PASSAGE FOUR (Questions 13–16)

Paragraph

Neon

1▶ Neon is a nonmetallic chemical element revealed when air is liquefied and then heated. It is the second-lightest of the noble gases—the Group 18 gases of the periodic table of elements—falling only behind helium. While the most prevalent commercial use for neon remains in the manufacturing of neon advertising signs, it is also utilized in certain types of lasers and as a cryogenic refrigerant.

2▶ **13A** In the 1770s, researchers discovered that oxygen and nitrogen were present in air, and in fact made up 99 percent of it. Up until that decade, air was believed to be a single element. **13B** In 1894, the chemical element argon was identified as a third component of air by Sir William Ramsay. **13C** However, it represented only 0.934 percent of air, leaving 0.034 percent still a mystery. **13D** Ramsay and Travers continued to research the tiny amounts of gas that remained after nitrogen, oxygen, and argon were removed.

3▶ **14A** In 1898, Sir Ramsay and William Travers discovered neon as another component of air. (Ramsay later went on to win the Nobel Prize in Chemistry for discovering all of the noble gases.) They named it for the Greek word *neos*, which means *new.* Although neon is a colorless gas under normal conditions, when an electrical discharge is passed through it, it generates an incredibly bright reddish-orange hue. **14B** Ramsay and Travers observed this by chilling air until it became a liquid, and then heating the liquid to catch the gases that boiled off. **14C** Adding the electrical discharge to the new gas in a rudimentary version of a mass spectrometer produced the glowing light. **14D** Neon actually discharges the most intense light at normal currents and voltages of all the noble gases.

4▶ It is a monatomic element, comprised of a single atom (it forms no compounds). Neon has three stable isotopes, all of which are produced in the formation of stars. **15A** In the universe, neon is the fifth most abundant gas, but it is comparatively rare on Earth, comprising only 1 part in 65,000 of Earth's atmosphere. **15B** This is due to its relative lightness, which allows it to escape into outer space. **15C** Much smaller amounts are believed to exist deep within the Earth's crust. **15D** Interestingly, an increased amount of Ne-20 is found in diamonds. Researchers believe this suggests a solar neon reservoir inside Earth.

5▶ **16A** In the early 1900s, George Claude of France produced large quantities of neon as a byproduct of his air liquefaction company. **16B** But its commercial application wasn't fully realized until 1912, when Claude's business associate Jacques Fonseque demonstrated an electrified sealed neon tube that could be used in advertising. **16C** The first neon sign was displayed at a Paris barbershop in 1912. **16D** Neon signs soon gained in popularity throughout the United States, especially demonstrated by their prevalence in the city of Las Vegas, Nevada. Another commercial use of neon is in cryogenic refrigeration, which cools items to very low temperatures. It has 40 times the refrigerating capacity of liquid helium, and 3 times that of liquid hydrogen. Other uses of the element include the production of high-voltage indicators and—prior to the advent of LCD flat screens—television tubes.

13. Look at the four squares [■] that indicate where the following sentence could be added to the second paragraph of the passage.

But after the determination that air was composed of multiple elements, new measuring techniques evolved, allowing scientists to recognize that there was something else besides the two known elements present in air.

Where would the sentence best fit? Click on a square [■] to add the sentence to the passage.

14. Look at the four squares [■] that indicate where the following sentence could be added to the third paragraph of the passage.

This process of separating out parts of a mixture through collection of vapors is called fractional distillation.

Where would the sentence best fit? Click on a square [■] to add the sentence to the passage.

15. Look at the four squares [■] that indicate where the following sentence could be added to the fourth paragraph of the passage.

The stable isotopes of neon are Ne-20, Ne-21, and Ne-22.

Where would the sentence best fit? Click on a square [■] to add the sentence to the passage.

16. Look at the four squares [■] that indicate where the following sentence could be added to the fifth paragraph of the passage.

The first American equivalent was lit in 1923 at a Los Angeles Packard car dealership.

Where would the sentence best fit? Click on a square [■] to add the sentence to the passage.