

Directed Reading

Section: Energy in the Earth System

1. Traditionally, how have different fields of Earth science been studied?

2. How are scientists approaching the study of Earth today?

EARTH-SYSTEM SCIENCE

In the space provided, write the letter of the description that best matches the term or phrase.

- | | |
|------------------------|----------------------------------------------------------------------------------------------------------------------|
| _____ 3. system | a. the ability to do work |
| _____ 4. matter | b. a set of particles or interacting components considered to be a distinct physical entity for the purpose of study |
| _____ 5. energy | c. a system in which energy, but not matter, is exchanged with the surroundings |
| _____ 6. open system | d. a system in which both energy and matter are exchanged with the surroundings |
| _____ 7. closed system | e. anything that has mass and takes up space |

8. What is true of systems in terms of their size and boundaries?

9. How does a large, complex system like the Earth system operate?

Directed Reading *continued*

10. In what four ways can energy be transferred?

11. How might a system be described in terms of matter and energy?

12. Give an example of an open system, and explain what makes it an open system.

13. Give an example of a closed system, and explain what makes it a closed system.

14. Why does the Earth system resemble a closed system, even though it is technically an open system?

EARTH'S FOUR SPHERES

15. Matter on Earth occurs in what three states?

Directed Reading *continued*

16. The Earth system is composed of four _____ that are storehouses of all the planet's matter.

17. A mixture of gases that surround a planet, moon, or other celestial body is called its _____.

18. The portion of Earth that is water is called the _____.

19. The mostly solid, rocky part of Earth that extends from the center of the core to the surface of the crust is called the _____.

20. The part of Earth where life exists, which includes all Earth's living organisms, is called the _____.

21. What purpose does the atmosphere serve?

22. Where can Earth's fresh water supply be found?

23. What parts of Earth are included in the geosphere?

24. Of what is the biosphere composed?

Directed Reading *continued*

EARTH'S ENERGY BUDGET

In the space provided, write the letter of the description that best matches the term or phrase.

- | | |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| _____ 25. first law of thermodynamics | a. additions and subtractions in energy are balanced in the transfer of all energy among Earth's spheres |
| _____ 26. energy budget | b. energy is transferred between systems, but it cannot be created or destroyed |
| _____ 27. second law of thermodynamics | c. material is heated, the material's density decreases, and the hot material rises and releases energy as heat; cooler, denser material sinks and displaces the hot material |
| _____ 28. convection | d. energy transfer takes place, and matter becomes less organized with time |

29. Like energy, _____ can be transferred but cannot be created or destroyed.

30. The overall effect of the second law of thermodynamics is that the universe's _____ is spread out more and more uniformly over time.

31. Earth's four main spheres are _____ that can be thought of as huge storehouses of matter and energy.

32. How are matter and energy exchanged between the spheres?

33. When Earth formed, its interior was heated by what two processes?

34. Because Earth's interior is warmer than its surface layers, hot materials move toward the surface in a process called _____.

Directed Reading *continued*

35. Earth's most important external energy source is the _____.
36. The heat generated by solar radiation causes the movement of air masses, which in turn creates _____ and ocean currents.
37. What is another important source of external energy from the sun and moon?

38. The pull of the sun and the moon, combined with Earth's rotation, generates _____, which cause currents and drive the mixing of ocean water.

CYCLES IN THE EARTH SYSTEM

39. Define *reservoir*.

40. Define *cycle*.

41. What happens to nitrogen as it passes through the nitrogen cycle?

42. What happens to carbon in the short-term carbon cycle?

Directed Reading *continued*

43. What happens to carbon in the long-term carbon cycle?

44. Through which spheres does phosphorus move during the phosphorus cycle?

45. Describe the sequence of the phosphorus cycle.

46. Describe the water cycle.

47. What is transpiration?

48. The carbon cycle is affected when humans use _____.

49. When humans burn fossil fuels, _____ is rapidly returned to the atmospheric reservoir.

50. Both the nitrogen and phosphorus cycles are affected by _____.