Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1)

Which of the following is the correct order of the layers of the Earth from inside to outside?

1)

_____

A)

inner core, outer core, crust, mantle

B)

inner core, mantle, outer core, crust

C)

inner core, outer core, mantle, crust

D)

mantle, inner core, crust, outer core

E)

crust, inner core, outer core, mantle

2)

Which of the following best describes the internal structure of the earth?

2)

_____

A)

An egg, it is solid at the core, surrounded by liquid and then a hard outer shell.

B)

A chocolate covered cherry, it is solid at the core surrounded by a liquid layer and semi-solid layer, then covered in a thin solid coating.

C)

A bowling ball, it is completely solid all the way through.

D)

A geode, it is hollow at the center with a strong, hard, outside layer.

E)

An orange, it has a thin peel with a solid, but watery inside.

3)

What is the difference between the inner and outer core of the Earth?

3)

_____

A)

The inner core is cool and the outer core is hot.

B)

The inner core is hot and the outer core is cool.

C)

The inner core is made from magma and the outer core is metal.

D)

The inner core is solid and the outer core is liquid.

E)

The inner core is liquid and the outer core is solid.

4)

Which of the following is **FALSE** about the mantle?

4)

_____

A)

The mantle is mostly liquid.

B)

The density of the rocks in the mantle is higher than water.

C)

The mantle surrounds the outer core.

D)

The density of the rocks in the mantle is lower than the outer core.

E)

The mantle is composed of iron- and magnesium-rich rocks.

5)

What would be the correct relationship between the crust and the lithosphere?

5)

_____

A)

The lithosphere is liquid, whereas the crust is solid.

B)

The lithosphere and the crust are the same thing.

C)

The lithosphere contains both the oceans and the continents, the crust only includes continents.

D)

The crust sits on top of the lithosphere.

E)

The lithosphere sits on top of the crust.

6)

Which of the following is **NOT** a significant source of the internal heat of the earth?

6)

_____
A)

Heat generated by crystallization of the core
B)

Original heat of formation of the planet
C)

Radioactive decay of elements scattered throughout the mantle
D)

Heat from the Sun

7)

The energy for plate tectonics comes from

7)

_____
A)

heat from the earth's core.
B)

ocean currents.
C)

heat from the sun.
D)

the magnetic field of the earth.
E)

gravity between the Earth and Moon.

8)

Where are earthquakes usually the **LEAST** common?

8)

_____
A)

Hotspots
B)

Transform plate boundaries
C)

Central region of tectonic plates
D)

Convergent plate boundaries
E)

Divergent plate boundaries

9)

Which of the following is **TRUE** about plate tectonics?

9)

_____

A)

Explains that the earth's lithosphere is split into large pieces that move on top of a weak and hot layer called the asthenosphere.

B)

It is a controversial idea that most geologists now think is incorrect.

C)

Explains that continents drift around the globe, whereas the oceanic crust does not move over geologic time.

D)

Explains that the earth's crust is split into plates that float on a completely molten mantle.

10)

The slow movement of the lithosphere is

10)

_____

A)

caused by the gravitational attraction from the Moon.

B)

speeding up because of human-induced changes.

C)

a key feature in the theory of plate tectonics.

D)

responsible for earthquakes but not volcanoes.

11)

What would you **NOT** expect to see at locations where tectonic plates are sinking?

11)

_____

A)

Volcanoes

B)

Undersea mountain range that wraps around the Earth like seams of a baseball

C)

Magma

D)

Subduction of oceanic lithosphere

E)

Earthquakes

12)

Which of the following statements is **TRUE** about a mid-ocean ridge?

12)

_____

A)

It is a place where old oceanic lithosphere is remelted.

B)

It is a site of some of the world's largest and most devastating earthquakes.

C)

It is a site of explosively erupting volcanoes.

D)

It includes the deepest parts of the ocean basin.

E)

It is located at a divergent boundary where tectonic plates move apart.

13)

The Himalayas are associated with which of the following tectonic plate boundaries?

13)

_____

A)

Ocean-continental convergence (subduction)

B)

Transform

C)

Ocean-ocean convergence (subduction)

D)

Continent-continent convergence (collision)

E)

Divergent

14)

Why aren't volcanoes associated with continent-continent convergence?

14)

_____

A)

Volcanoes only occur on islands in the ocean and not on land.

B)

Both plates are too buoyant to sink into the asthenosphere.

C)

Rising magma from melted plates can't break through continental crust.

D)

The continental plate isn't hot enough to cause volcanoes.

E)

Volcanoes are not associated with convergent plate boundaries.

15)

If you wanted to draw the boundaries of tectonic plates on a world map, which of the following maps would give you the most complete information?

15)

_____

A)

mid-ocean ridges

B)

edge of continental shelves

C)

hotspots

D)

earthquake distribution

E)

active volcanoes

16)

Which tectonic plate setting is associated with the following features: light to moderate earthquakes; nonexplosive volcanic eruptions; new oceanic lithosphere produced? Mid-Atlantic Ridge is a geographic example.

16)

_____

A)

divergent plate boundary

B)

convergent plate boundary (subduction zone)

C)

convergent plate boundary (collision zone)

D)

transform plate boundary

E)

hotspot

17)

Which tectonic plate setting is associated with the following features: great earthquakes; explosive volcanic eruptions; oceanic plate sinks into mantle and remelts? Andes Mountains are a geographic example.

17)

_____
A)

divergent plate boundary
B)

convergent plate boundary (subduction zone)
C)

convergent plate boundary (collision zone)
D)

transform plate boundary
E)

hotspot

18)

Which tectonic plate boundary is associated with the following features: major earthquakes; no volcanoes; large and high mountain chain is formed? Himalayan Mountains are a geographic example.

18)

_____
A)

divergent plate boundary
B)

convergent plate boundary (subduction zone)
C)

convergent plate boundary (collision zone)
D)

transform plate boundary
E)

hotspot

19)

Which tectonic plate boundary is associated with the following features: strong to major earthquakes; no volcanoes; no mountain chain is formed? San Andreas fault is a geographic example.

19)

_____
A)

divergent plate boundary
B)

convergent plate boundary (subduction zone)
C)

convergent plate boundary (collision zone)
D)

transform plate boundary
E)

hotspot

20)

The characteristic type of tectonic plate motion associated with a transform plate boundary is

20)

_____
A)

plates move laterally past each other with horizontal motion.
B)

plates move directly away from each other.
C)

plates move directly towards each other and one plate slides beneath the other.
D)

plates move directly towards each other and one plate sinks deep into the mantle.

21)

Tectonic plates move about as fast as

21)

_____
A)

a tortoise walks.
B)

hotspot.
C)

a car moves on a city street.
D)

a swallow flies.
E)

fingernails grow.

22)

Which tectonic plate setting is associated with the following features: volcanic eruptions; magma rises from deep in the mantle; can produce a chain of extinct volcanoes with increasing distance from the active volcano? Yellowstone National Park and Hawaiian islands are geographic examples.

22)

_____
A)

convergent plate boundary (subduction zone)
B)

transform plate boundary
C)

convergent plate boundary (collision zone)
D)

divergent plate boundary
E)

hotspot

23)

The Hawaiian Islands are an example of

23)

_____
A)

transform plate boundary.
B)

diverging plates.
C)

hotspots.
D)

two ocean plates converging.
E)

two continental plates converging.

24)

Which statement about the hotspot at Hawaii is **FALSE**?

24)

_____
A)

A hotspot at Hawaii explains the presence of active volcanoes far from a tectonic plate boundary.
B)

Magnetic reversals are the primary cause for the hotspot at Hawaii.
C)

The age of volcanic rock in the Hawaiian Islands gets progressively older to the west.
D)

A hotspot is a localized zone of upwelling mantle rock located deep below the moving tectonic plate.

25)

What does paleomagnetism study?

25)

_____

A)

magnetism of the Earth's poles

B)

magnetism of new magma

C)

magnetism of the Earth's core

D)

magnetism of rock formed during the Ice Age

E)

magnetism of rocks when their magnetic properties formed

26)

What is the importance of magnetic reversals to the theory of plate tectonics?

26)

_____

A)

It is associated with mass extinction events.

B)

It provides evidence for seafloor spreading.

C)

It explains times of rapid change on the Earth's surface.

D)

It causes volcanic eruptions.

E)

It causes earthquakes.

27)

Geologists tested the model of sea floor spreading by dating rocks from the ocean floor. The model successfully predicted that ocean rocks

27)

_____

A)

get older moving from south to north along the top of a mid-ocean ridge.

B)

show no particular pattern of age with respect to the mid-ocean ridges.

C)

get older with increasing distance from a mid-ocean ridge.

D)

get younger with increasing distance from a mid-ocean ridge.

28)

The youngest seafloor rocks are found

28)

_____

A)

underneath the continents.

B)

where the ocean is the flattest.

C)

evenly distributed throughout the ocean.

D)

nearest to the mid-ocean ridges.

E)

nearest to the continental shelves.

29)

Reversals of the earth's magnetic polarity

29)

_____

A)

have occurred randomly in the past and represent times when the earth turned upside-down

B)

have occurred randomly in the past and represent times when the south magnetic pole was swapped in location with the north magnetic pole.

C)

have not happened since the end of the Paleozoic.

D)

occur with a regular periodicity; the next one will happen in about 140 years.

E)

are a consequence of major earthquakes.

30)

Marine magnetic anomalies are now known to have developed because

30)

_____

A)

there are linear strips of iron ore embedded in the seafloor as a consequence of sea-floor spreading.

B)

different strips of seafloor formed at different times on an earth whose magnetic polarity occasionally reverses through geologic time.

C)

movement of the continents relative to the magnetic field.

D)

magnetic reversals were finally shown to be a consequence of variations in the orientation of the earth's magnetic field lines relative to the equator.

E)

movement at convergent margins tends to distort the earth's magnetic field over broad distances.

31)

The geographic distribution of the Mesosaurus, a small swimming reptile that lived during the late Paleozoic, shows that the reptile lived on the southwest coast of what is now Africa and the southeast coast of what is now South America. This provides evidence that

31)

_____

A)

migration between Africa and South America was once possible.

B)

Africa and South America were once joined into one continent.

C)

the Atlantic Ocean was once much more shallow.

D)

a land bridge once existed between Africa and South America.

E)

the Earth was once much smaller in size.

32)

Where would you find ridge-push, a possible mechanism for driving the motion of tectonic plates?

32)

_____

A)

Between a continent and an ocean plate

B)

Hotspot

C)

Transform fault boundary

D)

Convergent boundary

E)

Divergent boundary

33)

All of the following are forces that may contribute to plate movements **EXCEPT**

33)

_____
A)

the gravitational pull of the Earth on the subducting slabs of oceanic lithosphere.
B)

the gravitational pull of the Earth on plates away from the mid-ocean ridges.
C)

convection currents within the asthenosphere.
D)

centrifugal forces from the rotation of the Earth.

34)

Which of the following hazards would you expect to see at a divergent plate boundary?

34)

_____
A)

large earthquakes; no volcanoes; landslides and flooding due to the large plateau of very high mountains
B)

moderate strength earthquakes; non-explosive volcanic eruptions; flooding if volcanoes erupt underwater such as in Iceland
C)

large earthquakes; no volcanoes; flooding if the plate boundary is hilly
D)

large earthquakes; explosive volcanic eruptions; landslides and flooding due to long chain of volcanic mountains

35)

Which of the following hazards would you expect to see at a convergent plate boundary associated with a subduction zone?

35)

_____
A)

large earthquakes; explosive volcanic eruptions; landslides and flooding due to long chain of volcanic mountains
B)

moderate strength earthquakes; non-explosive volcanic eruptions; flooding if volcanoes erupt underwater such as in Iceland
C)

large earthquakes; no volcanoes; landslides and flooding due to the large plateau of very high mountains
D)

large earthquakes; no volcanoes; flooding if the plate boundary is hilly

36)

Which of the following hazards would you expect to see at a convergent plate boundary associated with a continent-continent collision

zone?

36)

_____
A)

large earthquakes; no volcanoes; flooding if the plate boundary is hilly
B)

moderate strength earthquakes; non-explosive volcanic eruptions; flooding if volcanoes erupt underwater such as in Iceland
C)

large earthquakes; no volcanoes; landslides and flooding due to the large plateau of very high mountains
D)

large earthquakes; explosive volcanic eruptions; landslides and flooding due to long chain of volcanic mountains

37)

Which of the following hazards would you expect to see at a transform plate boundary?

37)

_____
A)

moderate strength earthquakes; non-explosive volcanic eruptions; flooding if volcanoes erupt underwater such as in Iceland
B)

large earthquakes; explosive volcanic eruptions; landslides and flooding due to long chain of volcanic mountains
C)

large earthquakes; no volcanoes; flooding if the plate boundary is hilly
D)

large earthquakes; no volcanoes; landslides and flooding due to the large plateau of very high mountains

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

38)

In California, Los Angeles is slowly moving toward San Francisco because the two cities are located on two different tectonic plates with a transform plate boundary in between.

38)

_____

39)

The asthenosphere layer of the Earth is completely liquid.

39)

_____

40)

The Earth is composed of layers that have different properties.

40)

_____

41)

The Earth's core is thought to be hollow.

41)

_____

42)

The mantle is a layer of molten iron metal that surrounds the solid inner core.

42)

_____

43)

Triple junctions are where three tectonic plates border each other.

43)

_____

44)

The boundaries of tectonic plates are defined by the location of ocean coastlines.

44)

_____

45)

Tectonic plates move completely continuously at speeds of several centimeters per year.

45)

_____

46)

Earthquakes occur at all tectonic plate boundaries **EXCEPT** transform plate boundaries.

46)

_____

47)

Volcanism at transform plate boundaries is derived from melting of crustal rock.

47)

_____

48)

During subduction, one plate sinks under another tectonic plate.

48)

_____

49)

Tectonic plates are actively separating at convergent plate boundaries and subduction zones.

49)

_____

50)

Earth's magnetic field is produced from large amounts of magnetic minerals buried within the lower part of the crust.

50)

_____

51)

The oldest ocean crust will tend to occur at the greatest distances from the mid-ocean ridge.

51)

_____

52)

Over geologic time New York City is moving farther away from London, England due to movement associated with the Mid-Atlantic Ridge.

52)

_____

53)

Pangaea refers to the enormous single ocean that was produced when all of the continents were assembled.

53)

_____

54)

Reconstructing all of the continents into a single supercontinent called Pangaea helps to explain better evidence of ancient glaciation on several continents, especially in terms of ice flow directions.

54)

_____

55)

Reconstructing all of the continents into a single supercontinent called Pangaea helps to explain better the occurrence of the same fossil plants and animals on different continents.

55)

_____

56)

Slab pull seems to be a more important driving force for moving tectonic plates than ridge push.

56)

_____

57)

Convergent plate boundaries generally represent a greater hazard to people than divergent or transform plate boundaries due to the threat of major earthquakes, explosive volcanic eruptions, tsunamis, and landslides (associated with the mountain chains).

57)

_____

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

58)

Give a description of the lithosphere, crust, asthenosphere, and mantle and explain the relationships between them.

59)

Explain the concept of convection. Describe how convection may work in the mantle of the earth.

60)

Explain how the seafloor is produced. Why does the Earth **NOT** get any bigger or smaller over geologic time?

61)

Explain why the location of volcanoes does **NOT** give a complete picture of the location of the plate boundaries.

62)

If you were studying photographs of another planet, what features would you look for to determine whether or not plate tectonic activity is occurring or has ever occurred?

63)

Explain the importance of Paleomagnetism in understanding plate tectonics.

64)

Describe how the Hawaiian Islands were formed and explain how they are evidence for tectonic plate motion.

65)

Describe the theory of continental drift and explain how it relates to plate tectonics.

66)

Describe the mechanisms of ridge-push and Slab-pull and explain which one is the more important process in driving plate tectonics.

67)

Explain where the magma for volcanoes at divergent plate boundaries comes from and how it rises to the surface. In this explanation, briefly describe how mantle convection is related to the motion of tectonic plates.

68)

The Cascade Region of northwestern U.S. is home to a subduction zone. Describe the hazards that can occur in this area. For each hazard, explain how the hazards are caused in the subduction zone.

69)

Magnetic reversals have happened throughout most of the Earth's history. Explain how these magnetic reversals have been used as evidence for Seafloor Spreading.

70)

Using concepts from plate tectonic theory, describe an area that should have many different types of geologic hazards and an area that should have few geologic hazards. NOTE: You do not have to give a specific geographic location, just give the general characteristics in terms of plate tectonic theory.

1)

C

2)

B

3)

D

4)

A

5)

D

6)

D

7)

A

8)

C

9)

A

10)

C

11)

B

12)

E

13)

D

14)

B

15)

D

16)

A

17)

B

18)

C

19)

D

20)

A

21)

E
22)

E
23)

C
24)

B
25)

E
26)

B
27)

C
28)

D
29)

B
30)

B
31)

B
32)

E
33)

D
34)

B
35)

A
36)

C
37)

C
38)

TRUE
39)

FALSE
40)

TRUE
41)

FALSE
42)

FALSE
43)

TRUE
44)

FALSE
45)

FALSE
46)

FALSE
47)

FALSE
48)

TRUE
49)

FALSE
50)

FALSE
51)

TRUE
52)

TRUE
53)

FALSE
54)

TRUE
55)

TRUE
56)

TRUE
57)

TRUE
58)

The crust is the outer rocky layer of Earth. The lithosphere (also called a tectonic plate) includes all of the crust and the upper part of the mantle; it is a relatively cool and brittle material. The asthenosphere is entirely within the mantle; it is a hot and weak layer that flows slowly. The mantle is mostly solid ultramafic igneous rock.
59)

Convection is a circular pattern of circulation that probably operates down to depths deep in the mantle; there is hot rising mantle rock at mid-ocean ridges and cool descending mantle rock at subduction zones.
60)

Seafloor is produced at mid-ocean ridges (divergent plate boundaries) and it is destroyed by melting at subduction zones (convergent

plate boundaries). Because the production of new oceanic crust at mid-ocean ridges is similar to the amount destroyed at subduction zones, the Earth does not get any bigger or smaller over geologic time.

61)

Volcanoes are only associated with some of the tectonic plate boundaries (divergent and convergent (subduction)) as well as hotspots, which are not at a tectonic plate boundary. Volcanoes are not associated with transform plate boundaries or continental collision zones.

62)

You might look for linear belts of mountain ranges, volcanoes, or trenches as well as linear fault zones. You might also look for evidence of continental (i.e., granitic) crust and oceanic (i.e., basaltic) crust, which should be at significantly different elevations due to their differences in density. Less dense continental crust should be at significantly higher elevations than denser oceanic crust.

63)

Paleomagnetic studies (studying the magnetism recorded in rock to understand the nature of Earth's magnetic field in the geologic past) were critical in developing the model of seafloor spreading, which was a precursor model to plate tectonic theory. Specifically paleomagnetic studies were essential in the discovery of magnetic reversals and marine magnetic anomalies, which are key elements of seafloor spreading.

64)

The Hawaiian Islands were formed by a hotspot deep in the mantle; as the Pacific plate moved over the Hawaiian Islands' hotspot, a chain of volcanoes was produced.

65)

Continental drift states that the continents have slowly moved over geologic time; the continents move because they are embedded in the lithosphere which moves as a result of plate tectonics.

66)

In ridge-push there is a gravitational push (like a gigantic landslide) away from the mid-ocean ridge crest toward the subduction zone. Slab-pull occurs when the plate moves far from the ridge and cools, becoming denser. The weight of the dense down-going slab pulls on the entire tectonic plate. Calculations indicate that slab-pull is a more important process in driving plate tectonics.

67)

Hot molten rock from deep in Earth's mantle rises buoyantly toward the base of the lithosphere. Divergence of the oceanic plates along mid-ocean ridges causes some magma to leak out onto the seafloor and some magma below the seafloor to cool, creating new oceanic lithosphere to the edge of the plates. Over geologic time this newly formed oceanic lithosphere is eventually carried away from its source of heat at the divergent plate boundary and will cool. This represents a moving tectonic plate. Once the ocean lithosphere has cooled enough so that its density is similar to that of the underlying asthenosphere, it will be able to sink back down into the mantle at a subduction zone, completing the convection cell.

68)

Convergent plate boundaries, where one plate dives beneath another, are areas particularly prone to natural hazards. Because of the tectonic plate convergence, pressure builds up and is released when earthquakes occur. As the downgoing plate melts, the magma feeds explosively erupting volcanoes. There is a chain of volcanic mountains, where there is increased precipitation and an abundance of high, steep slopes prone to landslides and flooding.

69)

Geologists have found that Earth's magnetic field has reversed itself many times in the geologic past, i.e., the north and south magnetic poles have swapped position. The timescale of magnetic reversals is used to explain marine magnetic anomalies (variations of high and low magnetic field strength symmetrical on either side of a mid-ocean ridge). Regions of high magnetic field strength (positive anomaly) are interpreted as basalt that formed at the mid-ocean ridge during a normal polarity event (magnetic poles in positions similar to today); regions of low magnetic field strength (negative anomaly) are interpreted as basalt that formed at the mid-ocean ridge during a reversed polarity event (magnetic poles in positions opposite to today).

70)

An area that is close to a tectonic plate boundary can have many different types of geologic hazards (e.g., earthquakes, volcanoes, mountains/landslides, and rivers/floods), whereas an area that is far from a tectonic plate boundary should have few geologic hazards.