Essentials of Oceanography 8th edition Garrison Test Bank

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TRUE/FALSE

1 : Alfred Wegener was a polar explorer who suggested that at one time, Earths landmasses were joined into a supercontinent called Pangaea.
A : true
B : false

Correct Answer : A

2 : One piece of evidence that suggests the existence of Pangaea is the apparent fit of continents across North and South Atlantic.
A : true
B : false

Correct Answer : A

3 : The oceanic crust is primarily made of basalt.
A : true
B : false

Correct Answer : A

4 : Density is a measure of relative heaviness and is defined as mass per unit volume.
A : true
B : false

Correct Answer : A

5 : The asthenosphere is cooler than the lithosphere.
A : true
B : false

Correct Answer : B

6 : Plate tectonics (continental drift) is driven by convection currents of slow-moving material within Earths inner core.
A : true
B : false

Correct Answer : B

7 : Subduction zones are areas where new seafloor is created.
A : true
B : false

Correct Answer : B

8 : Transform faults are never found at mid-ocean ridges.
A : true
B : false

Correct Answer : B

9 : There are three types of plate convergences: continentcontinent, oceancontinent, and oceanocean convergent plate boundaries.
A : true
B : false

Correct Answer : A

10 : The Hawaiian Islands were formed within the last 2 million years above a hot spot that is now inactive.
A : true
B : false

Correct Answer : B

11 : Alfred Wegener used the differences in mountain age, composition, and structure on both sides of the Atlantic to support his theory of continental drift.
A : true
B : false

Correct Answer : B

12 : The lithosphere included the oceanic crust, the continental crust, and the uppermost cool and rigid part of the mantle.
A : true
B : false

Correct Answer : B

13 : Major plates move on average about the rate at which fingernails grow.
A : true
B : false

Correct Answer : A

14 : Particles of iron-bearing magnetite occur naturally in basaltic magma. As this magma forms new seabed, the magnetic particles cool, locking their magnetic orientation to that of Earths prevailing magnetic field.
A : true
B : false

Correct Answer : A

15 : Mid-ocean ridges are almost free of sediment.
A : true
B : false

Correct Answer : A

MULTIPLE CHOICE

16 : As early as the 1700s, scientists and observers noticed a remarkable coincidence of shape of the Atlantic coasts of Africa and ____.
A : North America
B : Australia
C : Asia
D : South America

Correct Answer : D

17 : Earlier than 200 million years ago, the continents were joined into one supercontinent called ____.
A : Pangaea
B : Panthalassa
C : Oceanus
D : Tethys

Correct Answer : A

18 : Scientists believe the breakup of Pangaea occurred about ____.
A : 1 million years ago
B : 25 million years ago
C : 200 million years ago
D : 750 million years ago

Correct Answer : C

19 : A cross section of Earth reveals a layered structure that has different thicknesses and densities. How do geologists know this?
A : from drilling and digging down into the various layers
B : from observing the characteristics of lava and gas issuing from volcanic vents
C : from observing the transit times through Earth of seismic waves generated by earthquakes
D : from comparisons with drill cores taken by robot spacecraft on Mars and Venus

Correct Answer : C

20 : What is the primary reason for the inside of Earth being hot?
A : No heat is being generated, but Earths outer layers have prevented the escape of heat trapped during the planets initial formation.
B : The decay of radioactive elements is creating heat in Earths inner layers.
C : The nuclear process of fusing hydrogen into helium like that found in stars is at work in Earths interior.
D : Huge quantities of oil and natural gas occasionally burn deep within Earth.

Correct Answer : B

21 : Buoyancy is the ability of an object to float in a fluid by ____.
A : weighing less than the water surrounding it
B : displacing a volume of water equal in weight to its own weight
C : having a lot of air within its body
D : displacing a volume of water which weighs slightly less than its own weight

Correct Answer : B

22 : The ____ accounts for 83 percent of Earths volume.
A : mantle
B : inner core
C : crust
D : outer core

Correct Answer : A

23 : About how many kilometers (miles) is it from the center of Earth to the outer edge of the outer core?
A : 12,523 kilometers (7,827 miles)
B : 6,370 kilometers (3,980 miles)
C : 1,264 kilometers (790 miles)
D : 2,880 kilometers (1,800 miles)

Correct Answer : B

24 : The hot, partially melted, slowly flowing layer of Earth is called the ____.
A : inner core
B : asthenosphere
C : lithosphere
D : outer core

Correct Answer : B

25 : The rigid outer layer of Earth that comprises the continental crust, oceanic crust, and the uppermost mantle is called the ____.
A : hydrosphere
B : lithosphere
C : asthenosphere
D : outer core

Correct Answer : B

26 : What are the primary elements in Earths continental crust?
A : oxygen, uranium, and thorium
B : oxygen, silicon, and uranium
C : oxygen, silicon, and aluminum
D : iron, aluminum, and carbon

Correct Answer : C

27 : One cubic meter of which of these would weigh the most?
A : ocean water
B : granite rock
C : basaltic rock
D : mantle

Correct Answer : D

28 : Why was Alfred Wegeners idea of continental drift dismissed?
A : Someone else had already introduced his idea to the scientific community.
B : Many of his evidences did not support drifting continents.

C : Continents have not moved since Earth was created.
D : The evidence at the time seemed to suggest a solid mantle that did not allow drifting of continents to be possible.

Correct Answer : D

29 : The mid-ocean ridges are ____.
A : subduction zones
B : oceanocean convergent boundaries
C : divergent plate boundaries
D : oceancontinent convergent plate boundaries

Correct Answer : C

30 : Roughly how fast do most lithospheric plates move?
A : about 5 kilometers per year
B : about 5 kilometers per thousand years
C : about 5 centimeters per hour
D : about 5 centimeters per year

Correct Answer : D

31 : Californias San Andreas fault is which type of plate boundary?
A : divergent plate boundary
B : transform plate boundary
C : oceancontinent convergent plate boundary
D : continentcontinent convergent plate boundary

Correct Answer : B

32 : A mystery in our understanding of plate tectonics has been, until recently, the nature of the power source capable of moving the plates and the continents embedded within them. Recent evidence indicates the power source to be ____.
A : the readjustment of the surface to continual shrinking of the whole Earth
B : convection currents within Earths mantle moving the plates
C : the action of ocean currents dragging along the seafloor, causing the seafloor and the continents to move
D : the continual vibration from earthquakes and volcanoes slowly moves the continents equator-ward under the influence of centrifugal force

Correct Answer : B

33 : If two oceanic plates collide and one is older and cooler (and therefore, denser) than the other, what will happen?
A : A deep trench will form.
B : Continental mountains will form.
C : A mid-ocean ridge will form.
D : A hot spot will form.

Correct Answer : A

34 : Japan is located along the Pacific Ring of Fire and experiences many earthquakes. The majority of the earthquakes around Japan occur ____.

A : only on the east side of the island where the Pacific plate subducts
B : only on the west side of the island where the Eurasian plate subducts
C : near the Pacific spreading center
D : near the Mid-Atlantic ridge

Correct Answer : A

35 : The youngest seafloor rocks are found ____.
A : near the edges of continents
B : near the rift valleys of mid-ocean ridges
C : beneath the deep sea trenches
D : evenly distributed over the ocean basins

Correct Answer : B

36 : The Himalayan Mountains were formed as a result of ____.
A : oceancontinent convergence
B : continentcontinent convergence
C : oceanocean divergence
D : continentcontinent divergence

Correct Answer : B

37 : New crust is being generated ____.
A : in the deep ocean trenches
B : at convergent plate boundaries
C : at divergent plate boundaries
D : at the centers of tectonic plates

Correct Answer : C

38 : Geologists believe that a new ocean basin is forming ____.
A : at the East African Rift Valley
B : in the Mediterranean Sea
C : along the divergent boundary between India and Asia
D : along the boundary between the Nazca Plate and the South American Plate

Correct Answer : A

39 : A boundary in which crustal plates slide laterally past one another is called a ____.
A : transform fault
B : convergent zone
C : divergent zone
D : rift valley

Correct Answer : A

40 : Which statement is true with regard to subduction zones?
A : They are also referred to as hot spots.
B : They are sites where lithospheric plates are diverging or pulling apart.
C : They are marked by the presence of mid-ocean ridges.
D : They are zones where old seafloor descends into the crust and mantle.

Correct Answer : D

41 : The largest known mantle plume is located beneath ____.
A : Antarctica
B : Africa
C : Hawaii
D : Yellowstone National Park

Correct Answer : B

42 : Some plateaus, ocean ridges, ancient island arcs, and parts of continental crust are too buoyant to be subducted. These are, instead, squeezed and sheared onto the face of a continent, forming ____.
A : Wadati-Benioff zones
B : terranes
C : rift valleys
D : sea mounts

Correct Answer : B

43 : The magnetic striping of the seafloor is considered evidence of seafloor spreading and ____.
A : periodic interruptions in mantle convection
B : subduction occurring in rift valleys
C : changes in Earths axis of rotation
D : periodic reversals in the polarity of Earths magnetic field

Correct Answer : D

44 : The Hawaiian Islands formed as they pass over a hot spot in the middle of the ____.
A : Mid-Atlantic ridge
B : Nazca Plate
C : Mariana Trench
D : Pacific Plate

Correct Answer : D

45 : Which statement about hot spots is true?
A : Hot spots arise from relatively stationary plumes of magma in the mantle.
B : Hot spots are always located along plate boundaries.
C : Hot spots are never associated with volcanoes.
D : Hot spots can only exist beneath oceanic crust.

Correct Answer : A

46 : If there was once one supercontinent over 200 million years ago, then there was a single ocean called ____.
A : Pangaea
B : Panthalassa
C : Oceanus
D : Tethys

Correct Answer : B

47 : Besides the shoreline fit of continents, what other evidence did Alfred Wegener use to support his theory of continental drift?
A : The measured speed of the moving continents.
B : Similar seawater compositions on both sides of the Atlantic Ocean.
C : Ice core samples indicating similar CO2 measurements at both poles.
D : The alignment of mountain ranges, fossils, and coal between separated continents.

Correct Answer : D

48 : Why dont tall mountains in the continental crust sink and disappear into the partially melted asthenosphere?
A : The asthenosphere is rigid and doesnt allow the mountain to sink.
B : The continental crust is lighter than the asthenosphere so it cant sink.
C : Mountains do sink into the asthenosphere, but only until they have displaced a volume of asthenosphere equal to their mass.
D : The asthenosphere is constantly building up the mountain from below so it cant sink.

Correct Answer : C

49 : Which layer of Earth is a very hot, dense, and viscous liquid composed mostly of iron and nickel?
A : outer core
B : inner core
C : asthenosphere
D : lower mantle

Correct Answer : A

50 : If Earth were uniform (homogenous) throughout, seismic waves would ____.
A : not travel from the site of an earthquake and stop at its origination point
B : bend as it moves from the earthquake site toward the center of Earth and then back to the surface
C : be reflected from the earthquake site after traveling half the distance to the center
D : radiate from the site of an earthquake in straight lines

Correct Answer : D

51 : What factors determine the behavior of a rock?
A : temperature, pressure, and the rate of at which a deforming force is applied
B : location, depth, and pressure
C : temperature, chemical composition, and location
D : pressure, depth, and chemical composition

Correct Answer : A

52 : What would cause continental crust to become thinner in mountainous regions?
A : erosion, isostatic uplift, and further erosion
B : volcanic eruptions
C : subduction of continental crust beneath oceanic crust
D : extension and contraction of asthenosphere

Correct Answer : A

53 : The type of plate boundary can be determined by evaluating the depths of earthquakes. What seismic trend would occur at oceancontinent convergent boundaries?
A : The depth of earthquakes would increase as you move from oceanic crust toward continental crust.
B : The depth of earthquakes could decrease as you move from oceanic crust toward continental crust.
C : Earthquake depths would remain constant as you move from oceanic crust to continental crust.
D : Only shallow earthquakes would occur along oceancontinent convergent boundaries.

Correct Answer : A

54 : Which location is associated with a divergent plate boundary?
A : East Africa
B : California
C : Andes, South America
D : Aleutian Trench

Correct Answer : A

55 : Which plate does the westward-moving South American Plate encounter in South America?
A : Cocos plate
B : Juan De Fuca plate
C : Farallon plate
D : Nazca plate

Correct Answer : D

56 : What type of boundary is located in the Northwestern United States and forms the Cascade Ranges?
A : transform boundary
B : divergent boundary
C : oceancontinent convergent boundary
D : continentcontinent convergent boundary

Correct Answer : C

57 : Tiny particles of iron-bearing magnetic minerals, such as _____, act as a compass needle at mid-ocean ridges when magma erupts and cools recording Earths magnetic field.
A : quartz
B : muscovite
C : magnetite
D : hornblende

Correct Answer : C

58 : Which statement best describes ocean sediments near mid-ocean ridges?
A : The layers of sediment reach 150 to 200 feet in thickness near mid-ocean ridges.
B : Ocean sediments are greater than 200 million years in age at mid-ocean ridges.
C : Ocean sediments are nearly absent near mid-ocean ridges.
D : The layers alternate between fine-grained sediments and lava beds near mid-ocean ridges.

Correct Answer : C

59 : Loihi is an excellent example of a(n) _____.
A : subduction zone near the Hawaiian islands
B : new island forming under a hot spot beneath the Pacific plate
C : exotic terrane accreted onto the westernmost region of North America
D : extinct submerged volcano moving away from the East Pacific Rise

Correct Answer : B

60 : Ocean basins have opened and closed over great spans of time during Earths history. This process of opening and closing is called a _____.
A : Wilson cycle
B : divergentconvergent cycle
C : convection current
D : uplift-subduction cycle

Correct Answer : A

ESSAY

61 : What kind of observational evidence did Alfred Wegener use to propose his theory of continental drift and the idea that the continents were once connected as the single landmass, Pangaea?

Correct Answer : In a lecture in 1912, Alfred Wegener, a busy German meteorologist and polar explorer, proposed a startling and original theory, continental drift. Wegener suggested that all Earth’s land had once been joined into a single supercontinent surrounded by an ocean. He called the landmass Pangaea (pan, “all”; gaea, “Earth, land”) and the surrounding ocean Panthalassa (pan, “all”; thalassa, “ocean”). Wegener thought Pangaea had broken into pieces about 200 million years ago. Since then, he said, the pieces had moved to their present positions and were still moving.?Of course, Wegener’s evidence included the apparent shoreline fit of continents across the North and South Atlantic, but he also commented on the alignment of mountain ranges of similar age, composition, and structure on both sides of the Atlantic. He pointed to the discovery of coal and the fossilized remains of tropical plants in frigid Antarctica, and even the similarities of fossils found across separated continents.

62 : What is plate convergence and what types of features are produced from convergence?

Correct Answer : ?Plate convergence happens when lithospheric plates come together. There are three types of convergence, and they are defined by the composition and density of plates that are coming together: (1) the convergence of oceanic crust and continental crust, (2) the convergence of oceanic crust and oceanic crust, and (3) the convergence of continental crust and continental crust. Because of the density differences between oceanic and continental crust, different features are produced.?When oceanic crust collides with continental crust, the heavier oceanic crust subducts beneath the continent, forming a deep trench. Volcanic mountains also form at these boundaries because subducting ocean crust partially melts as it plunges downward toward the mantle. The release of volatile components (such as water and carbon dioxide) from the ocean crust reduces the melting temperature of the surrounding mantle, forming a magma rich in dissolved gases. The magma then rises through overlying layers to the surface, causing volcanic eruptions.?Where oceanic crust converges with oceanic

crust, the denser (older and cooler) plate will subduct beneath the lighter plate forming a trench. The same processes that cause volcanoes to form along ocean–continent convergent boundaries will occur at ocean–ocean convergent boundaries as well. However, the resulting volcanoes emerge from the sea floor instead of the continent. The volcanoes appear in a curve pattern on the overriding crust. These volcanoes are called “island arcs” when they emerge above sea level.?Lastly, when two plates of continental crust collide, neither plate will subduct because both plates are of approximately equal density. The colliding plates, instead, are compressed, folded, and uplifted to form large mountains, such as the Himalayan mountains.

63 : Using the Atlantic Ocean as an example, describe in detail how an ocean basin is formed.

Correct Answer : Ocean basins are formed at divergent plate boundaries where two lithospheric plates pull apart. The Atlantic Ocean basin began growing around 210 million years ago when heat from the mantle caused the asthenosphere to expand and rise. This caused the overlying lithosphere to lift and fracture, forming a rift. As the lithosphere continued to separate, magma rose to the surface and solidified, forming a new basaltic ocean floor. Over time, as the ocean basin continued to grow larger and deeper, water began to collect in the basin, eventually forming the Atlantic Ocean.

64 : How has the history of plate movement been captured in residual magnetic fields?

Correct Answer : A compass needle points to the magnetic north pole because of the persistent magnetic field caused by the movement of molten metal in the Earth’s outer core. As new seafloor is produced at spreading centers, the magnetic minerals (which are naturally occurring in basaltic magma) align with the Earth’s magnetic field. As the new rock cools and hardens, the orientation of the Earth’s magnetic field at that particular time is frozen and records information like a fossil does. Scientists use this information to measure spreading rates and are able to create detailed charts of the ocean floor dating back about 200 million years.

65 : Describe the mechanism that controls the formation of the Hawaiian Islands. Is this island chain still actively forming?

Correct Answer : The Hawai’ian Islands were formed as a result of a hot spot, the surface expression of a stationary mantle plume. As the Pacific Plate moves in a westerly- northwesterly direction over the hot spot, the high temperatures and rising magma from the plume weaken the crust and form a volcano on the ocean floor. The volcano eventually grows large enough to break the surface of the ocean, becoming a volcanic island. Because the Pacific Plate is moving, the volcanic island eventually is carried away from the source of origin, and a new island forms over the stationary hot spot. Over millions of years, a volcanic island chain is formed. The Emperor Seamounts north of Hawai’i are the oldest remnants of this island chain, and the island of Hawai’i is the youngest. A new island, Loihi, is currently being formed on the ocean floor and will become the next Hawai’ian island in about 30,000 years.

66 : How does the analysis of seismic waves reveal information about the nature of Earths interior?

Correct Answer : The nature of the layers, their properties, and the forces that influence them have been learned largely by the study of shock waves associated with distant earthquakes. Seismic waves, low-frequency pulses of energy generated by earthquakes, can spread rapidly into Earth in all directions and then return to the surface. Sensitive seismographs have allowed researchers to study the ways seismic waves refract and bounce off abrupt transitions between Earth’s inner layers.?If Earth were uniform (homogenous) throughout, seismic waves would radiate from the site of an earthquake in straight lines. If the density, or rigidity, of Earth

increased smoothly with depth, seismic wave velocity would increase evenly with depth, and the waves would gradually bend upward toward the surface. If Earth were layered inside, some seismic waves would be reflected at the boundaries between layers, whereas others would bend. Seismic evidence shows that Earth is layered.

67 : There are two ways in which Earths layers can be classified: chemical composition and physical properties. Briefly describe the different layers by their chemical composition and then by their physical properties.

Correct Answer : When classifying the layers by their chemical properties, they can be divided into crust, mantle, and core. The crust beneath the ocean differs in thickness, composition, and age from the crust of the continents. The relatively thin oceanic crust is primarily basalt, a heavy dark-colored rock composed mostly of oxygen, silicon, magnesium, and iron. By contrast, the most common material in the thicker continental crust is granite, a familiar speckled rock composed mainly of oxygen, silicon, and aluminum. The mantle, the layer beneath the crust, is thought to consist mainly of oxygen, iron, magnesium, and silicon. The outer and inner cores, which consist mainly of iron and nickel, lie beneath the mantle at Earth's center.?Different conditions of temperature and pressure occur at different depths, and these conditions influence the physical properties of the materials. The behavior of a rock is determined by three factors: temperature, pressure, and the rate at which a deforming force (stress) is applied. Geologists have, therefore, devised another classification of Earth's interior based on physical properties. The lithosphere is the cool, rigid outer layer composed of the continental and oceanic crusts and the uppermost cool and rigid portion of the mantle. The asthenosphere is the hot, partially melted, slowly flowing layer of the upper mantle below the lithosphere. The lower mantle extends down to the core. The mantle below the asthenosphere does not melt because of rapidly increasing pressure. As a result, it is denser and flows much more slowly. The core has two parts. The outer core is a very dense, viscous liquid. The inner core is a solid and is even denser.

68 : From the time accurate charts became available in the late 1700s, observers noticed the remarkable coincidence of the shape of the Atlantic coasts of Africa and South America. What additional evidence strengthened the idea of continental drift with regards to geographic fit?

Correct Answer : Marine scientists probed the submerged edges of the continents and found that the ocean bottom nearly always sloped gradually out to sea for some distance and then dropped steeply to the deep-ocean floor. They realized that these shelf-like continental edges were extensions of the continents themselves. Where they had measurements, researchers found that the fit between South America and Africa, impressive at the shoreline, was even better along the submerged edges of the continents.

69 : Our Earth is approximately 4.6 billion years old. The oldest continental crust was recently found in Australia and contained pieces of zircon that dates back to about 4.4 billion years. The oldest oceanic crust dates back to only 180 to 200 million years old. What would account for the large discrepancy in age between the oldest continental crust and the oldest oceanic crust?

Correct Answer : Young Earth formed by the accretion of cold particles within a cloud of dust and gas. The Earth was then heated by the impact of asteroids, comets, and other falling debris. This heat, combined with gravitational compression and heat from decaying radioactive elements accumulating deep within the newly assembled planet, caused Earth to partially melt. Gravity pulled most of the dense iron and nickel inward to form the planet's core, while the lighter elements—silicon, magnesium, aluminum, and oxygen-bonded compounds—rose to the surface and formed the crust. We can consider the formation of a permanent crust as the "birthday" of Earth some 4.6 billion years ago.?The ocean basins formed soon after crustal

formation. If the ocean basins are genuinely ancient, and if the processes that produce the sediments have been operating for most or all of that time, the age of sediments on the ocean floor should be great like that found on the oldest continental crust, but they are not. The young spreading ridges are almost free of sediment, and the oldest edges of the basins support layers of sediment 15 to 20 times thinner than the age of the ocean itself would suggest. The oldest sediments of the ocean basins are rarely more than 180 million years old. The reason is that sediments are subducted at a plate's leading edge.

70 : The continental crust of the Pacific Northwest and Alaska are much different from the rest of the United States. What process would account for these varied differences?

Correct Answer : Plateaus, isolated segments of seafloor, ocean ridges, ancient island arcs, and parts of continental crust are rafted along with a plate and scraped off when the plate is subducted. Theses sheared off faces of subducted plates are uplifted and called terranes. The thickness and low density of terranes prevent their subduction. The Pacific Northwest of North American and most of Alaska are composed of this quilt-like assemblage of material, some of which has evidently arrived from thousands of kilometers away.