

■ **Background**

The system of measurement used today by scientists in all countries of the world is called the **metric system**. The metric system is a decimal system, meaning it is based on the number ten and multiples of ten, such as 100 and 1000. This handout will act as your reference to the metric system throughout Integrated Science 1 and 2.

■ **Units**

Length (L) [typical tool used = meter stick]

Length is the distance from one point to another. The basic unit of length in the metric system is a **meter (m)**. A meter is slightly longer than a yard.

1 meter (m) = 100 centimeters (cm)

1,000 meters (m) = 1 kilometer (km)

1 meter (m) = 1,000 millimeters (mm)

1 centimeter (cm) = 10 millimeters (mm)

1 meter (m) = 1,000,000 micrometers (μm)

Volume (V) [typical tool used = graduated cylinder]

Volume is the amount of space an object takes up. The basic unit of volume in the metric system is a **liter (l)**.

1 liter (l) = 1,000 milliliters (ml) = 1000 cubic centimeters (cm^3)

Temperature (T) [typical tool used = mercury thermometer]

Temperature measures the average kinetic energy of the particles in a substance. Kinetic energy is the energy of motion. More energy = more particle motion = higher temperature. Likewise, less energy = less particle motion = lower temp. In the metric system, temperature is measured in degrees **Celsius ($^{\circ}\text{C}$)**

0°C = freezing point of water

100°C = boiling point of water

Mass (M) [typical tool used = electronic balance]

Mass is commonly used to describe the weight of an object. The basic unit of mass is a **gram (g)**.

1 kilogram (kg) = 1,000 grams (g)

1 gram (g) = 1,000 milligrams (mg)

1kg = 1,000,000,000 mg

■ **Conversions**

Conversions between units, is a skill needed when working with the metric system. The following example should be your primary way of converting units.

Example: convert 152 meters into centimeters.

Solution:

the value you are converting \longrightarrow $\frac{152\text{m}}{1 \text{ meter}} \times \frac{100 \text{ cm}}{1 \text{ meter}} = 15,200\text{cm}$

this fraction is an equivalency that features the unit you are converting from as the denominator - and your target unit as the numerator

this is the answer obtained by canceling the meter units - leaving centimeters - which was your target unit

■ Practice Unit Conversions

*Complete the following problems (in the space provided) by showing all of your work
- and by drawing a box around your final answer.*

“showing all of your work” means setting up the entire equation and using unit abbreviations for each value

1. 30 centimeters into meters

2. 10 kilometers into meters

3. 15,050 milligrams into grams

4. 3,264 milliliters into liters

5. 9,674,444 grams into kilograms

6. 3.1 kilograms into milligrams

7. 5,897,159 milligrams into kilograms

Questions 1-7 were conversion problems within the metric system. Questions 8-13 are unique conversion problems because they are asking you to convert between two different systems: the English System and the Metric System

As long as the English system continues to be used, conversions between the two systems will be necessary. Use the conversion factors below to complete the problems that follow.

Length	Volume	Mass
2.54 centimeter (cm) = 1 inch (in)	1 liter (l) = 1.06 quarts (qt)	1 kilogram (kg) = 2.20 pounds (lb)
1 meter (m) = 3.28 feet (ft)	3.79 liters (l) = 1 gallon (gal)	
1 meter (m) = 1.094 yards (yd)		
1.609 kilometer (km) = 1 mile (mi)		

8. 4.5 inches into centimeters

9. 25.3 meters into feet

10. 2.3 miles into kilometers

11. 14 inches into centimeters

12. 125 pounds into kilograms

13. 20 gallons into liters