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1.1 What Is Life?

Biology is the study of life and living organisms. But what is a living organism? What distinguishes living things from nonliving things?

Living things share certain characteristics. For one thing, they use energy. Living things, such as the sunflowers and lions in Figure 1.1, take energy from the environment and convert it into other forms of energy for their own use. Plants take radiant energy from sunlight and convert it into the chemical energy of molecules, which they can use to build their stems and leaves or fuel their activities. Animals eat, converting the energy they get from food into chemical energy, which they store in their bodies. This chemical energy is eventually converted into kinetic energy (the energy of motion) and heat (thermal energy).



(a)



(b)

FIGURE 1.1

Living things take energy from the environment and convert it into other forms of energy. (a) Sunflowers convert energy from sunlight into chemical energy, which can be used to build tissues or fuel activity. (b) Lions convert the chemical energy stored in food into motion or other activity, or use it for growth and reproduction.



Another characteristic of living things is that they develop and grow. When chicks hatch, they are small and covered with downy yellow feathers. Over time, they grow bigger, and their downy feathers are replaced by stiff adult feathers (Figure 1.2).

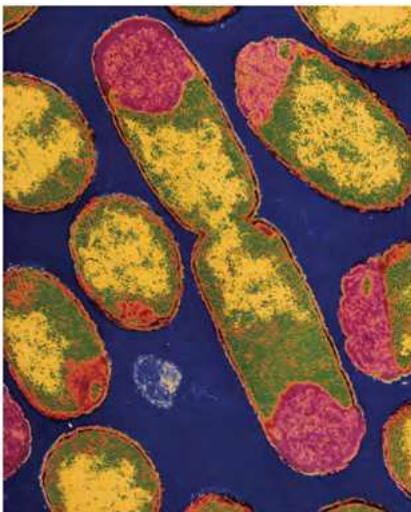
Living things maintain themselves. They generate structures, such as stems and leaves or skin and bones, and they repair damage done to those structures. When you scrape your knee, your blood clots to stop the bleeding, and the wounded skin scabs over and heals. Living things also maintain their internal environment, keeping it stable in the face of changing external conditions. Whether it is freezing cold or blisteringly hot, your body temperature stays right around 37°C (98.6°F).

Living things have the capacity to reproduce. They make offspring that are exact or inexact copies of themselves. Figure 3.3 shows the two ways living things reproduce, asexually and sexually. In *asexual reproduction*, a living organism reproduces all by itself, such as by dividing into two. Bacteria typically reproduce asexually. In *sexual reproduction*, organisms form special sex cells, such as sperm and eggs, that join to develop into new individuals. Humans, penguins, beetles, and oak trees reproduce sexually.



FIGURE 1.2

Living things develop and grow over time.



(a)



(b)

FIGURE 1.3

Living things have the capacity to reproduce.

(a) Bacteria reproduce asexually by dividing.

(b) Penguins reproduce sexually.

Finally, living things are parts of populations that evolve. Populations do not remain constant from one generation to the next but change over time. Often, populations change in response to their environments. During the Industrial Revolution, when cities became polluted and blackened with soot, peppered moth populations evolved so that camouflaged dark-winged moths became more common than light-winged moths. After antipollution laws were passed and cities were cleaned up, light-winged moths again became more common.



READING CHECK

1. Cars are not living things. Which characteristics of living organisms do cars have, and which are they lacking?
2. Do all living things have all the characteristics of life we have listed?

CHECK YOUR ANSWERS

1. Cars use energy, converting the energy in gasoline into motion. We might be able to argue that cars “develop” over time, acquiring nicks and dents and wearing down the treads on their tires. However, cars do not maintain themselves, do not reproduce, and do not evolve.
2. There are some exceptions—for example, mules are sterile and unable to reproduce, but they are certainly alive.

For more on the characteristics of life, check out the website below:

<https://sciencing.com/ten-characteristics-living-organisms-8119158.html>

