

1. The French Philosopher and naturalist \_\_\_\_\_ was one of the first scientists to consider the composition of the interior of the earth. In his *Principles of Philosophy* he proposed that the Earth contains a core with a liquid similar to that of the sun and wrapped by layers of rock, metal, water, and air.
  - a. Rules for the Direction of the Mind
  - b. Rene Descartes
  - c. Meditations on First Philosophy
  - d. Discourse on the Method
  
2. The Danish naturalist \_\_\_\_\_ in his *Dissertationis prodromus* of 1669 is credited with four of the defining principles of the science of stratigraphy: The law of superposition, the principle of original horizontality, the principle of lateral continuity, and the principle of cross-cutting relationships.
  - a. Nicolas Steno
  - b. Hans Christian Ørsted
  - c. Johan Theodor Holmskiold
  - d. Søren Pedersen Abildgaard
  
3. He originated the theory of uniformitarianism—a fundamental principle of geology—which explains the features of the Earth's crust by means of natural processes over geologic time. His work established geology as a proper science, and thus he is often referred to as the "Father of Modern Geology". \_\_\_\_\_
  - a. Sir Patrick Geddes
  - b. William Nicol
  - c. James Hutton
  - d. John Fleming
  
4. He published 'The History of Ocean Basins' in 1962, in which he outlined a theory that could explain how the continents could actually drift. This theory later became known as 'Sea Floor Spreading'.
 

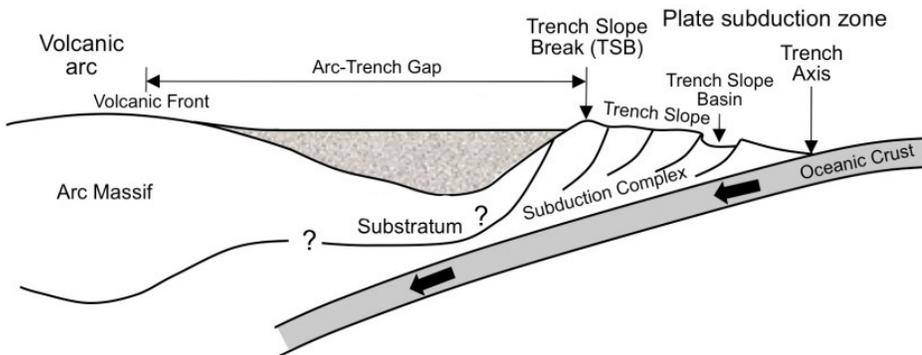
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  - a. Alfred Wegener
  - b. James Hutton
  - c. Arthur Holmes
  - d. Harry Hess
  
5. During his lifetime he was primarily known for his achievements in meteorology and as a pioneer of polar research, but today he is most remembered as the originator of the theory of continental drift by hypothesizing in 1912 that the continents are slowly drifting around the Earth.
  - a. Alfred Wegener
  - b. James Hutton
  - c. Arthur Holmes
  - d. Harry Hess
  
6. What is the plate tectonic theory?
  - a. the belief that continents have moved slowly apart to their current locations on Earth
  - b. the belief that hot, less dense material is forced up through Earth's crust through mid-ocean ridges
  - c. the belief that Earth's crust and upper mantle is broken into sections
  - d. the belief that Earth is broken into sections that fit together into one sphere

7. What is the continental drift theory?
- the belief that continents have always been located at their current locations on Earth
  - the belief that continents have moved slowly apart to their current locations on Earth
  - the belief that continents have quickly moved apart to their current locations on Earth
  - the belief that continents are moving slowly together from their current locations on Earth
8. One of the main objections to Wegener's hypothesis was his inability to provide an acceptable \_\_\_\_\_ for continental drift.
- Time
  - Rate
  - Direction
  - Mechanism
9. Mountains comparable in age and structure in the mountain belt that contains the Appalachians are found in \_\_\_\_\_.
- The British Isles
  - Africa
  - South America
  - Australia
10. The inner core is \_\_\_\_\_.
- Liquid and mostly consists of iron and nickel
  - Solid and mostly consists of iron and nickel
  - Liquid and mostly consists of silica
  - Solid and mostly consists of silica
11. Which layer of the earth's interior is the source of the earth's magnetic field?
- The mantle
  - The asthenosphere
  - The inner core
  - The outer core
12. The boundary between the inner and outer core is known as the \_\_\_\_\_.
- Asthenosphere
  - Gutenberg discontinuity
  - Lehmann discontinuity
  - Mohorovicic discontinuity
13. Between the outer core and the mantle is the \_\_\_\_\_.
- Asthenosphere
  - Gutenberg discontinuity
  - Lehmann discontinuity
  - Mohorovicic discontinuity

14. The \_\_\_\_\_ is the boundary between the crust and the mantle in the earth. This is a depth where seismic waves change velocity and there is also a change in chemical composition.
- Asthenosphere
  - Gutenberg discontinuity
  - Lehmann discontinuity
  - Mohorovicic discontinuity
15. The type of plate boundary where plates move together, causing one of the slabs of lithosphere to be consumed into the mantle as it descends beneath the overriding plate, is called a \_\_\_\_\_ boundary.
- Divergent
  - Transform
  - Convergent
  - Transitional
16. The type of plate boundary where plates move apart, resulting in upwelling of material from the mantle to create new seafloor, is a \_\_\_\_\_ boundary.
- Divergent
  - Transform
  - Convergent
  - Transitional
17. \_\_\_\_\_ are places where plates slide sideways past each other. At this boundary lithosphere is neither created nor destroyed.
- Divergent boundaries
  - Transform boundaries
  - Convergent boundaries
  - Transitional boundaries
18. The Mid-Atlantic Ridge is an example of a \_\_\_\_\_ boundary.
- Transitional
  - Divergent
  - Convergent
  - Transform
19. The San Andreas fault is an example of a \_\_\_\_\_ boundary.
- Transitional
  - Divergent
  - Convergent
  - Transform
20. The African Rift Valley is an example of a \_\_\_\_\_ boundary.
- Transitional
  - Divergent
  - Convergent
  - Transform

21. The Mariana Trench is an example of a \_\_\_\_\_ boundary.
- Transitional
  - Divergent
  - Convergent
  - Transform
22. The type of tectonic setting for forearc and back arc basins is \_\_\_\_\_
- Diverging boundary
  - Alluvial deposits from either subduction zone mountains or suture zone mountains
  - Section through ocean floor
  - Marine sediments deposited in front of or (in ocean-ocean subduction) behind the volcanic arc in a subduction zone
23. A large elongated depression with steep walls formed by the downward displacement of a block of the earth's surface between nearly parallel faults or fault systems \_\_\_\_\_.
- Rift Valley
  - Foreland basin
  - Back arc basin
  - Intracratonic
24. A mass of sedimentary material scraped off a region of oceanic crust during subduction and piled up at the edge of the overriding plate. \_\_\_\_\_.
- Foreland basin
  - Forarc basin
  - Accretionary wedge
  - Ophiolite



25. The illustration above depicts a \_\_\_\_\_.
- Forearc basin
  - Foreland basin
  - Intermontane basin
  - Backarc basin

26. Forearc basins are basins that develop between a volcanic arc and an \_\_\_\_\_.

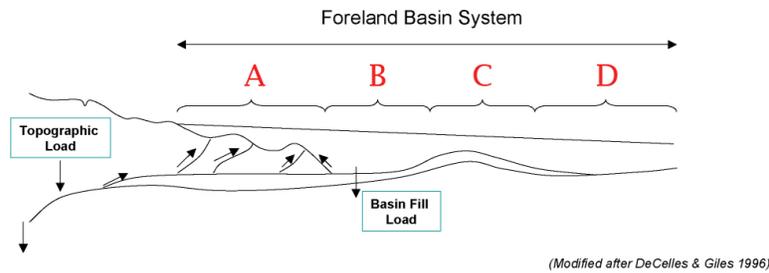
- a. Foreland basin
- b. Cratonic basin
- c. Backarc basin
- d. Accretionary wedge

27. A common type of basin that forms through cooling are \_\_\_\_\_ basins, which are circular basins in the interior of continents.

- a. Cratonic
- b. Foreland
- c. Backarc
- d. Forarc

28. A \_\_\_\_\_ basin is a structural basin that develops adjacent and parallel to a mountain belt. They form because the immense mass created by crustal thickening associated with the evolution of a mountain belt causes the lithosphere to bend, by a process known as lithospheric flexure.

- a. Cratonic
- b. Foreland
- c. Backarc
- d. Forearc



29. A foreland basin system consists of four discrete depozones. They are labeled in the illustration above. Letter B depicts which zone?

- a. wedge-top
- b. back-bulge
- c. foredeep
- d. Forebulge

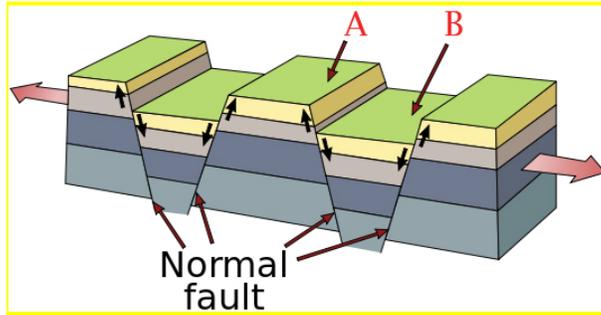
30. \_\_\_\_\_ is the slow creeping motion of Earth's solid silicate mantle caused by convection currents carrying heat from the interior of the Earth to the surface.

- a. Mantle dislocation creep
- b. Mantle convection
- c. Crust boiling
- d. Lithospheric melting

31. In 1963, J. Tuzo Wilson first proposed that volcanic chains like the Hawaiian Islands form when a tectonic plate drifts over a "hot spot" in the mantle. Eight years later, Princeton geophysicist W. Jason Morgan suggested that such hot spots — he initially proposed about 20 around the world — were fueled by \_\_\_\_\_.
- Gravity pulling the heavy lithosphere away from a mid ocean ridge
  - Convergence of two oceanic plates moving over over an extinct volcano
  - Narrow plumes of hot mantle rock rising from the core-mantle boundary
  - Divergence of two oceanic plates ripping apart the mantle
32. The process of super-continent formation and destruction via repeated cycles of creation and destruction of oceanic crust is known as the \_\_\_\_\_.
- Wilson Cycle
  - Milankovitch cycle
  - Calvin - Benson - Bassham Cycle
  - CNO cycle
33. A/an \_\_\_\_\_ is a fragment of crustal material formed on, or broken off from, one tectonic plate and accreted or "sutured" to crust lying on another plate. The crustal block or fragment preserves its own distinctive geologic history, which is different from that of the surrounding areas. The suture zone between it and the crust it attaches to is usually identifiable as a fault.
- Terrane
  - Aulacogen
  - Craton
  - Batholith
34. Laurentia is a large continental \_\_\_\_\_ that forms the ancient geological core of the North American continent. In eastern and central Canada, much of it is exposed at the surface as the Canadian Shield; when subsurface extensions are considered, the wider term Laurentian Shield is more common, not least because large parts of the structure extend outside Canada
- Terrane
  - Aulacogen
  - Craton
  - Batholith
35. \_\_\_\_\_ develop when a continental plate is crumpled and is pushed upwards to form mountain ranges.
- Orogenic belts
  - Continental shields
  - Terranes
  - Arc basins
36. The sequence of repeated cycles of sedimentation, deposition and erosion, followed by burial and metamorphism, and then by formation of granitic batholiths and tectonic uplift to form mountain chains, is called the \_\_\_\_\_.
- Wilson cycle
  - Orogenic cycle
  - Bradbury cycle
  - Rock cycle

37. \_\_\_\_\_ often result from rifting, another indicator of tensional tectonic forces. These can be small or form extensive rift valley systems, such as the East African Rift zone. Death Valley in California is a smaller example. There are two types - lifted and sloped.

- Fold and thrust belts
- Batholiths
- Kuppens
- Fault block mountains



38. In the illustration above depicts a lifted fault block system. Letter B is should be labeled: \_\_\_\_\_

- Graben
- Horst
- Rift
- Transform fault

39. \_\_\_\_\_ was a supercontinent that existed during the late Paleozoic and early Mesozoic eras.

- Panthalassa
- Pangaea
- Gondwana
- Laurasia

40. A failed graben system filled with extremely thick sediments is called a/an \_\_\_\_\_. The Mississippi embayment with the associated New Madrid Seismic Zone is an example of an ancient one that dates back to the breakup of the ancient continent, Rodinia. This ancient rift was the site of extreme earthquakes in the early 19th century in the region.

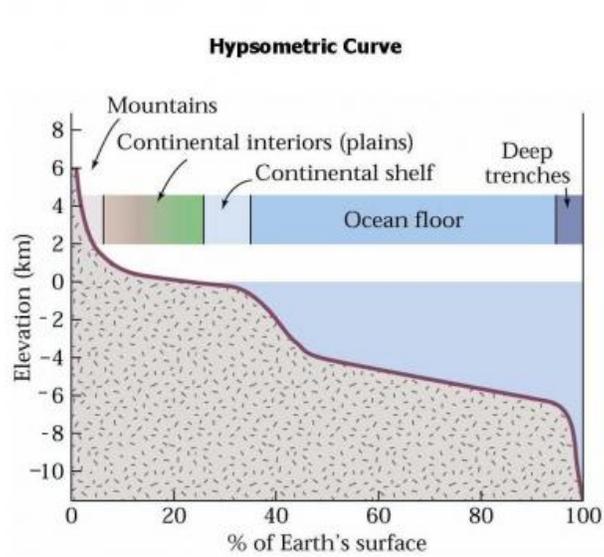
- Arkose
- Diapir
- Pluton
- Aulacogen

41. Hotspot volcanoes are considered to have a fundamentally different origin from island arc volcanoes. The latter form \_\_\_\_\_. It is this that fuels a chain of volcanoes, such as the Aleutian Islands, near Alaska.

- over subduction zones, at converging plate boundaries
- between divergent plates
- broken off continental crust at zones of divergence
- lowering levels of seawater

42. The lithosphere is composed of the crust, and some of the upper mantle. Mature oceanic plate is approximately \_\_\_\_\_ km thick, of which, the upper 5-7 km is oceanic crust.
- 20-80
  - 100-200
  - 80-100
  - 10-20
43. Continental plate is about \_\_\_\_\_ km thick, and includes continental crust which varies from 5 to 70 km in thickness.
- 10-20
  - 28-80
  - 100-150
  - 150-200
44. \_\_\_\_\_ is the state of gravitational equilibrium between Earth's crust and mantle such that the crust "floats" at an elevation that depends on its thickness and density.
- Isostasy
  - Eustasy
  - Staticotasy
  - Glacioisostasy
45. Clarence Edward Dutton, American geologist and pioneer seismologist who developed and named the principle of \_\_\_\_\_. According to this principle, the level of the Earth's crust is determined by its density; lighter material rises, forming continents, mountains, and plateaus, and heavier material sinks, forming basins and ocean floors.
- Eustasy
  - Glacioisostasy
  - staticotasy
  - Isostasy
46. Three principal models of isostasy are used. In the \_\_\_\_\_ model different topographic heights are accommodated by changes in crustal thickness, in which the crust has a constant density.
- Vening Meinesz
  - Airy–Heiskanen
  - flexural isostasy
  - Pratt–Hayford
47. \_\_\_\_\_ is the sinking of large parts of the Earth's crust into the asthenosphere. The sinking is caused by a heavy weight placed on the Earth's surface. Often this is caused by the heavy weight of glacial ice due to continental glaciation. This is a process in which permanent ice places pressure on the Earth's crust, thereby depressing it with its weight.
- Isostatic depression
  - Eustatic compression
  - Subsidence
  - Upwelling

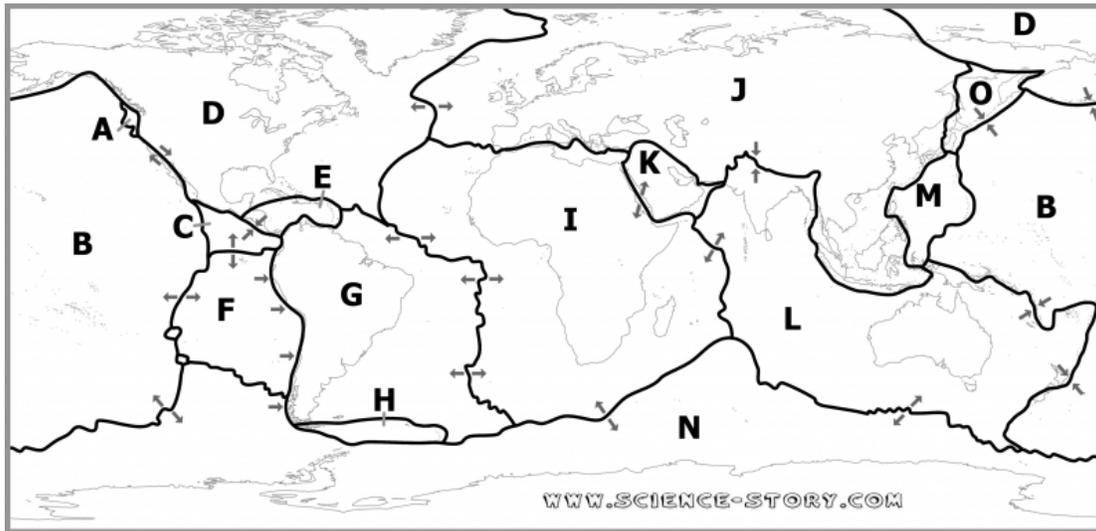
48. \_\_\_\_\_ is the measurement of land elevation relative to sea level.
- Isometry
  - Eustasy
  - Hypsometry
  - Bathymetry



49. Using the hypsometric curve above, determine the minimum elevation of mountains that make up the highest 10% of the Earth's surface.
- 6 km
  - .5 km
  - 2 km
  - 4 km
50. Using the hypsometric curve above, determine what percentage of the Earth's surface is above sea level.
- 29%
  - 71%
  - 40%
  - 8%
51. What two factors control the explosiveness of an volcanic eruption?
- the amount of gases and pressure within Earth's crust
  - the time of year and current weather conditions
  - the amount of water vapor and silica in the magma
  - the pressure within Earth and plate movement
52. Of the three types of volcanoes, which is the least explosive?
- cinder volcanoes
  - composite volcanoes
  - They all have the same level of explosiveness
  - shield volcanoes

53. Composite volcanoes are found mostly where \_\_\_\_\_.
- Earth's plates come together and one plate sinks beneath the other
  - rifts in Earth's surface occur
  - hot spots in the mantle occur
  - Earth's plates pull apart
54. The difference between basaltic and granitic magma is \_\_\_\_\_.
- the color
  - the amount of silica
  - the amount of water vapor
  - the way it cools
55. Which of the following describes the build up and release of stress during an earthquake?
- the Modified Mercalli Scale
  - the elastic rebound theory
  - the principle of superposition
  - the travel time difference
56. Approximately what percentage of earthquakes occur at plate boundaries?
- 25%
  - 50%
  - 75%
  - 90%
57. Which of the following did not occur at a plate boundary?
- New Madrid, Missouri, 1812
  - San Francisco, 1906
  - Anchorage, Alaska, 1964
  - Loma Prieta, California, 1989
58. \_\_\_\_\_ lavas are volumetrically the most abundant type of lava because they are erupted at mid-ocean ridges and because they make up the submarine portion of seamounts and large intraplate volcanoes, like the Hawaii-Emperor seamount chain.
- Pahoehoe
  - Pillow
  - A'a
  - Block
59. \_\_\_\_\_ lava is characterized by a smooth, billowy, or ropy surface. Its flows tend to be relatively thin, from a few inches to a few feet thick.
- Pahoehoe
  - Pillow
  - A'a
  - Block

60. \_\_\_\_\_, the most abundant element in magma, comprises a little less than half the total of its composition.
- Silicon
  - Aluminum
  - Iron
  - Oxygen
61. There are two known processes by which magma ceases to exist: by volcanic eruption, or by crystallization within the crust or mantle to form a \_\_\_\_\_. In both cases the bulk of the magma eventually cools and forms igneous rocks.
- Pahoehoe
  - Pluton
  - Vent
  - Gas
62. The "North American" continent's brief Cambrian respite ended in the Ordovician, when an \_\_\_\_\_ slammed into the East Coast, raising mountains from Greenland to Mississippi. At the time, the Appalachians were as tall and stunning as the Himalayas are today.
- island chain
  - ancient ocean
  - batholith
  - Pluton
63. The \_\_\_\_\_ is a chain of mountain ranges that consists of an almost continuous sequence of mountain ranges that form the western "backbone" of North America, Central America, South America and Antarctica. It is also the backbone of the volcanic arc that forms the eastern half of the Pacific Ring of Fire.
- North American Craton
  - Canadian Shield
  - American Cordillera
  - Laurentia Craton
64. There are several volcanic areas in the world considered to be supervolcanoes. Which of the following is a supervolcano?
- Yellowstone National Park
  - Lake Superior
  - Mount St. Helens
  - Banff National Park
65. How many large plates (Major plates) form the outer shell of the earth? (major plates only - do not include minor or micro plates in total)
- 1
  - 7
  - 15
  - 27



66. Which plate is labeled with G?
- South American Plate
  - Pacific Plate
  - Nazca Plate
  - Juan de Fuca Plate
67. Which Plate is labeled with J?
- Nazca Plate
  - Scotia Plate
  - Eurasian Plate
  - Arabian Plate
68. Which Plate is labeled with E?
- North American plate
  - Juan de Fuca Plate
  - Cocos Plate
  - Caribbean Plate
69. The Ring of Fire is a direct result of plate tectonics. The eastern section of the ring is the result of the Nazca Plate and the Cocos Plate being subducted beneath the westward-moving \_\_\_\_\_.
- Pacific Plate
  - Caribbean Plate
  - South American Plate
  - North American Plate
70. He was a Flemish cartographer and geographer, conventionally recognized as the creator of the first modern atlas, the *Theatrum Orbis Terrarum* (Theatre of the World). He is also believed to be the first person to imagine that the continents were joined together before drifting to their present positions.
- Abraham Ortelius
  - Nicolas Steno
  - Dan Mckenzie
  - Gerardus Mercator

71. He is a Professor of Geophysics at the University of Cambridge, and one-time head of the Bullard Laboratories of the Cambridge Department of Earth Sciences. He wrote the first paper defining the principles of plate tectonics, and his early work on mantle convection created the modern discussion of planetary interiors.

- a. Harry Hess
- b. Sydney Brenner
- c. Stephen William Hawking
- d. Dan McKenzie

72. The expanding Earth hypothesis was first formulated in the 1950s by S. Warren Carey, an Australian geologist. Though Professor Carey recognized sea floor spreading and the idea that the continents had once been assembled into the supercontinent of Pangaea, he did not recognize an important element of the modern day plate tectonic paradigm. What was that element ?

- a. Convergence
- b. Convection currents
- c. Divergence
- d. Subduction

\*73. The Mediterranean Ridge is a wide ridge in the bed of the Mediterranean Sea, running along a rough quarter circle from Calabria, south of Crete, to the southwest corner of Turkey, and from there eastwards south of Cyprus and Turkey. It is an \_\_\_\_\_ caused by the African Plate subducting under the Eurasian and Anatolian plates.

- a. Rift Valley
- b. Accretionary wedge
- c. Back arc basin
- d. Intracratonic

\*74. An \_\_\_\_\_ is a section of the Earth's oceanic crust and the underlying upper mantle that has been uplifted and exposed above sea level and often emplaced onto continental crustal rocks. Their great significance relates to their occurrence within mountain belts such as the Alps or the Himalayas, where they document the existence of former ocean basins that have now been consumed by subduction.

- a. Ophiolite
- b. Accretionary wedge
- c. Back arc basin
- d. Intermontane basin

\*75. The stratigraphic sequence observed in ophiolites corresponds to the lithosphere-forming processes at mid-oceanic ridges. The idealized stratigraphic sequence of an ophiolite is: \_\_\_\_\_ (top to bottom)

- a. deep marine sediments, pillow lava, sheeted dykes, gabbro, peridotite
- b. peridotite, gabbro, sheeted dykes, pillow lava, deep marine sediments
- c. pillow lava, deep marine sediments, sheeted dykes, peridotite, gabbro
- d. gabbro, peridotite, pillow lava, sheeted dykes, deep marine sediments