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Geology 101 - Fall 2008 Exam #2

Short Answer and Sketching

1. Briefly summarize the meaning of *faunal succession* and how it was discovered.
2. From oldest to youngest, list the four main geologic Eras.
3. Describe three kinds of places (different plate tectonic settings) where volcanism can occur on the ocean floor. Explain why it occurs in each place.

4. What kinds of sediments are typically deposited near shore?

What kinds of sediments are typically deposited in moderate depth water?

What kinds of sediments are deposited some ways out from shore?

What kinds of sediments are deposited in the deepest parts of the oceans?

Explain why the different kinds of sediments are deposited in different parts of the ocean.

5. Define the following terms:

orogeny

tectonics

6. Use a sketch to explain why the oldest parts of continents are usually in the center, with younger parts "wrapped" around the outside.

10. Explain why rain is often associated with low-pressure but not with high-pressure?

Multiple Choice

1. What is the main geologic feature for which Siccar Point in Scotland is famous?
 - a. a boundary between steep gray layers below and gently dipping red layer above
 - b. an unconformity
 - c. an ancient erosion surface
 - d. all of the above
 - e. none of the above

2. Where is the oldest layer in this tilted sequence of sedimentary rocks?
 - a. at the top of the hill in the center of the photograph
 - b. any of the layers at the bottom along the river's shore
 - c. the layers on the lower left part of the photograph
 - d. the layers on the right of the photograph

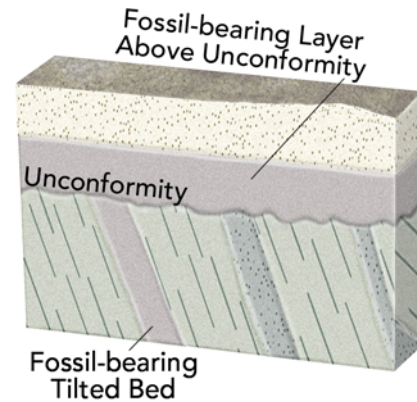


3. If a rock started with 1,000 atoms of a parent but now contains 250 atoms, how many half lives have passed?
 - a. .25 half lives
 - b. .5 half lives
 - c. 1 half life
 - d. 2 half lives
 - e. there is no way to tell

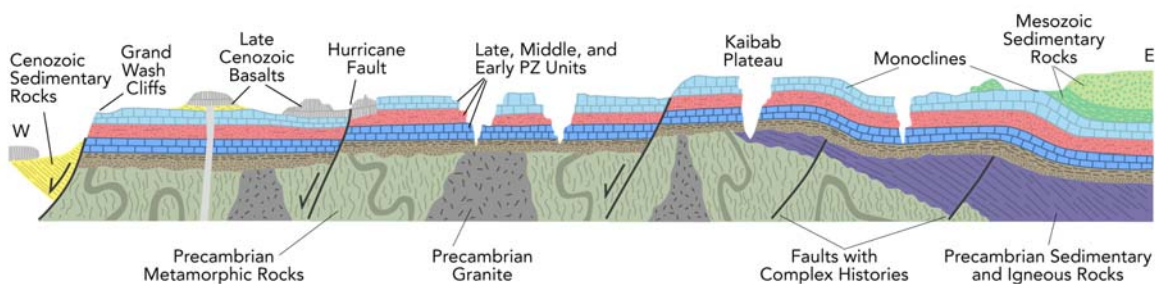
4. In this photograph, Paleozoic sandstone rests depositionally on Precambrian granite. What events must have occurred before deposition of the sandstone?
 - a. uplift of granite to the surface
 - b. solidification of granite at depth
 - c. formation of an erosion surface
 - d. all of the above
 - e. none of the above



5. What would fossil ages from the geologic timescale tell us about the age of this unconformity?
- the unconformity is younger than the fossil ages on the tilted bed
 - the unconformity is older than the fossil ages in layers above the unconformity
 - the amount of time represented by the unconformity can be approximately bracketed by the ages of the fossils above and below
 - all of the above
 - a and b only



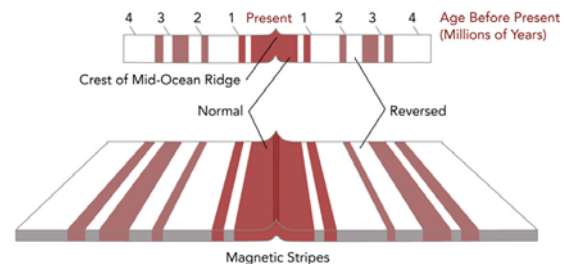
6. Which of the following is evidence that Earth's history is not short?
- millions of layers of light- and dark-colored sediment that record yearly cycles
 - rates of seafloor spreading compared to the width of the Atlantic Ocean
 - a 4-billion-year age on a rock in Canada
 - thousands of isotopic ages measured by different methods
 - all of the above
7. Which of the following is a reason why rock units may change from one section to another?
- facies change
 - restricted aerial distribution
 - removed along an unconformity or disconformity
 - eroded away
 - all of the above
8. From this cross section of the Grand Canyon (next page), what are the oldest rocks or structures?
- Late Cenozoic basalts
 - Mesozoic sedimentary rocks
 - Precambrian sedimentary and igneous rocks
 - Precambrian metamorphic rocks and granite
 - Hurricane fault and faults along the Grand Wash Cliffs



9. Which of the following CANNOT be observed on a seismic-reflection profile?
- orientation of rock layers
 - shape of the seafloor
 - folds
 - faults
 - all of the above can be observed

10. The Earth's magnetic field is generated by:
- salty water moving through the deep parts of the crust
 - convection currents in the asthenosphere
 - movement of iron and electrical currents within Earth's outer core
 - aligned magnetic minerals within Earth's inner core
11. What are some uses of magnetic reversals?
- matching the patterns of reversals in a rock sequence to the magnetic time scale
 - studying magnetic stripes on the seafloor
 - calculating rates of seafloor spreading
 - all of the above
 - a and b only

12. If the area shown in this figure is 240 kilometers wide, and the oldest crust is 4 million years old, what was the approximate rate of seafloor spreading across this ridge?
- 0.24 kilometers per million years
 - 2.4 kilometers per million years
 - 80 kilometers per million years
 - 240 kilometers per million years
 - 960 kilometers per million years



13. What is the ultimate source of food for animals living around deep-sea hydrothermal vents?
- sunlight and photosynthesis
 - the decay of creatures that float on the ocean surface and settle to the bottom
 - nuclear energy from the heated uranium-rich rocks
 - bacteria that break down hydrogen sulfide
14. Why does the elevation of the seafloor decrease from the mid-ocean ridge to the abyssal plain?
- the oceanic lithosphere cools and becomes denser
 - the weight of sediments depresses the oceanic crust
 - the oceanic plate is flexed downward near a subduction zone
 - slab rollback pulls the oceanic lithosphere deeper
15. In what setting does the thickest sediment accumulate in the oceans?
- mid-ocean ridges in any location in the ocean
 - abyssal plain in the middle of the ocean
 - oceanic trenches in the middle of the ocean
 - continental shelves and slopes along passive margins
16. The deepest parts of the seafloor are:
- mid-ocean ridges
 - abyssal plain
 - seamounts
 - oceanic trenches
 - continental shelves

17. Which of the following parts of the seafloor are the shallowest?
 - a. mid-ocean ridges
 - b. abyssal plain
 - c. oceanic trenches
 - d. continental shelves

18. Which parts of the seafloor have the youngest oceanic crust?
 - a. mid-ocean ridges
 - b. abyssal plain
 - c. oceanic trenches
 - d. continental shelves along passive margins

19. Why are the patterns showing the age of the seafloor symmetrical in the Atlantic Ocean but not the Pacific Ocean?
 - a. spreading along the Atlantic ridge added seafloor to plates on both sides
 - b. subduction has consumed large areas of old oceanic crust in the Pacific
 - c. spreading along the Pacific ridge added seafloor to plates on both sides
 - d. subduction has consumed large areas of old oceanic crust in the Atlantic
 - e. both a and b

20. How do most oceanic islands and seamounts form?
 - a. they are small pieces rifted apart from continents
 - b. they are places where the seafloor has been buckled upward by convergence
 - c. they are constructed by volcanic eruptions that first occur under water
 - d. they are large fan-shaped mounds deposited by turbidity currents

21. Which of the following is an island arc?
 - a. Hawaiian Islands
 - b. Iceland
 - c. the East African Rift
 - d. Aleutian Islands
 - e. none of the above

22. Which of the following is a consistent feature of reefs and atolls?
 - a. volcanic islands
 - b. passive continental margins
 - c. divergent plate boundaries
 - d. carbonate rocks and accumulations

23. Which of the following places would NOT be a good place to visit a reef?
 - a. shallow seas that are relatively free of suspended sediment
 - b. the area offshore of northeastern Australia
 - c. the Caribbean
 - d. islands in the southwestern Pacific Ocean
 - e. shallow, clear waters off Iceland

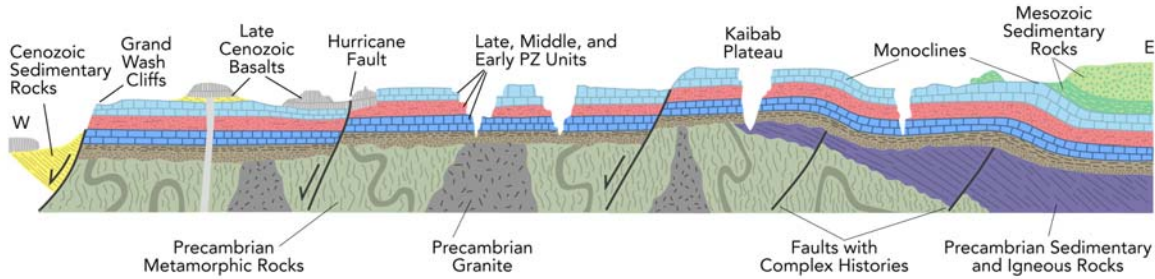
24. Which of the following are associated with turbidity currents?
 - a. a dense slurry of water and sediment that moves downhill
 - b. submarine canyons
 - c. submarine fans
 - d. graded beds
 - e. all of the above

25. How do most salt deposits form?
- dense slurries of sediment and water along continental slopes
 - rapid deposition offshore of deltas, like in the Gulf of Mexico
 - evaporation of water, such as in restricted seaways
 - conversion of limestone to dolostone
26. Where do the most significant orogenies occur?
- at mid ocean ridges
 - near continental margins
 - adjacent to continental rifts
 - in the centers of old continents
27. What could cause a region to be higher in elevation than an average part of a continent?
- thinner continental crust
 - less dense continental crust
 - cooler continental crust
 - crust that has been horizontally stretched
 - a and b only
28. In which of the following environments is the lithosphere likely to be thinnest?
- beneath a mid-ocean ridge
 - beneath a typical part of the abyssal plain
 - a tectonically active continental margin
 - the interior of a continent away from plate boundaries
29. From its very base to its top, the tallest mountain in the world is:
- Mt. Chimborazo
 - Mauna Kea
 - Mt. Everest
 - Mt. McKinley
30. Which of the following regions would you predict to have the thickest continental crust?
- the West Coast because it is close to the plate boundary
 - the Colorado Rockies and adjacent Great Plains
 - the area with thick sediments around the Mississippi River
 - the Appalachian Mountains, the dominant range in the eastern U.S.
 - the East Coast because it is a passive margin



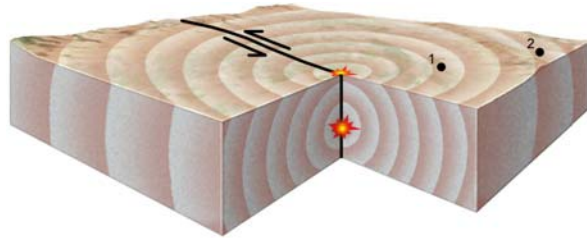
31. What kind of stress can lead to the formation of basins?
- compressional
 - extensional
 - transform
 - all of the above

32. What is the main cause of uplift during a continental collision?
- down flexing of one continent in front of thrust belts
 - addition of magmas from the subduction zone
 - an almost doubling of the thickness of continental crust
 - thinning of the lithosphere
33. Which of the following is a valid description of features within continental interiors?
- the central region of a continent is called a shield and is a broad, basaltic volcano with gentle slopes
 - the continental platform has nearly horizontal sedimentary rocks deposited on crystalline basement
 - the oldest exposed rocks in a continent are usually along the coastline
 - broad domes and basins in continental interiors have nearly vertical beds around their flanks
 - all of the above
34. How did the Ural Mountains within the middle of the Eurasian plate form?
- stresses from a distant plate boundary reactivated ancient faults
 - the continent is beginning to break apart along a line of hot spots
 - the area is a plate boundary
 - two continents collided, trapping the mountain within the new, larger continent
35. What part of North America contains the oldest exposed rocks?
- the Appalachian Mountains
 - western North America
 - Alaska and western Canada
 - the Canadian Shield
 - the east coast of Canada and nearby parts of the U.S.
36. Which is the youngest mountain range in the United States?
- Cascades
 - Appalachians
 - Rockies
 - Sierra Nevada
 - Canadian Shield
37. From this cross section of the Grand Canyon, what is the youngest rock or structure of the ones listed below?
- Late Cenozoic basalts
 - Mesozoic sedimentary rocks
 - Precambrian sedimentary and igneous rocks
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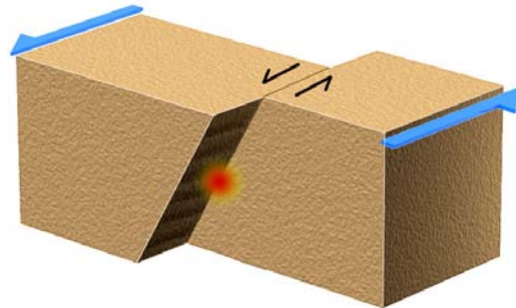
38. What do the two stars near the center of this block represent?

- the location of the earthquake
- the star at depth is the place where the earthquake is generated
- the star at depth is the hypocenter
- the star on the surface is the epicenter
- all of the above



39. An earthquake generated on this type of fault would most likely be associated with a:

- subduction zone
- divergent plate boundary
- rift
- caldera
- transform boundary



40. When do rocks along a fault have the highest amount of stress and stored elastic strain?

- right before an earthquake
- right after an earthquake
- several weeks or months after an earthquake
- none of the above because rocks cannot behave in an elastic manner

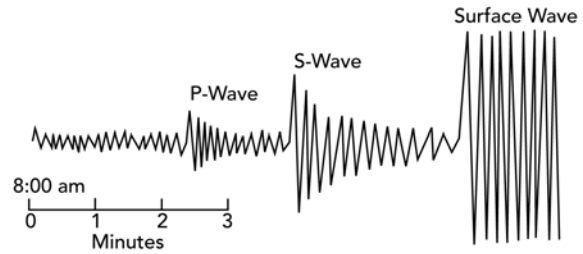
41. The characteristics of P-waves include:

- they compress and then expand the rock in the direction the wave travels
- they are generated near the surface and only compress the rock as they travel
- they travel slower than other seismic waves
- they displace the rock back and forth in a direction that is perpendicular to their travel direction
- they cannot be recorded on seismographs

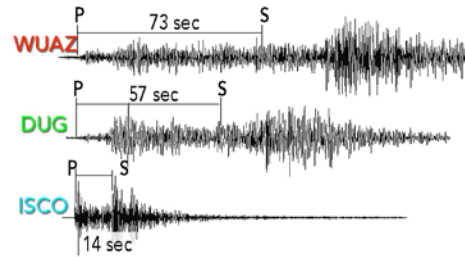
42. The characteristics of S-waves include:

- they can travel through liquids
- they shear rock from side to side or up and down
- they displace the rock in a direction that is perpendicular to their travel direction
- both a and b
- both b and c

43. The diagram on the right indicates that:
- S-waves are the first wave to arrive at station and then die out into P-waves
 - S-waves are the last wave to arrive at the station
 - P-waves arrive first, followed by S-waves
 - surface waves arrive first, followed by S-waves and then P-waves
 - surface waves cause the smallest vibrations



44. The diagram on the right shows the record of one earthquake on seismograms at three different stations in a seismic network. These three seismograms show:
- ISCO station is closest to the earthquake
 - WUAZ station was right at the earthquake
 - DUG station is farthest from the earthquake
 - WUAZ is the closest station, followed by DUG, and then ISCO
 - none of the above



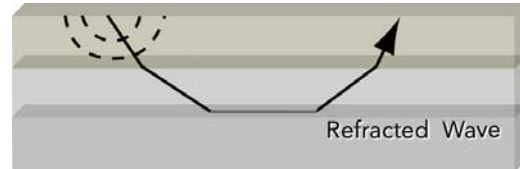
45. What feature suggests that this is a strike-slip fault rather than some other kind of fault?
- the presence of a fault scarp
 - the soft appearance of the landscape
 - the horizontal offset of the drainage channel
 - differences in vegetation across the fault
 - the lack of human development



46. The density profile across a buried streambed suggests that:
- materials in the streambed are less dense than underlying materials
 - the uppermost layer in the streambed has the lowest density
 - the channel has a steep side and a gentle side
 - all of the above



47. Refraction causes some seismic waves to return toward Earth's surface because:
- steeply descending rays get refracted to shallower angles as they encounter faster materials at depth
 - rising rays refract upward as they encounter slower and slower material
 - no steeply descending rays are ever reflected or refracted back to the surface
 - steeply descending shear waves pass through the liquid core and reflect back to the surface
 - both a and b

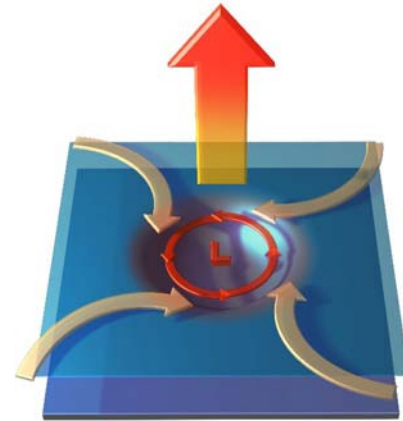


48. How deep do earthquake waves (of one sort or another) go when they travel through Earth:
- They only travel through the crust
 - They can travel through the crust and uppermost mantle
 - They can travel through the crust and mantle but not the core
 - They can travel through the crust, mantle and outer core
 - They can travel through all layers of the Earth
49. What portion of Earth's atmosphere is responsible for the weather we experience:
- troposphere
 - stratosphere
 - mesosphere
 - ionosphere
 - thermosphere
50. Which two gasses make up most of the atmosphere?
- hydrogen and helium
 - hydrogen and oxygen
 - hydrogen and nitrogen
 - nitrogen and oxygen
 - oxygen and carbon dioxide
51. Which is/are generally true about a low pressure zone?
- warm air moves up
 - cold air moves down
 - cold air moves up
 - warm air moves down
 - any of the above may be correct
52. Where in the atmosphere does the air temperature increase as you go up in elevation?
- troposphere
 - stratosphere
 - mesosphere
 - hydrosphere
 - lithosphere

53. Rain may occur:
- when air rises in a low pressure zone
 - along the leading edge of a cold front
 - along the leading edge of a warm front
 - on the ocean side of a continental margin mountain belt
 - any of the above

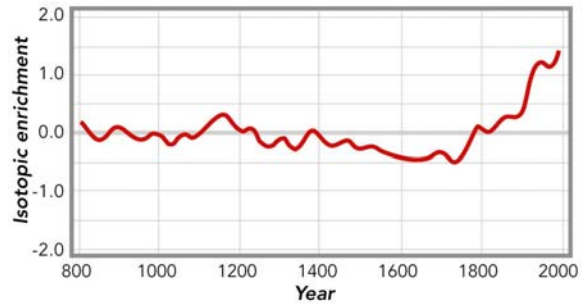
54. The Coriolis effect in this figure shows the deflection of cold air as it rushes in to replace hot rising air above a low pressure zone. The Coriolis effect:

- usually is evident in local small storms less than a few kilometers wide
- is responsible for tornados and whirlwinds
- requires a very large air masses since it requires deflection by the Earth's rotation
- is seen in smoke rising from a building fire
- all of the above



55. The ocean current known as the Gulf Stream in the Atlantic Ocean is a:
- warm current flowing north from the equator
 - cold current flowing north from the equator
 - warm equatorial current flowing east into the Gulf of Mexico
 - deep-ocean current that controls fish abundances in the southern hemisphere
 - none of the above
56. El Nino is a condition that brings increased precipitation to the eastern Pacific Ocean basin when:
- when weakening of an ocean current results in cooler sea temperatures in the eastern Pacific
 - when strengthening of an ocean current results in warmer sea temperatures in the eastern Pacific
 - when an ocean current reverses direction, resulting in cooler sea temperatures in the eastern Pacific
 - heating occurs in deserts of the American Southwest during summer months
 - none of the above
57. The subtropics at 30° north and south of the equator are characterized by arid lands. This is primarily a result of:
- rising hot air caused by solar heating in these zones
 - descending hot air that heats the ground
 - descending, dry air that is part of a cell that originates at the equator
 - rising cool, dry air that flows in a cell to the equator
 - polar air that flows towards the equator

58. This graph shows an interpretation of temperatures based on the change in isotopes in ice-core data. This graph implies that:
- current temperatures are by far the hottest based on this record
 - atmospheric warming started as early as the late 1700s
 - the coolest time period on this data set was from around 1500 to the last part of the 1700s
 - all of the above
 - a and b only



59. Which of the following is NOT true about the interaction of sunlight with Earth?
- most Earth-surface heating comes from sunlight
 - the amount of solar radiation hitting Earth varies due to orbital variations and changes in the Sun's energy output
 - some sunlight is reflected off the atmosphere without heating Earth
 - the Earth can absorb energy and radiate some back into space as infrared energy
 - all of the above are true about the interaction of sunlight with Earth
60. Which gas is the most significant/effective contributor to the greenhouse effect on Earth?
- water vapor
 - CO₂
 - nitrogen
 - hydrogen
 - oxygen