revolution, is based on our ability to "edit" and rewrite the genetic code—in a sense, redesigning the living world to order. We may soon learn to correct or replace damaged genes that cause inherited diseases. Other research seeks to genetically engineer bacteria to clean up toxic wastes. Biotechnology also raises enormous ethical, legal, and social questions. Dare we tamper with the fundamental biological information that makes us human?

► *A plant biologist analyzes genetically modified rice plants.*

Building the Tree of Life Biologists have discovered and identified roughly 1.8 million different kinds of living organisms. That may seem like an incredible number, but researchers estimate that somewhere between 2 and 100 million more forms of life are waiting to be discovered around the globe—from caves deep beneath the surface, to tropical rainforests, to coral reefs and the depths of the sea. Identifying and cataloguing all these life forms is enough work by itself, but biologists aim to do much more. They want to combine the latest genetic information with computer technology to organize all living things into a single universal "Tree of All Life"—and put the results on the Web in a form that anyone can access.

► *Paleontologists study the fossilized bones of dinosaurs.*

Ecology and Evolution of Infectious Diseases HIV, bird flu, and drug-resistant bacteria seem to have appeared out of nowhere, but the science behind their stories shows that relationships between hosts and pathogens are dynamic and constantly changing. Organisms that cause human disease have their own ecology, which involves our bodies, medicines we take, and our interactions with each other and the environment. Over time, disease-causing organisms engage in an "evolutionary arms race" with humans that creates constant challenges to public health around the world. Understanding these interactions is crucial to safeguarding our future.

► *A wildlife biologist studies a group of wild gelada baboons. Pathogens in wild animal populations may evolve in ways that enable them to infect humans.*

Genomics and Molecular Biology These fields focus on studies of DNA and other molecules inside cells. The "molecular revolution" of the 1980s created the field of genomics, which is now looking at the entire sets of DNA code contained in a wide range of organisms. Ever-more-powerful computer analyses enable researchers to compare vast databases of genetic information in a fascinating search for keys to the mysteries of growth, development, aging, cancer, and the history of life on Earth.

► *A molecular biologist analyzes a DNA sequence.*

Performing Biological Investigations

How is the metric system important in science?

During your study of biology, you will have the opportunity to perform scientific investigations. Biologists, like other scientists, rely on a common system of measurement and practice safety procedures when conducting studies. As you study and experiment, you will become familiar with scientific measurement and safety procedures.

Scientific Measurement Because researchers need to replicate one another's experiments, and because many experiments involve gathering quantitative data, scientists need a common system of measurement. **Most scientists use the metric system when collecting data and performing experiments.** The metric system is a decimal system of measurement whose units are based on certain physical standards and are scaled on multiples of 10. A revised version of the original metric system is called the International System of Units, or SI. The abbreviation *SI* comes from the French *Le Système International d'Unités.*

Because the metric system is based on multiples of 10, it is easy to use. Notice in **Figure 1–15** how the basic unit of length, the meter, can be multiplied or divided to measure objects and distances much larger or smaller than a meter. The same process can be used when measuring volume and mass. You can learn more about the metric system in Appendix B.

BUILD Vocabulary

PREFIXES The SI prefix *milli-* means "thousandth." Therefore, 1 millimeter is one-thousandth of a meter, and 1 milligram is one-thousandth of a gram.

Common Metric Units

Length	Mass
1 meter (m) = 100 centimeters (cm) 1 meter = 1000 millimeters (mm) 1000 meters = 1 kilometer (km)	1 kilogram (kg) = 1000 grams (g) 1 gram = 1000 milligrams (mg) 1000 kilograms = 1 metric ton (t)
Volume	**Temperature**
1 liter (L) = 1000 milliliters (mL) 1 liter = 1000 cubic centimeters (cm^3)	0°C = freezing point of water 100°C = boiling point of water

FIGURE 1–15 The Metric System Scientists usually use the metric system in their work. This system is easy to use because it is based on multiples of 10. In the photo, biologists in Alaska weigh a small polar bear. **Predict** *What unit of measurement would you use to express the bear's mass?*