45 An Intense Beam of Light

Our society uses lasers in many areas of science, medicine, communications, industry, and the military. We also utilize lasers in such commonplace devices as bar code scanners, radar speed-detectors, CD and videodisk players, and laser pointers. Laser technology is relatively new, but a theoretical laser was proposed by Albert Einstein in 1917. It wasn't until 1960, however, that technology allowed for construction of the first laser. That laser was made of a solid ruby medium (a substance that transmits energy) that produced an intense beam of pure red light. Lasers today are made of a variety of materials, each of which emits an intense beam of light having one pure color.

The word *laser*—an acronym for light amplification by stimulated emission of radiation—describes how the device works. A laser has three main parts: an energy source, such as intense ordinary light; a medium of ions, molecules, or atoms; and a mirror at either end of the medium—one mirror to reflect the light that strikes it and one to output part of the light. The atoms of the medium exist at low- and high-energy levels. When the energy source activates, the low-energy atoms absorb the energy and become excited to a higher level. Some of the excited atoms spontaneously radiate light waves in random directions and then return to their low-energy level. Many of the light waves become trapped between the mirrors, staying within the medium and striking high-energy atoms. The high-energy atoms become stimulated and emit light of the same wavelength as the light wave that stimulated them. The emitted light amplifies the passing light wave. By repeatedly activating the energy source, the cycle continues, making the light wave bigger and stronger. Eventually some of the wave bursts through the output mirror as a laser beam—a tremendously powerful radiating light wave.

Main Idea 1

	Answer	Score
Mark the *main idea*	M	15
Mark the statement that is *too broad*	B	5
Mark the statement that is *too narrow*	N	5

a. Our society uses lasers in many different areas. ☐ ____

b. The first laser produced an intense beam of pure red light. ☐ ____

c. *Laser* is an acronym for the words that describe how a laser works. ☐ ____

Score 15 points for each correct answer. **Score**

Subject Matter

2 The purpose of this passage is to
- ☐ a. identify the uses of lasers in our society.
- ☐ b. describe the history of lasers.
- ☐ c. explain how lasers work.
- ☐ d. compare low-energy atoms with high-energy atoms.

Supporting Details

3 The following is not part of today's lasers:
- ☐ a. an energy source.
- ☐ b. a ruby.
- ☐ c. a medium of ions or molecules.
- ☐ d. a pair of mirrors.

Conclusion

4 We can conclude that the light wave reflects back and forth within the laser until
- ☐ a. the low-energy atoms become excited.
- ☐ b. spontaneous light radiation occurs.
- ☐ c. the medium becomes weak.
- ☐ d. the wave has enough energy to escape.

Clarifying Devices

5 To demonstrate what an acronym is, the writer
- ☐ a. uses italicized type for the first letters of words.
- ☐ b. underlines the word.
- ☐ c. compares it to an abbreviation.
- ☐ d. tells how many parts there are.

Vocabulary in Context

6 Theoretical means
- ☐ a. very small.
- ☐ b. based on theory, not fact.
- ☐ c. very large.
- ☐ d. capable of causing accidents.

Add your scores for questions 1–6. Enter the total here and on the graph on page 215. **Total Score** ____