Part 2: Metric Units and Conversions

Some of the length units you might be familiar with are meter (m), centimeter (cm), and millimeter (mm). Because we are working with microorganisms, it is useful to know how to convert between these units and a much smaller unit called the micrometer (µm).

For example, an animal cell is 10 µm in size. That's much easier to write than 0.00001 m, but the two measurements mean the same thing.

To convert among different units, you need to use **conversion factors.** A conversion factor is a ratio between two equivalent numbers. For example, if a paperclip is 0.032 m long, how long is it in centimeters?

Since 1 meter is equal to 100 cm, the conversion factor you will use is **100 cm/1 m**:

0.032 m × conversion factor = size of paperclip in cm

0.032 m × 100 cm/1 m = 3.2 cm/1 = <u>3.2 cm</u>

Alternatively, you can set up a ratio:

100 cm/1 m = *x* cm/0.032 m

x = <u>3.2 cm</u>

What if you wanted to know how long a 0.032-m paperclip is in millimeters (mm)?
There are 1,000 mm in a meter, so you can use the conversion factor **1,000 mm/1 m** and complete the calculation in the following way:

0.032 m × 1,000 mm/1 m = 32 mm/1 = <u>32 mm</u>

Or, set up a ratio:

1 m/1,000 mm = 0.032 m/*x* mm

x = <u>32 mm</u>

Finally, what about in micrometers (µm)? There are 1,000,000 µm in a meter, so the conversion factor is **1,000,000 µm/1 m**. The calculation is:

0.032 m × 1,000,000 µm/1 m = 32,000 µm/1 = <u>32,000 µm</u>

Or, set up a ratio:

1 m/1,000,000 µm = 0.032 m/*x* µm

x = <u>32,000 µm</u>

The following table will help you find the conversion factors needed for the practice problems. Complete the missing numbers:

1 m =	100 cm =	1,000 mm =	1,000,000 µm
0.01 m =	__ cm =	10 mm =	__ µm
__ m =	0.1 cm =	__ mm =	1,000 µm
__ m =	__ cm =	0.001 mm =	__ µm

Practice Problems

Use the appropriate conversion factors to calculate each of the following and show your work for each:

1. Use a ruler to measure the width of your index finger in centimeters (cm).
   Record the measurement here: __________

   a. How wide is your index finger in meters (m)? __________

   b. In millimeters (mm)? __________

   c. In micrometers (µm)? __________

2. An average human skin cell measures 30 µm in diameter.

   a. What is the diameter in millimeters (mm)? _________

   b. In centimeters (cm)? __________

   c. In meters (m)? __________

3. If you lined up human skin cells side-by-side, how many would fit across the width of your index finger? Explain your reasoning.