

Skills Worksheet

Directed Reading**Section: Determining Absolute Age**

1. What does *relative age* indicate?

2. Besides relative age, what else do scientists need to know in order to learn more about Earth's history?

3. What is absolute age?

ABSOLUTE DATING METHODS

- _____ 4. A method scientists use to determine absolute age involves
- observing and calculating climate changes that may or may not have occurred over time.
 - using geologic processes that can be observed and measured over time.
 - using geologic processes that have been observed during earthquakes and volcanic eruptions.
 - studying the interaction of plants and animals and making guesses about the past.

- _____ 5. Another method of determining absolute age
- involves measuring the chemical composition of certain materials in rock.
 - involves measuring the sediment contained in several layers of rock.
 - involves recording which layer of rock is on top of other layers.
 - involves analyzing the chemical composition of soils on top of rock.

- _____ 6. The age of a stream can be measured using rates of erosion found by
- measuring the amount of sediment in the stream.
 - measuring the rate at which the stream erodes its bed.
 - measuring the rate at which water flows through the stream during a flood.
 - measuring the number of streams that join the stream along its full length.

Directed Reading *continued*

- _____ 7. Over what time period can rates of erosion help scientists determine absolute age?
- a. more than 2,000,000 years
 - b. from 1,000,000 to 2,000,000 years
 - c. from 100,000 to 200,000 years
 - d. from 10,000 to 20,000 years
- _____ 8. Which geologic feature can be given an absolute age using rates of erosion?
- a. Mt. Saint Helens
 - b. the Grand Canyon
 - c. Niagara Falls
 - d. Lake Superior
- _____ 9. Rate of erosion is not a dependable way of determining the absolute age of the Grand Canyon because
- a. the Grand Canyon formed during a huge flood, and little evidence remains.
 - b. the Grand Canyon formed over millions of years, and rates of erosion may have varied greatly.
 - c. the Grand Canyon has been surrounded by deserts, where rates of erosion are very slow.
 - d. the Grand Canyon is too large for rates of erosion to be measured.
10. In what way can the rate of deposition be used to estimate absolute age?

11. In general, at about what rate is sedimentary rock such as limestone, shale, or sandstone deposited?

12. What are two reasons a sedimentary layer might not be deposited at the average rate?

13. How are varves similar to the rings of a tree?

Directed Reading *continued*

14. What do varves look like?

15. Where and how do varves generally form?

16. How many layers make up a single varve?

17. How are varves useful to geologists?

RADIOMETRIC DATING

_____ 18. Small amounts of what type of materials in rocks can act as natural clocks?

- a. sedimentary
- b. intrusive
- c. radioactive
- d. igneous

_____ 19. Atoms of the same element that have different numbers of neutrons are called

- a. varves.
- b. isotopes.
- c. radioactive particles.
- d. alpha particles.

_____ 20. Radioactive isotopes emit particles and energy

- a. at a constant rate regardless of surrounding conditions.
- b. at differing rates regardless of surrounding conditions.
- c. at differing rates depending on surrounding conditions.
- d. at a constant rate if conditions remain the same.

Directed Reading *continued*

- _____ 21. When radioactive isotopes decay,
- a. an atom emits particles, but no energy is released.
 - b. an atom emits particles, and rocks become smaller.
 - c. an atom emits particles, and small amounts of energy are released.
 - d. an atom emits particles, and large amounts of energy are released.
- _____ 22. In what way is the natural breakdown of isotopes most useful to scientists?
- a. It can provide an estimate of the absolute age of rocks.
 - b. It can accurately measure the absolute age of rocks.
 - c. It can provide an estimate of the relative age of rocks.
 - d. It can accurately measure the relative age of rocks.
- _____ 23. The method of using radioactive decay to measure the absolute age of rocks is called
- a. blind dating.
 - b. radioactive dating.
 - c. radiometric dating.
 - d. decay dating.
- _____ 24. What happens when an atom emits particles and energy?
- a. The atom always remains unchanged.
 - b. The atom always changes into a different isotope of the same element.
 - c. The atom always changes into a different isotope of the same element.
 - d. The atom changes into a different isotope of the same element or into an isotope of a different element.
- _____ 25. The original radioactive isotope in a rock is called
- a. the parent isotope.
 - b. the daughter isotope.
 - c. the breakdown isotope.
 - d. the clock isotope.

26. What do scientists measure when using radiometric dating?

27. What are daughter isotopes?

Directed Reading *continued*

28. How do scientists determine the absolute age of a rock using radiometric dating?

29. What changes the rate of radioactive decay?

30. What have scientists determined about the time that is required for half of any amount of a radioactive isotope to decay?

31. What is a half-life?

32. If you began with 10 g of a parent isotope, how much of that isotope would be left after one half-life?

33. How much of an original isotope remains at the end of a second half-life?

34. How can scientists determine the age of a rock sample using the half-life of a parent isotope?

35. What does a higher percentage of daughter isotopes in a rock mean?

Directed Reading *continued*

36. How could a parent or daughter isotope be gained or lost?

37. What determines which radioactive element will give a more accurate measurement of a rock's age?

38. How long is the half-life of uranium-238?

39. In radiometric dating, for what kinds of geologic samples containing uranium is uranium-238 most useful? Why?

40. What is the half-life of potassium-40?

41. In what kinds of rock does potassium-40 occur?

42. What ages of rock are dated by potassium-40?

43. What is the half-life of rubidium-87, and how is it related to and used in conjunction with potassium-40?

Directed Reading *continued*

CARBON DATING

- _____ 44. The method used to determine the age of organic remains included in rock layers is called
- a. argon-argon dating, or argon-2 dating.
 - b. carboniferous dating, or wet-carbon dating.
 - c. carbon-carbon dating, or carbon-2 dating.
 - d. carbon-14 dating, or radiocarbon dating.
- _____ 45. What carbon isotope combines with oxygen to form radioactive carbon dioxide, CO₂?
- a. carbon-12
 - b. carbon-13
 - c. carbon-14
 - d. carbon-15
- _____ 46. What does most CO₂ in the atmosphere contain?
- a. about equal amounts of nonradioactive carbon-12 and radioactive carbon-14
 - b. small amounts of nonradioactive carbon-12 and large amounts of radioactive carbon-14
 - c. nonradioactive carbon-12 and no radioactive isotope carbon-14
 - d. nonradioactive carbon-12 and small amounts of isotope carbon-14
47. Describe how all living organisms end up containing both carbon-12 and carbon-14.

48. What is the first step in finding the age of a small amount of organic material?

Directed Reading *continued*

49. What is the second step in finding the age of a small amount of organic material?

50. What is the half-life of carbon-14?

51. Why does radioactive carbon-14 begin to decay after a plant or an animal dies?

52. What happens to the carbon-14 in the tissues of a plant or an animal that has died?
