. Also, the glass pipette can sometimes make your life easier. If you need to put 1 ml in each of 10 tubes, it's much faster to use a 10-ml glass pipette than to pipette 1 ml 10 times with a micropipettor (and very nearly the same accuracy, if you're careful).