

Name: _____
Mr. Willis
Conceptual Physics: _____
Date: _____

Unit XII
The Universe
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XII

Study Guide

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

_____ 1. In a diagram depicting the solar system as heliocentric, what is located at the center?

- a. Earth
- b. the sun
- c. the moon
- d. Mars

_____ 2. Which of the following is the most likely reason that ancient observers believed that Earth was the center of the universe?

- a. The Earth seemed to move on its axis.
- b. Earth's motions are only recently known because of high-powered telescopes.
- c. Objects in the sky appear to circle around Earth.
- d. Ancient observers believed the universe was stationary.

_____ 3. The orbit of a planet around the sun is a(an)

- a. Ellipse.
- b. straight line.
- c. circle.
- d. parabola.

_____ 4. Which of the following helps explain why the planets remain in motion around the sun?

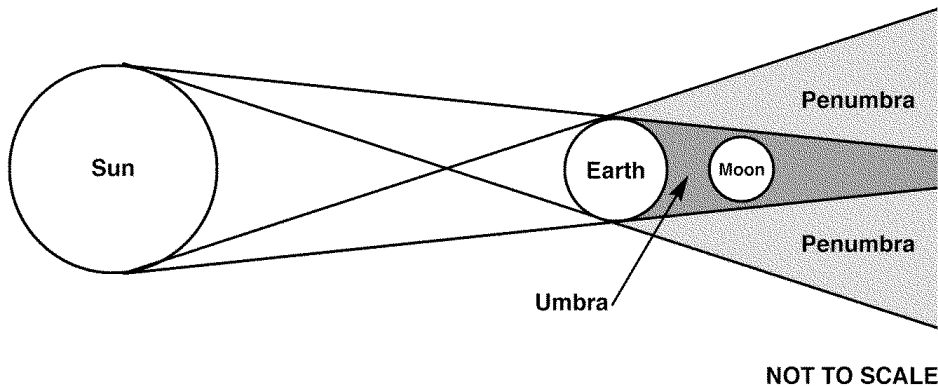
- a. density
- b. gravity
- c. inertia
- d. both (b) and (c)

_____ 5. The moon most likely formed

- a. from a collision of Earth with a Mars-sized object.
- b. In another region of space and drifted toward Earth.
- c. from material in the solar system that came together.
- d. In the same way as Earth was formed.

_____ 6. Ocean tides are the result of

- a. the rotation of Earth.
- b. the sun's gravitational pull on Earth.
- c. changes in Earth's orbital position around the sun.
- d. differences in both the sun's and moon's gravitational pull on Earth.

**Figure 25-1**

____ 7. Study Figure 25-1. Suppose you are an astronaut on the side of the moon facing Earth during a total lunar eclipse. Which would you see as you look toward Earth?

- Earth illuminated by reflected moonlight.
- The normal view; there is always reflected light from the moon's surface.
- You could not see the sun because Earth blocks its light.
- The light from the sun behind Earth would be blinding.

____ 8. The four terrestrial planets are so called because they

- are the nearest planets to Earth.
- were all once part of Earth.
- are similar in structure to Earth.
- can all be seen from Earth without a telescope.

____ 9. Which characteristic of the inner planets increases with increasing distance from the sun?

- | | |
|------------------------|-------------------------|
| a. equatorial diameter | c. average temperature |
| b. Period of rotation | d. period of revolution |

____ 10. Which of the gas giants has the largest diameter?

- | | |
|------------|------------|
| a. Jupiter | c. Saturn |
| b. Uranus | d. Neptune |

____ 11. Comets are made mostly of

- | | |
|------------------|-------------------------|
| a. iron. | c. hydrogen and helium. |
| b. ice and rock. | d. methane. |

____ 12. Which of the following is a wide belt of objects that extends beyond Pluto's orbit?

- | | |
|----------------------|----------------------|
| a. the asteroid belt | c. the Kuiper belt |
| b. the Oort cloud | d. none of the above |

____ 13. The sun's energy is produced by

- | | |
|--------------------------|-----------------------------------|
| a. the sun burning fuel. | c. an ordinary chemical reaction. |
| b. Nuclear fission. | d. nuclear fusion. |

_____ 14. What will happen to the relative amounts of hydrogen and helium in the sun over the next few billion years?

- a. Hydrogen will increase and helium will decrease.
- b. Hydrogen will decrease and helium will increase.
- c. Both hydrogen and helium will decrease.
- d. Both hydrogen and helium will remain the same.

_____ 15. The sun remains stable over time because

- a. Its supply of hydrogen is inexhaustible.
- b. the product of fusion, helium, is a stable element.
- c. the inward pull of gravity and outward push of thermal pressure are balanced.
- d. Nuclear fusion is a stabilizing process.

_____ 16. For the sun to be stable, the inward and outward forces within the sun must be

- a. In equilibrium.
- b. part of the fusion reaction.
- c. Focused in the core.
- d. balanced with temperature and density.

_____ 17. A stream of electrically charged particles sent into space by the sun is called

- a. a solar flare.
- b. a sunspot.
- c. a solar prominence.
- d. the solar wind.

_____ 18. The distance between stars is typically measured in

- a. light-years.
- b. kilometers.
- c. astronomical units.
- d. miles.

_____ 19. Astronomers classify stars according to their

- a. distance from Earth.
- b. color, size, and absolute brightness.
- c. age and parallax.
- d. all of the above

_____ 20. The apparent brightness of a star

- a. varies with the position from which it is viewed.
- b. can be calculated from its absolute brightness and mass.
- c. Is greater as distance from the sun increases.
- d. Is a measure of its light viewed from any position.

_____ 21. The life cycle of a star begins with a cloud of gas and dust called a

- a. protoplanet.
- b. constellation.
- c. nebula.
- d. protosun.

_____ 22. What is a pulsar?

- a. the remains of a low-mass star after it explodes
- b. a spinning neutron star emitting radio waves
- c. another name for a protostar
- d. the stage before a dying star becomes a supernova

- ____ 23. Galaxies are classified into four groups based on their
- shapes.
 - sizes.
 - number of stars.
 - brightness.
- ____ 24. When the absorption lines of a galaxy shift toward the blue end of the spectrum, it means that the galaxy is
- Moving away from Earth.
 - small and young.
 - moving closer to Earth.
 - large and old.
- ____ 25. Hubble's Law states that the speed at which a galaxy is moving away is proportional to the
- mass of the galaxy.
 - Number of stars in the galaxy.
 - galaxy's distance from Earth.
 - age of the galaxy.
- ____ 26. The big bang theory explains the
- origin of the universe.
 - life cycle of a star.
 - Doppler effect.
 - arrangement of constellations.
- ____ 27. Which of the following provides support for the big bang theory?
- red shift
 - cosmic microwave background radiation
 - elliptical galaxies
 - both (a) and (b)
- ____ 28. Dark matter can be detected by its
- cosmic microwave background radiation.
 - red shift.
 - gravitational effects on visible matter.
 - velocity.
- ____ 29. Much of the mass of the universe may be composed of
- electromagnetic waves.
 - cosmic microwaves.
 - background radiation.
 - dark matter.

Completion

Complete each sentence or statement.

30. Because Earth's orbit around the sun is an ellipse, and Earth is not always the same distance from the sun, one AU is defined as the _____ distance from Earth to the sun.
31. All of the planets in our solar system have _____ with the exception of Mercury and Venus.
32. Because there is no _____ on the moon, any liquid water would have evaporated into space long ago.
33. The model of the universe in which Earth is stationary is the _____ model.

34. The collision from which the moon formed ejected a huge amount of Earth's crust into space along with part of Earth's _____.

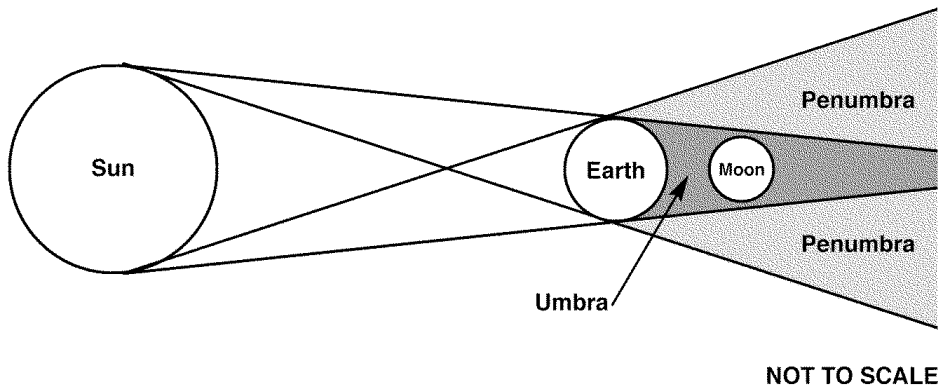


Figure 25-1

35. The total lunar eclipse shown in Figure 25-1 is occurring during the _____ phase of the moon.
36. The length of a planet's day is determined by its _____.
37. Icy objects that mostly travel in long, elliptical orbits around the sun are _____.
38. The _____ belt contains perhaps tens of thousands of objects orbiting within about 100 AU of the sun.
39. The great reservoir of comets beyond the Kuiper belt is called the _____.
40. The material that formed our solar system originated from a solar _____.
41. The sun's major source of fuel is _____.
42. The two forces that are balanced when a star is in equilibrium are outward pressure and _____.
43. Nuclear fusion within the sun takes place within the _____.
44. The apparent change in position of an object with respect to a distant background is called _____.
45. By using a spectrograph, a star's absorption lines can identify the different _____ that a star is composed of.
46. A contracting cloud of dust and gas with enough mass to form a star is called a(an) _____.
47. The sun will end its life as a red giant and eventually end up as a(an) _____.

48. A group of two or more stars held together by gravity is called a(an) _____.
49. A large spherical group of older stars is called a(an) _____.
50. New stars are not forming in older _____ galaxies.
51. The apparent change in frequency and wavelength of a sound or light source as it moves toward or away from an observer is called the _____.
52. The theory that the universe came into being in a single moment with an enormous explosion is the _____ theory.
53. Matter that does not give off any radiation is called _____.
54. As a star stabilizes as a red giant, it produces carbon, oxygen, and other elements from the fusion of _____.
55. The characteristic pulsing of the radiation observed from a pulsar is caused by the neutron star's _____.
56. A binary system in which one star passes in front of the other, blocking some light from reaching Earth is called a(an) _____ binary.
57. The observation that cosmic microwave background radiation is detected in all directions in the universe supports the hypothesis that the universe is _____.

Short Answer

58. What is the ecliptic plane?
59. What are the components of our solar system?
60. What is the difference between a full moon and a new moon?
61. What is the theoretical source of the solar nebula from which our solar system formed?
62. At least how much longer is the sun expected to remain a stable main sequence star?
63. Why do astronomers measure the parallax of nearby stars?

64. What characteristic of a star's spectrum do astronomers use to determine the different elements in the star?
65. What two factors cause a nebula to develop into a star?
66. What is a group of stars called that appears to form a pattern when seen from Earth?
67. What does recent evidence suggest is at the center of our galaxy?
68. How can an object's red shift tell us how fast the object is moving away from Earth?
69. How have scientists used Hubble's Law to estimate the age of the universe?
70. To what do astronomers attribute the increasing rate of expansion of the universe?

Essay

71. Describe two kinds of technology in use today for the exploration of space.
72. Explain why Earth is currently in little danger of being hit by a Mars-sized object.
73. What three criteria must any theory of the origin of the solar system satisfy? What theory satisfies all three?
74. Besides shape, what is the difference between an elliptical galaxy and an irregular galaxy?
75. Discuss the hypothetical role of the amount of dark matter and dark energy in predicting the future of the universe.

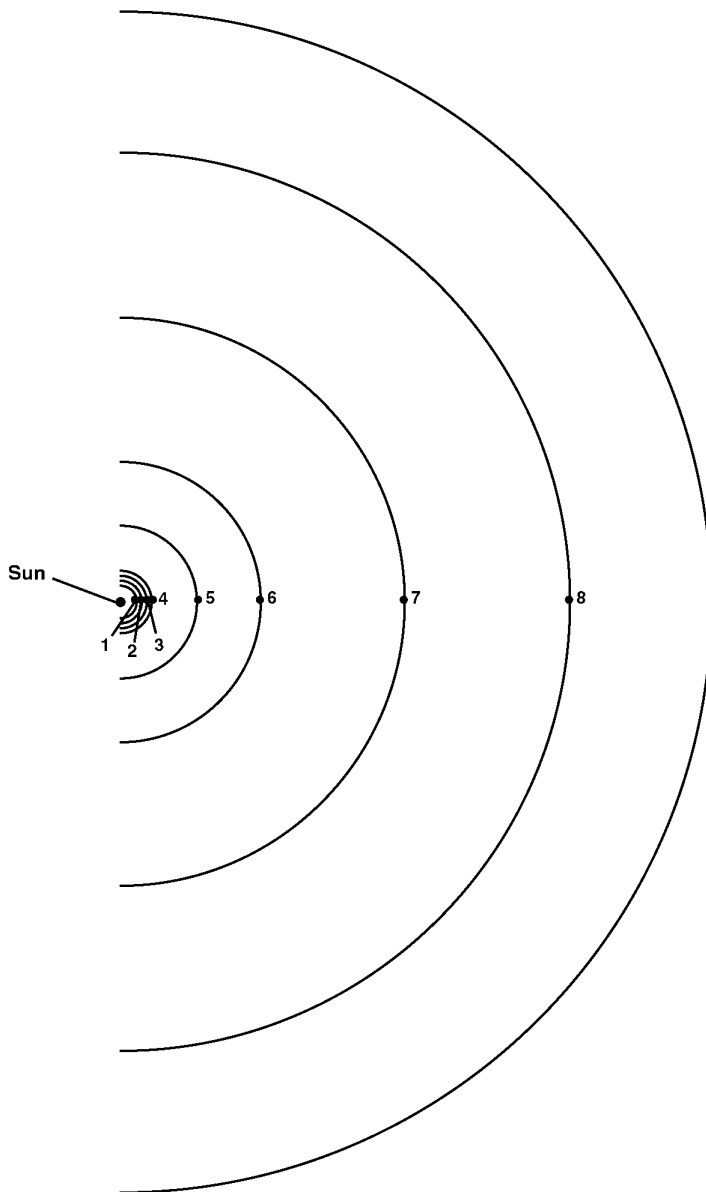


Figure 25-2

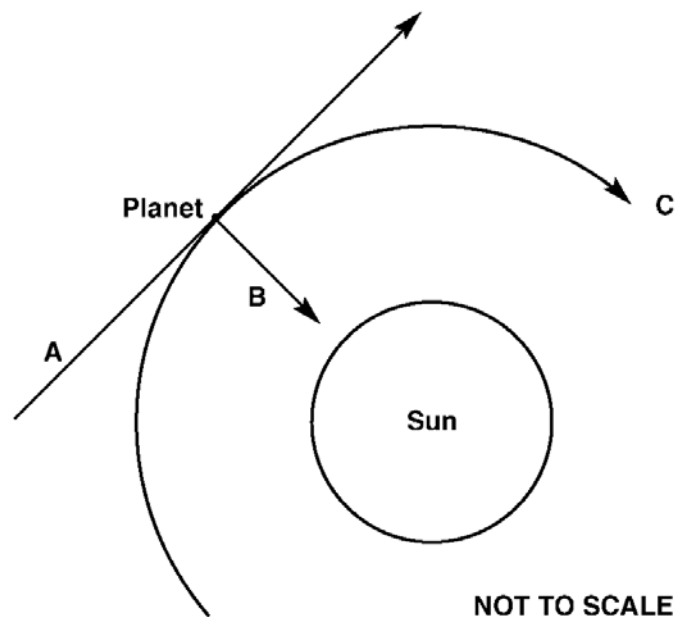


Figure 25-3

NOT TO SCALE

76. Is the model in Figure 25-2 geocentric or heliocentric? Explain how you know.
77. In Figure 25-2, which components of the solar system are indicated by orbits 1– 9? Name each component in order from the sun, and classify each according to type.
78. If a planet is orbiting along path C in Figure 25-3, explain why it stays in orbit. Refer to Figure 25-3 in your explanation.
79. Based on Figure 25-3, describe the path that the planet would follow if the sun did not exist. Why would this happen?
80. Saturn is the least dense of all the planets. Why does Saturn remain in orbit instead of drifting away in space or crashing into the sun?