

## Chapter 02 Internal Energy and Plate Tectonics

### Multiple Choice Questions

1. The age of the Earth is about \_\_\_\_\_.
- A. 10 million years
  - B. 100 million years
  - C. 1000 million years
  - D. 460 million years
  - E.** 4600 million years

*Bloom's Level: 1. Remember*  
*Section: Internal Sources of Energy*

2. The heat that transformed the Earth early in its history came primarily from all but which of the following?
- A. impact energy
  - B. gravitational energy
  - C.** magnetic energy
  - D. decay of radioactive elements

*Bloom's Level: 1. Remember*  
*Section: Internal Sources of Energy*

3. The early differentiation of the Earth into a mantle and a core was created by

\_\_\_\_\_.

- A. gravitational accretion of iron-rich particles in the core, followed by silicate-rich particles in the mantle
- B. nuclear fission in the center of the Earth, which converted hydrogen and helium to iron
- C.**

the buildup of heat and the melting of iron which was pulled by gravity to the center of the Earth

*Bloom's Level: 1. Remember*

*Section: Earth History*

4. The inner core is a 2450-km diameter \_\_\_\_\_ mass with temperatures up to 4300°C (7770°F).

- A. gaseous
- B. liquid
- C.** solid

*Bloom's Level: 1. Remember*

*Section: Internal Sources of Energy*

5. As radioactive atoms decay, energy is \_\_\_\_\_.

- A. absorbed
- B.** released
- C. neither absorbed nor released
- D. may be absorbed or released, depending on which isotope is involved in the decay

*Bloom's Level: 1. Remember*

*Section: Internal Sources of Energy*

6. All of the continents were once combined into a single supercontinent called

- 
- A. Laurasia
  - B. Gondwanaland
  - C. Tethys
  - D. Panthalassa
  - E.** Pangaea

*Bloom's Level: 1. Remember*

*Section: Development of the Plate Tectonics Concept*

7. Which of the following is NOT a basic tenet of plate tectonics?

- A. Melted asthenosphere flows upward as magma and cools to form new ocean floor lithosphere.
- B. The new lithosphere slowly moves laterally away from the zones of oceanic crust formation on top of the underlying asthenosphere (seafloor spreading).
- C. When the leading edge of a moving slab of oceanic lithosphere collides with another slab, the older, colder, denser slab turns downward and is pulled by gravity back into the asthenosphere (subduction), while the less-dense, more buoyant slab overrides it.
- D.** The slab pulled into the asthenosphere begins the process of melting and moves into the liquid core.
- E. The slab pulled into the asthenosphere begins the process of reabsorption into the mantle.

*Bloom's Level: 1. Remember*

*Section: Development of the Plate Tectonics Concept*

8. The time needed for a typical atom in an oceanic plate to complete a plate-tectonic cycle is \_\_\_\_\_.

- A. about a hundred thousand years
- B. about a million years
- C. about 10 million years
- D.** in excess of 250 million years
- E.

Material does not recycle via tectonic processes

*Bloom's Level: 1. Remember*

*Section: How We Understand the Earth*

9. The most famous and outspoken of the early proponents of continental drift was \_\_\_\_\_.

- A. Plato, for whom "plate tectonics" was named
- B. Leonardo da Vinci
- C. William Smith
- D.** Alfred Wegener
- E. Immanuel Kant

*Bloom's Level: 1. Remember*

*Section: Development of the Plate Tectonics Concept*

10. In the \_\_\_\_\_, evidence abounded, mechanisms seemed plausible, and the plate tectonic theory was developed and widely accepted.

- A. mid-1930s
- B. mid-1940s
- C. mid-1950s
- D.** mid-1960s
- E. mid-1970s

*Bloom's Level: 1. Remember*

*Section: Development of the Plate Tectonics Concept*

11. After lava cools below the Curie point, which is about \_\_\_\_\_, atoms in iron-bearing minerals become magnetized in the direction of the Earth's magnetic field at that time and place.

- A. 50°C
- B. 250°C
- C. 550°C**
- D. 850°C
- E. 1150°C

*Bloom's Level: 1. Remember*

*Section: Magnetization of Volcanic Rocks*

12. After lava cools below the \_\_\_\_\_ point, about 550°C, atoms in iron-bearing minerals become magnetized in the direction of the Earth's magnetic field at that time and place.

- A. magnetization
- B. critical
- C. triple
- D. Curie**
- E. solidus

*Bloom's Level: 1. Remember*

*Section: Magnetization of Volcanic Rocks*

13. If sea-floor spreading occurs at a constant rate, the widths of magnetized seafloor strips have \_\_\_\_\_ ratios as the lengths of time between successive reversals of the Earth's magnetic field.

- A. opposite
- B. critical
- C. triple
- D. two to one
- E. the same**

*Bloom's Level: 1. Remember*

*Section: Magnetization Patterns on the Seafloors*

14. The oldest rocks on the ocean floors are about \_\_\_\_\_ years in age.
- A. 50,000
  - B. one million
  - C. 200 million**
  - D. 2 billion
  - E. 4.5 billion

*Bloom's Level: 1. Remember*

*Section: Magnetization Patterns on the Seafloors*

15. The hotspot-melting-through-lithosphere process forms lines of extinct volcanoes on the ocean floor, from youngest to oldest, \_\_\_\_\_.
- A. with random ages along the lines
  - B. in a direction pointing toward the sun
  - C. pointing at 90 degrees to the direction of plate movement
  - D. pointing in the opposite direction of plate movement
  - E. pointing in the direction of plate movement**

*Bloom's Level: 1. Remember*

*Section: Other Evidence of Plate Tectonics*

16. The blanket of sediment on the sea floor is \_\_\_\_\_ toward the ocean margins.
- A. very thin at the volcanic ridges and thickens**
  - B. very thick at the volcanic ridges and thins
  - C. thick at the volcanic ridges and thickens more
  - D. very thin at the volcanic ridges and is missing

*Bloom's Level: 1. Remember*

*Section: Other Evidence of Plate Tectonics*

17. Moving progressively away from the ridges, the ocean water depths increase systematically with seafloor age due to all but which of the following?

- A. cooling and contraction of the oceanic crust with a resultant increase in density
- B. isostatic down warping due to the weight of sediments deposited on the sea floor
- C. erosion of the older ocean floor by deep ocean currents**
- D. conduction of heat away from the molten surface rocks

*Bloom's Level: 1. Remember*

*Section: Other Evidence of Plate Tectonics*

18. When oceanic lithosphere collides with another plate, the \_\_\_\_\_ in the process of subduction.

- A. older, colder plate goes beneath the younger, warmer plate**
- B. younger, warmer plate goes beneath the older, colder plate
- C. plates both disappear downward
- D. plates pile up, forming mid-ocean ridges

*Bloom's Level: 1. Remember*

*Section: Other Evidence of Plate Tectonics*

19. The slide-past motions of long transform faults occur in all but which of the following?

- A. In the northeastern Pacific as the Queen Charlotte fault, located near a sparsely populated region of Canada.
- B. Along the San Andreas Fault in California with its famous earthquakes.
- C. At the southwestern edge of the Pacific Ocean where the Alpine fault cuts across the South Island of New Zealand.
- D. Where the Indian subcontinent touches Asia.**

*Bloom's Level: 1. Remember*

*Section: Plate Tectonics*

20. The Pacific plate subducts along \_\_\_\_\_ edges and creates enormous earthquakes, such as the 1923 Tokyo seism.

- A. its southern and eastern
- B. its northern and eastern
- C. its southern and western
- D. its northern and western**
- E. all of its

*Bloom's Level: 1. Remember*

*Section: Other Evidence of Plate Tectonics*

21. The active triple junction in \_\_\_\_\_ Africa is geologically young, having begun about 25 million years ago.

- A. southwestern
- B. southeastern
- C. northeastern**
- D. western
- E. southern

*Bloom's Level: 1. Remember*

*Section: Other Evidence of Plate Tectonics*

22. The greatest earthquakes in the world occur \_\_\_\_\_.

- A. where plates collide with each other**
- B. where plates separate from one another
- C. where plates slide past each other
- D. in the interiors of individual plates

*Bloom's Level: 1. Remember*

*Section: Plate Tectonics*

**True / False Questions**

23. Recent work has suggested that the solid inner core may be spinning in the same direction as the surrounding Earth, only slower.

**FALSE**

*Bloom's Level: 1. Remember*  
*Section: The Layered Earth*

24. The grand recycling of the upper few hundred kilometers of the Earth is called the tectonic cycle.

**TRUE**

*Bloom's Level: 1. Remember*  
*Section: The Grand Unifying Theory*

25. The gigantic pieces of lithospheric plates diverging, sliding past, or colliding with each other are directly responsible for the vast majority of the earthquakes, volcanic eruptions, and mountains on Earth.

**TRUE**

*Bloom's Level: 1. Remember*  
*Section: The Layered Earth*

26. In 1620, Francis Bacon of England noted the parallelism of the Atlantic coastlines of South America and Africa and suggested that these continents had once been joined.

**TRUE**

*Bloom's Level: 1. Remember*

*Section: Development of the Plate Tectonics Concept*

27. When data from the Earth's magnetic field locked inside seafloor rocks became widely understood, skeptics around the world were convinced that seafloor spreading occurs and that the concept of plate tectonics is valid.

**TRUE**

*Bloom's Level: 1. Remember*

*Section: Magnetization Patterns on the Seafloors*

28. The processes that reverse the polarity of the magnetic field are likely related to changes in the flow of the iron-rich liquid in the outer core.

**TRUE**

*Bloom's Level: 1. Remember*

*Section: Magnetization Patterns on the Seafloors*

29. The floor of the Atlantic Ocean is striped by parallel bands of magnetized rock that show alternating polarities in a pattern that is symmetrical and parallel to the mid-ocean spreading center.

**TRUE**

*Bloom's Level: 1. Remember*

*Section: Magnetization Patterns on the Seafloors*

30. Subducted slabs completely melt in the mantle and mix with the surrounding mantle.

**FALSE**

*Bloom's Level: 1. Remember*

*Section: The Grand Unifying Theory*

31. The greatest mountain ranges on Earth lie on the ocean bottoms and extend more than 40,000 miles.

**TRUE**

*Bloom's Level: 1. Remember*

*Section: Other Evidence of Plate Tectonics*

32. Hot spots have active volcanoes above them on the Earth's surface and moving plates carry the volcanoes away from their hot-spot source.

**TRUE**

*Bloom's Level: 1. Remember*

*Section: Other Evidence of Plate Tectonics*

33. The ages of former volcanoes decrease with their distance from their parent hot spot.

**FALSE**

*Bloom's Level: 1. Remember*

*Section: Other Evidence of Plate Tectonics*

34. Above the oceanic ridges, the ocean water depths are relatively deep in comparison to depths away from the ridges.

**FALSE**

*Bloom's Level: 1. Remember*

*Section: Other Evidence of Plate Tectonics*

35. Gravitational pull on a dense, down-going plate at a subduction zone (slab pull) is one of the forces that keeps the lithospheric plates moving.

**TRUE**

*Bloom's Level: 1. Remember*

*Section: The Grand Unifying Theory*

36. The rates of plate movement are comparable to those of human fingernail growth.

**TRUE**

*Bloom's Level: 1. Remember*

*Section: The Grand Unifying Theory*