

Chapter 26 Exploring the Universe

Section 26.5 The Expanding Universe

(pages 852–855)

This section describes Hubble’s Law. It also explains the big bang theory.

Reading Strategy (page 852)

Previewing Before reading, examine Figure 26 and write at least two questions to help you understand the information in it. As you read, write answers to your questions. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

The Evolution of the Universe
Questions on the Evolution of the Universe

Hubble’s Law (pages 852–853)

- Is the following sentence true or false? The apparent change in frequency and wavelength of a wave as it moves towards or away from an observer is known as the Doppler effect.

- How can astronomers use the Doppler effect? _____

- Circle the letter of each sentence that is true about spectrums of stars or galaxies.
 - As a star or galaxy circles the Earth, the lines in its spectrum shift toward the middle of the spectrum.
 - As a star moves toward Earth, the lines in its spectrum are shifted toward shorter wavelengths.
 - As a star or galaxy moves away from Earth, the lines in its spectrum are shifted toward longer wavelengths.
 - The greater the observed shift in spectrum, the greater the speed the star or galaxy is moving.
- The shift in the light of a galaxy toward the red wavelengths is called a(n) _____.
- Describe Hubble’s Law. _____

- Is the following sentence true or false? The most distant galaxies that can be seen from Earth are moving away at more than 90% of the speed of light. _____

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7. Describe what the observed red shift in the spectra of galaxies shows.

The Big Bang Theory (page 854)

8. Astronomers theorize that the universe came into being in an event called the _____.
9. Circle the letter of each sentence that is true according to the big bang theory.
- a. The matter and energy in the universe was once concentrated in a very hot region smaller than a sentence period.
 - b. The universe began billions of years ago with an enormous explosion.
 - c. The universe came into existence in an instant.
 - d. The matter and energy in the universe has taken billions of years to form.
10. After the big bang, it is theorized that the universe _____.
11. How large was the universe when the sun and solar system formed?
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12. Circle the letter of each sentence that gives evidence that supports the big bang theory.
- a. The existence of cosmic microwave background radiation.
 - b. The red shift in the spectra of distant galaxies.
 - c. The fact that the sun is about 20 billion years old.
 - d. The pulling of atoms together into gas clouds by gravity.
13. Recent measurements of the microwave background radiation have led astronomers to estimate that the universe is _____.

Continued Expansion (page 855)

14. Matter that does not give off radiation is known as _____.
15. Circle the letter of each sentence that is true about dark matter.
- a. Astronomers currently don't know what it is or how it is distributed.
 - b. It cannot be seen directly.
 - c. It can be measured using the Doppler effect.
 - d. It can be detected by observing how its gravity affects visible matter.
16. Why is it significant that the galaxies contain as much as ten times more dark matter than visible matter? _____
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