

2.1: TAKING MEASUREMENTS

SKILLS TO DEVELOP

- To express quantities properly, using a number and a unit.

A coffee maker's instructions tell you to fill the coffeepot with 4 cups of water and use 3 scoops of coffee. When you follow these instructions, you are measuring. When you visit a doctor's office, a nurse checks your temperature, height, weight, and perhaps blood pressure (Figure 2.1.1); the nurse is also measuring.

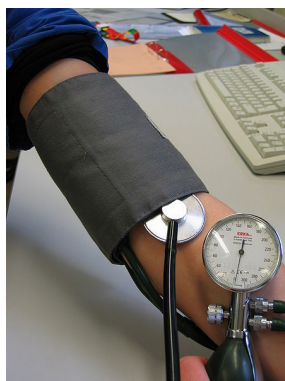


Figure 2.1.1: *Measuring Blood Pressure. A nurse or a doctor measuring a patient's blood pressure is taking a measurement. Figure used with permission (GFDL; Pia von Lützu).*

Chemists measure the properties of matter and express these measurements as quantities. A quantity is an amount of something and consists of a number and a unit. The number tells us how many (or how much), and the unit tells us what the scale of measurement is. For example, when a distance is reported as "5 kilometers," we know that the quantity has been expressed in units of kilometers and that the number of kilometers is 5. If you ask a friend how far he or she walks from home to school, and the friend answers "12" without specifying a unit, you do not know whether your friend walks—for example, 12 miles, 12 kilometers, 12 furlongs, or 12 yards. *Both a number and a unit must be included to express a quantity properly.*

To understand chemistry, we need a clear understanding of the units chemists work with and the rules they follow for expressing numbers. The next two sections examine the rules for expressing numbers.

EXAMPLE 2.1.1

Identify the number and the unit in each quantity.

- one dozen eggs
- 2.54 centimeters
- a box of pencils
- 88 meters per second

SOLUTION

- The number is one, and the unit is dozen eggs.
- The number is 2.54, and the unit is centimeter.
- The number 1 is implied because the quantity is only *a* box. The unit is box of pencils.
- The number is 88, and the unit is meters per second. Note that in this case the unit is actually a combination of two units: meters and seconds.

EXERCISE 2.1.1

Identify the number and the unit in each quantity.

- a. 99 bottles of soda
- b. 60 miles per hour
- c. 32 fluid ounces
- d. 98.6 degrees Fahrenheit

Answer a:

Answer b:

Answer c:

Answer d:

KEY TAKEAWAY

- Identify a quantity properly with a number and a unit.

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