telescopes

light

galaxies

9-12

On the basis of scientific evidence, the universe is estimated to be over ten billion years old. The current theory is that its entire contents expanded explosively from a hot, dense, chaotic mass.

Because the light seen from almost all distant galaxies has longer wavelengths than comparable light there on earth, astronomers believe that the whole universe is expanding.

The observed wavelength of a wave depends upon the relative motion of the source and the observer. If either is moving toward the other, the observed wavelength is shorter; if either is moving away, the wavelength is longer.

The stars differ from each other in size, temperature, and age, but they appear to be made up of the same elements found on earth and behave according to the same physical principles.

Increasingly sophisticated technology is used to learn about the universe. Visual, radio, and x-ray telescopes collect information from across the entire spectrum of electromagnetic waves; computers handle an avalanche of data and

A great variety of radiations are electromagnetic waves...Their wavelengths vary from radio waves, the longest, to gamma rays, the shortest. In empty space, all electromagnetic waves move at the same

Mathematical models and computer simulations are used in studying evidence from many sources in order to form a scientific account of the universe.

6-8

Technology is essential to science for such purposes as access to outer space and other remote locations, sample collection and treatment, measurement, data collection and storage, computation, and communication of information.

Human eyes respond to only a narrow range of wavelengths of electromagnetic waves-visible light.

Some distant galaxies are so far away that their light takes several billion years to reach the earth. People on earth, therefore, see them as they were that long ago in the past.

Telescopes reveal that there are many more stars in the night sky than are evident to the unaided eye, the surface of the moon has many craters and mountains, the sun has dark spots, and Jupiter and some other planets have their own moons.

Light from the next nearest star takes a few years to arrive. The trip to that star would take the fastest rocket thousands of years.

The universe contains many billions of galaxies, and each galaxy contains many billions of stars. To the naked eye, even the closest of these galaxies is no more than a dim, fuzzy spot.

Something can be "seen" when light waves emitted or reflected by it enter the eye.

3-5

Telescopes magnify the appearance of some distant objects in the sky, including the moon and the planets. The number of stars that can be seen through telescopes is dramatically greater than can be seen by the unaided eye.

Stars are like the sun, some being smaller and some larger, but so far away that they look like points of light.

A large light source at a great distance looks like a small light source that is much closer.

K-2

Magnifiers help people see things they could not see without them.

There are more stars in the sky than anyone can easily count, but they are not scattered evenly, and they are not all the same in brightness or color.