Writing and Language SAT Practice Test 33

Astrochemistry

Do ever you remember hearing in school that the sun—by far the largest body in our solar system—is composed almost entirely of the two smallest elements, 23 hydrogen, and helium. Or perhaps that the distinctive blue hues of Neptune and Uranus arise from an unusual abundance of organic methane? At the time, it may have seemed curious to you that scientists were able to make such bold hypotheses about the chemical compositions of things 24 using space-based telescopes for data-gathering; after all, we can hardly gather a gas sample from the surface of the sun. And yet we know with surprising certainty not only the composition of the bodies in our solar system, 25 from also that of many interstellar bodies, and even some intergalactic ones as well.

26 The key principle that connects astronomy and chemistry is the emission spectrum. When struck by a wave of electromagnetic radiation, every element 27 enter an "excited state," in which the electrons surrounding the nucleus "jump" to higher energy levels. Eventually, the complex returns to its ground state, and the excess energy is released once again as electromagnetic radiation. However, this new photon carries with it a sort of chemical "signature" called an emission spectrum, which is 28 one of the only of its kind to the element from which it was emitted.

A spectrometer is an instrument that spreads a wave of electromagnetic radiation into its component frequencies. When you look through a spectrometer at a beam of white light, 29 and you see a continuous band of colors shifting like a rainbow from red to violet. However, when a spectrometer is used to examine the flame test of, say, sodium carbonate or cobalt, the band is broken into a series of lines which represent the very specific frequencies of electromagnetic radiation that are 30 shot forth of the compound. Because emission spectra are unique to each element and constant throughout the universe, scientists are able to attach a spectrometer to a telescope, locate a celestial body, and 31 determine, the chemical composition of that body simply, by comparing the resulting spectrum to those of known compounds on Earth.

Over the past one hundred years astrochemical spectroscopy has revealed some fascinating information about our galaxy. It is because of spectroscopy, 32 however, that we know of the existence of interstellar complex organic compounds—such as ketones, aldehydes, alcohols, carboxylic acids, and even the amino acid glycine. Though it seems paradoxical that we 33 use the smallest units of matter to study the largest, astrochemical spectroscopy is sure to have a hand in our expanding knowledge of the universe for a very long time to come.

23.

A. NO CHANGE
B. hydrogen and helium.
C. hydrogen, and helium?
D. hydrogen and helium?

24. The writer wants to highlight that scientists are able to determine the chemical makeup of stars far from our solar system. Which choice would most specifically support this aim?

A. NO CHANGE
B. 93 million miles away or more;
C. that are a prodigious distance from Mother Earth;
D. capturing the imaginations of young and old alike;
25.

A. NO CHANGE
B. but also
C. also
D. and
26. Which choice would best introduce this paragraph?

A. NO CHANGE
B. Electromagnetic radiation is one of the major physical forces underlying the universe.
C. Photons are smaller than protons, representing quanta of light.
D. Perhaps one day, mankind will be able to move beyond observation of distant stars to exploration of faraway solar systems.
27.

A. NO CHANGE
B. entering
C. enters
D. entries
28.

A. NO CHANGE
B. partial
C. uniquely
D. specific
29.

A. NO CHANGE
B. and one can see
C. and he or she can find
D. you see
30.

A. NO CHANGE
B. emitted by
C. providing
D. linear for
31.

A. NO CHANGE
B. determine the chemical composition, of that body simply by comparing, the resulting spectrum to those of known compounds on Earth.

C. determine the chemical composition of that body simply by comparing the resulting spectrum to those of known compounds on Earth.
D. determine the chemical composition of that body, simply by comparing the resulting spectrum to those of known, compounds on Earth.
32.

A. NO CHANGE
B. on the other hand,
C. consequently,
D. for instance,
33. What would most logically follow the first part of this sentence while being consistent with the passage as a whole?

A. NO CHANGE
B. seek to understand the universe,
C. look for astronomical order among the chaos,
D. use chemistry to analyze the makeup of stars,