

BIG Idea The Sun, Earth, and the Moon form a dynamic system that influences all life on Earth.

Vocabulary

Key Concepts

Section 27.1 Tools of Astronomy

- electromagnetic spectrum (p. 764)
- interferometry (p. 767)
- reflecting telescope (p. 766)
- refracting telescope (p. 766)

MAIN Idea Radiation emitted or reflected by distant objects allows scientists to study the universe.

- Telescopes collect and focus electromagnetic radiation emitted or reflected from distant objects.
- Electromagnetic radiation is classified by wavelength and frequency.
- The two main types of optical telescopes are refractors and reflectors.
- Space-based astronomy includes the study of orbiting telescopes, satellites, and probes.
- Technology originally developed to explore space is now used by people on Earth.

Section 27.2 The Moon

- albedo (p. 771)
- ejecta (p. 771)
- highland (p. 771)
- impact crater (p. 771)
- mare (p. 771)
- ray (p. 771)
- regolith (p. 772)
- rille (p. 771)

MAIN Idea The Moon, Earth's nearest neighbor in space, is unique among the moons in our solar system.

- Astronomers have gathered information about the Moon using telescopes, space probes, and astronaut exploration.
- Like Earth's crust, the Moon's crust is composed mostly of silicates.
- Surface features on the Moon include highlands, maria, ejecta, rays, and rilles. It is heavily cratered.
- The Moon probably formed about 4.5 bya in a collision between Earth and a Mars-size object.

Section 27.3 The Sun-Earth-Moon System

- apogee (p. 783)
- ecliptic plane (p. 776)
- equinox (p. 777)
- lunar eclipse (p. 784)
- perigee (p. 783)
- solar eclipse (p. 781)
- solstice (p. 777)
- synchronous rotation (p. 780)

MAIN Idea Motions of the Sun-Earth-Moon system define Earth's day, month, and year.

- Earth's rotation defines one day, and Earth's revolution around the Sun defines one year.
- Seasons are caused by the tilt of Earth's spin axis relative to the ecliptic plane.
- The gravitational attraction of both the Sun and the Moon causes tides.
- The Moon's phases result from our view of its lighted side as it orbits Earth.
- Solar and lunar eclipses occur when the Sun's light is blocked.

Vocabulary Review

Fill in the blanks with the correct vocabulary term from the Study Guide.

1. Linking telescopes to improve the detail in the images obtained is called _____.
2. A telescope that uses curved lenses to focus visible light is called a(n) _____.
3. A(n) _____ can take place only when the Moon is in the new moon phase.

Each of the following sentences is false. Make each sentence true by replacing the italicized words with vocabulary terms from the Study Guide.

4. The Moon's *perigee* is the amount of sunlight that its surface reflects.
5. The far side of the Moon has many more *maria* than the near side.
6. *Interferometry* explains why the same side of the Moon is always visible from Earth.

Match each description below with the correct vocabulary term from the Study Guide.

7. a device that uses a mirror to collect light from distant objects
8. the point in the Moon's orbit when it is farthest from Earth
9. loose, ground-up rock, such as the layer covering much of the surface of the Moon

Understand Key Concepts

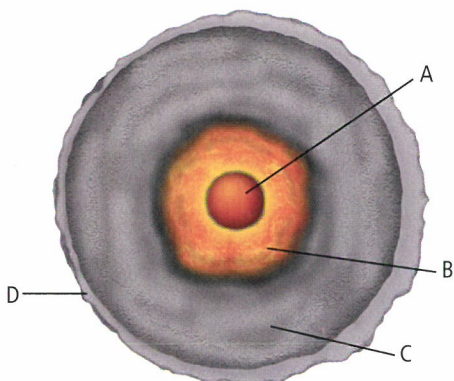
10. Which is the highest point in the sky that the Sun reaches on a given day?
 - A. ecliptic
 - B. solstice
 - C. tropic
 - D. zenith

Use the diagram below to answer Questions 11 and 12.



11. In the diagram above, which season is it in the northern hemisphere?
 - A. autumn
 - B. spring
 - C. summer
 - D. winter
12. When Earth is in the position shown in the diagram, at which place on Earth is the Sun most likely to be directly overhead at midday?
 - A. Arctic Circle
 - B. equator
 - C. Tropic of Cancer
 - D. Tropic of Capricorn
13. Which type of electromagnetic radiation has a longer wavelength than visible light?
 - A. gamma ray
 - B. X ray
 - C. radio wave
 - D. ultraviolet ray
14. Which geographic features on the Moon are most likely to be the oldest?
 - A. craters
 - B. highlands
 - C. maria
 - D. regolith
15. What is the mineral composition of most moon rocks?
 - A. basalts containing water
 - B. feldspar with high iron content
 - C. sedimentary breccias
 - D. silicates

Use the diagram below to answer Questions 16 and 17.



16. Which area of the Moon is physically molten?
- A. core
 - B. lower mantle
 - C. upper mantle
 - D. crust
17. Which area of the Moon is probably solid iron?
- A. core
 - B. lower mantle
 - C. upper mantle
 - D. crust

Constructed Response

18. **Describe** the advantages of placing telescopes in space.

Use the illustration below to answer Question 19.

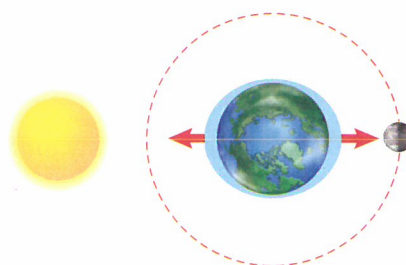


19. **Identify** What part of the lunar surface is most likely shown in this photograph?

20. **Distinguish** between rays and rilles, including where they are found and how they are formed on the Moon.
21. **Summarize** the ways in which Earth's Moon is unusual among all the moons in the solar system.
22. **Assess** the advantages of human missions compared with using robotic spacecraft to explore space.

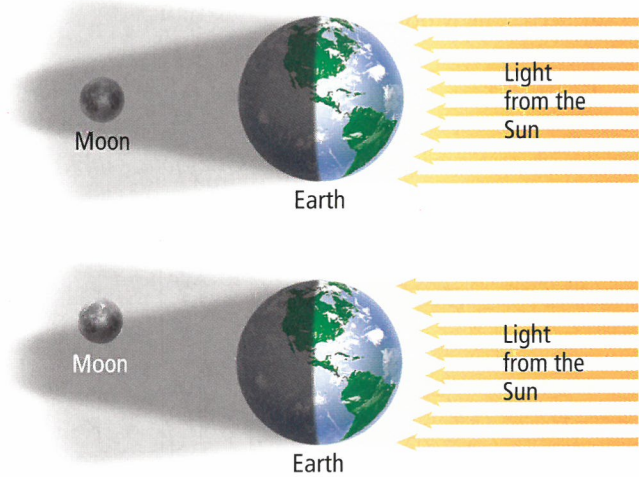
Think Critically

Use the illustration below to answer Question 23.



23. **Draw** a diagram similar to the one above to illustrate ocean tides that are not neap or spring.
24. **Infer** Why are lunar breccias not sedimentary like most breccias found on Earth?
25. **Contrast** the geological history of maria with that of the highlands.
26. **Consider** What would seasons be like if Earth were not tilted on its axis?
27. **Draw** a diagram showing the altitude of the Sun at summer solstice viewed from a position of 40° north latitude.
28. **Infer** Would ocean tides exist if Earth had no moon? If so, describe what they would be like.

Use the illustration below to answer Questions 29 and 30.



29. **List** the types of shadows as well as the types of eclipses that will be seen by an observer on the unlit side of Earth in each scenario.
30. **Infer** the view of the Sun from the Moon in each scenario.
31. **Appraise** Based on what you know about how maria formed, where would you expect to find the highest concentration of iron?
32. **Compare and contrast** the Moon's interior structure in **Figure 27.11** with Earth's interior structure in **Figure 1.3**.

Concept Mapping

33. Create a concept map using the following terms: *the Moon, albedo, Earth, phases, impact theory, highlands, maria, rilles, craters, rays, breccia, and regolith*. Refer to the *Skillbuilder Handbook* for more information.

Challenge Question

34. **Describe** the interrelationship between the Sun, Earth, and the Moon regarding tides and eclipses.

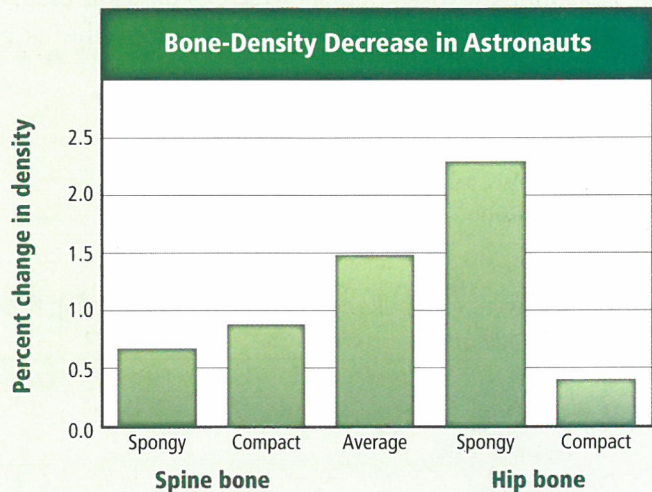
Additional Assessment

35. **WRITING in Earth Science** Imagine that you are the science officer on a scouting mission from another planet. You just observed the impact that formed Earth's Moon. Write a report describing the event.

DBQ Document-Based Questions

Data obtained from: Lang, T. et al. 2004. Cortical and trabecular bone mineral loss from the spine and hip in long-duration spaceflight. *Journal of Bone and Mineral Research* 19 (6).

Bone loss in the lower extremities and spine is a serious problem for astronauts who spend long periods in microgravity. The data below shows the percent loss of bone mineral per month from 13 crew members of the International Space Station.



36. Evaluate which body area showed the highest overall rate of bone loss.
37. Compare bone loss of the two types of bone in the hip. Which has the highest rate of loss? By how much?

Cumulative Review

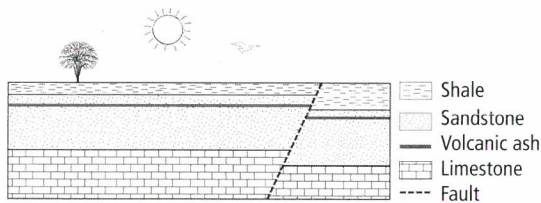
38. What is the source of CFCs and how do CFCs cause ozone depletion? (**Chapter 26**)
39. What are the most common minerals in granite? In basalt? (**Chapter 5**)

Standardized Test Practice

Multiple Choice

- Which is not considered a renewable resource?
 - brick
 - stone
 - copper
 - wood

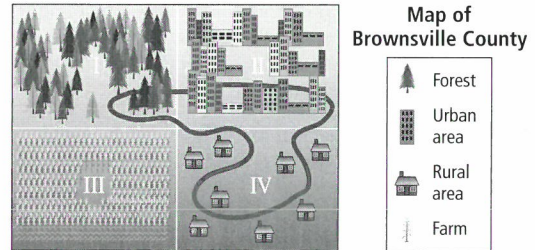
Use the geologic cross section below to answer Questions 2 and 3.



- Assuming the rock layers shown are in the same orientation that they were deposited, which layer is the oldest?
 - shale
 - sandstone
 - volcanic ash
 - limestone
- Which layer would be most helpful in determining the absolute age of these rocks?
 - shale
 - sandstone
 - volcanic ash
 - limestone
- Which fossil fuel was originally known as rock oil?
 - petroleum
 - natural gas
 - coal
 - oil shale
- In which process does the weight of a subducting plate help pull the trailing lithosphere into a subduction zone?
 - slab pull
 - ridge pull
 - slab push
 - ridge push

- What is debris from an impact that falls back to the surface of the Moon called?
 - rilles
 - maria
 - ejecta
 - albedo

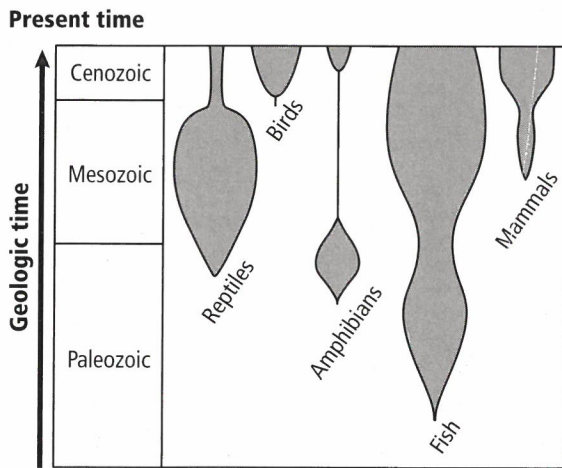
Use the illustrations below to answer Questions 7 to 9.



- Which area of Brownsville is most likely to have problems with flooding during heavy rains?
 - I
 - II
 - III
 - IV
- If Brownsville County decided to clear area I in order to expand area III, Brownsville might develop problems with topsoil erosion and pesticide pollution. What might be one way to minimize harmful effects?
 - deforestation
 - clear-cutting
 - monoculture
 - selective logging
- What will happen if the size of Brownsville's human population reaches the carrying capacity for its environment?
 - There will be more births than deaths.
 - The death rate will increase and the birth rate will increase.
 - The population will reach equilibrium.
 - The death rate will increase and the birth rate will decrease.
- The Marianas Islands in the Pacific Ocean were formed by volcanic action. Which is a TRUE statement?
 - There are glaciers near the Marianas Islands.
 - Tectonic plates collide near the Marianas Islands.
 - The Marianas Islands are larger than most islands.
 - The Marianas Islands are uninhabited.

Short Answer

Use the diagram below to answer Questions 11 to 13.



- If a wider bar represents more species of that type of organism, explain the change in diversity of amphibians from their introduction to present time.
- What can be inferred about the conditions on Earth for living things from the beginning of the Cenozoic Era to present time?
- How might the idea that oceans developed before land be supported by looking at this diagram?
- How does passive solar heating differ from active solar heating?
- Why is improving the energy efficiency of automobiles important?
- What two major flaws did scientists of Wegener's day cite as reasons to reject his hypothesis of continental drift?

Reading for Comprehension

Space Observatories

Why put observatories in space? Most telescopes are on the ground where you can deploy a heavier telescope and fix it more easily. The trouble is that earthbound telescopes must look through the Earth's atmosphere which blocks out a broad range of the electromagnetic spectrum, allowing a narrow band of visible light to reach the surface. Telescopes that explore the universe using light beyond the visible spectrum, such as those onboard the *CHANDRA X-Ray Observatory* need to be carried above the absorbing atmosphere. The Earth's atmosphere also blurs the light it lets through. The blurring is caused by varying density and continual motion of air. By orbiting above Earth's atmosphere, the *Hubble Space Telescope* gets clearer images.

Article obtained from: Astronomy picture of the day. *Hubble* Floats Free. NASA. November 24, 2002. (Online resource accessed October 17, 2006.)

- What is a benefit of earthbound telescopes?
 - They can be larger and are more easily fixed.
 - They are able to capture the entire electromagnetic spectrum.
 - They can use larger mirrors.
 - They can capture the visible light reaching Earth's surface.
- What can be inferred from this passage?
 - Earthbound telescopes have no benefits for scientific study.
 - Using telescopes outside the Earth's atmosphere produces the clearest pictures.
 - The *Hubble Space Telescope* needs to have larger mirrors to take better pictures.
 - It is impossible to fix telescopes orbiting outside Earth's atmosphere.

NEED EXTRA HELP?

If You Missed Question . . .	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Review Section . . .	24.1	21.2	21.3	25.1	17.4	27.2	26.2	26.2	26.1	17.3	23.1	23.3	23.1	25.2	25.3	17.1