Lasers, on the other hand, typically produce a narrow beam of coherent light. The waves emitted by a laser are in phase, and they do not shift relative to each other as time progresses. Because all the waves are in phase, they interfere constructively at all points. The individual waves effectively behave like a single wave with a very large amplitude. In addition, the light produced by a laser is monochromatic, so all the waves have exactly the same wavelength. As a result of these properties, the intensity, or brightness, of laser light can be made much greater than that of incoherent light. For light, intensity is a measure of the energy transferred per unit time over a given area.

Lasers transform energy into coherent light

A laser is a device that converts light, electrical energy, or chemical energy into coherent light. There are a variety of different types of lasers, but they all have some common features. They all use a substance called the *active medium* to which energy is added to produce coherent light. The active medium can be a solid, liquid, or gas. The composition of the active medium determines the wavelength of the light produced by the laser.

The basic operation of a laser is shown in **Figure 24.** When high-energy light or electrical or chemical energy is added to the active medium, as in **Figure 24(a),** the atoms in the active medium absorb some of the energy. You will learn that atoms exist at different *energy states* in the chapter "Atomic

Did you know?

The word *laser* is an acronym (a word made from the first letters of several words) that stands for "*l*ight *a*mplification by stimulated emission of *r*adiation."

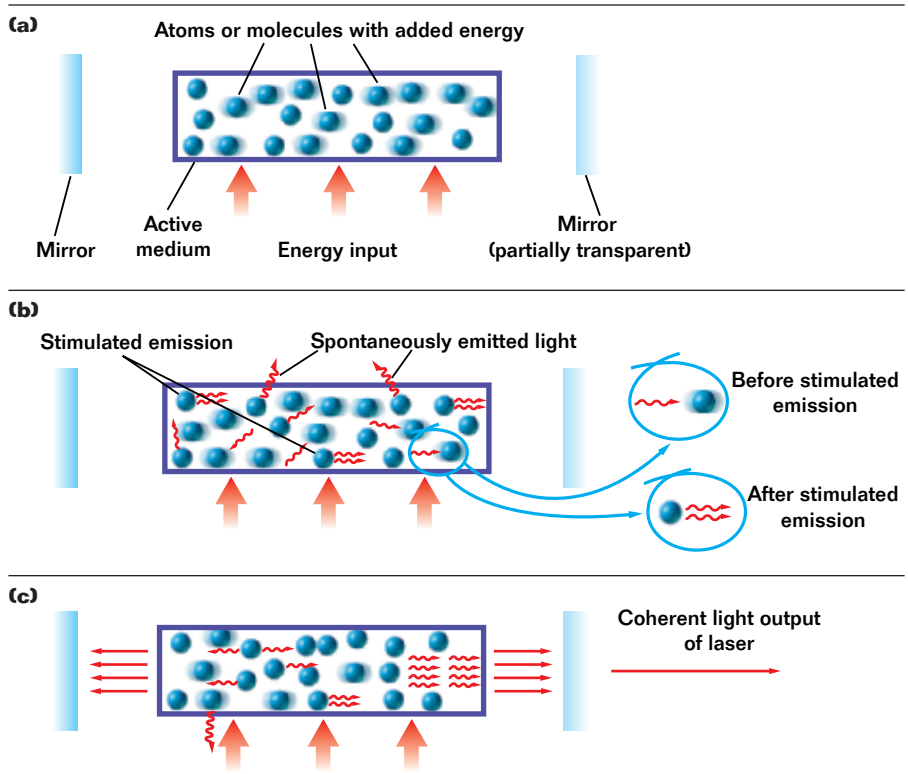

Figure 24
(a) Atoms or molecules in the active medium of a laser absorb energy from an external source. **(b)** When a spontaneously emitted light wave interacts with an atom, it may cause the atom to emit an identical light wave. **(c)** Stimulated emission increases the amount of coherent light in the active medium, and the coherent waves behave as a single wave.