PART I
Total Value: 60%

Instructions: Shade the letter of the correct answer on the computer scorable answer sheet provided.

1. Which refers to an observed regularity in science?

   (A) hypothesis
   (B) law
   (C) paradigm
   (D) theory

2. According to modern theory, approximately how many years ago did the solar nebula form?

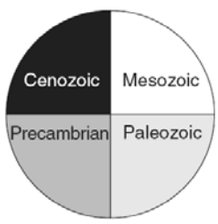
   (A) 5 billion
   (B) 20 billion
   (C) 250 million
   (D) 600 million

3. Which best illustrates the concept that sediment is deposited in flat layers?

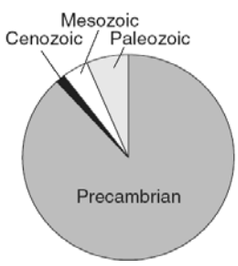
   (A) correlation
   (B) horizontality
   (C) superposition
   (D) uniformitarianism

4. Which graph best represents geological time?

   (A)



   (B)



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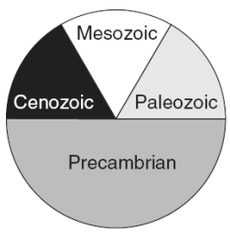

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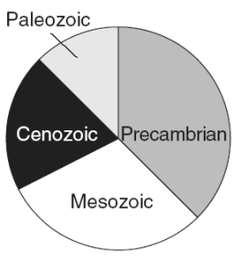


5. Which is best illustrated in the statement below?

"*A layer of granite is younger than a layer of limestone but older than a layer of sandstone.*"

(A) absolute dating
(B) correlation
(C) relative dating
(D) uniformitarianism

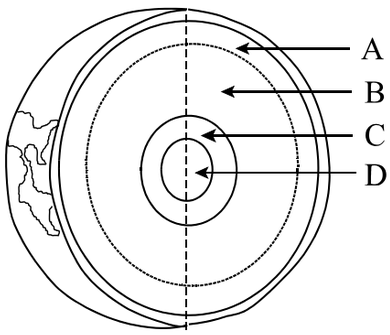
6. In what age did the first organisms with shells appear in the fossil record?

(A) Cenozoic
(B) Mesozoic
(C) Paleozoic
(D) Precambrian

7. Which best explains the difference in density between the inner core and the lithosphere?

(A) composition
(B) crystallization
(C) porosity
(D) thickness

Use the diagram below to answer the next two questions.



8. Which layer contains the asthenosphere?

(A) A
(B) B
(C) C
(D) D

9. Which factors contribute to the unique composition of D?

(A) geothermal energy and accretion
(B) geothermal energy and gravitational forces
(C) radioactive decay and accretion
(D) radioactive decay and gravitational forces

10. Which explains the origin of the hydrosphere?

(A) condensation
(B) precipitation
(C) thermal evaporation
(D) volcanic outgassing

11. Which is the largest water reservoir on Earth?

(A) ground water
(B) lakes
(C) oceans
(D) polar ice

12. Who studies lava eruptions and rates of cooling?

(A) hydrologist
(B) paleontologist
(C) seismologist
(D) volcanologist

13. Which is negatively charged?

(A) electron
(B) isotope
(C) neutron
(D) proton

14. What is the most abundant element in Earth's crust?

(A) iron
(B) nickel
(C) oxygen
(D) silicon

15. Which is a characteristic of a mineral?

(A) gas
(B) liquid
(C) organic
(D) solid

16. Which is a mineral?

(A) basalt
(B) gabbro
(C) quartz
(D) rhyolite

17. Which property is best used to distinguish between calcite and quartz?

(A) acid test
(B) colour
(C) lustre
(D) magnetism

18. Which best explains why diamond is much harder than graphite?

(A) atomic arrangement
(B) cleavage
(C) impurities
(D) specific gravity

19. Which best describes the direction of cleavage?

(A) It corresponds to strong bonding in the crystal structure.
(B) It corresponds to weak bonding in the crystal structure.
(C) It is determined by cooling rates.
(D) It is determined by crystal form.

20. Which property of quartz makes it resistant to weathering?

(A) cleavage
(B) colour
(C) hardness
(D) streak

21. Which rock has a glassy texture?

(A) andesite
(B) gabbro
(C) granite
(D) obsidian

22. Which rock cooled slowly beneath Earth's surface?

(A) andesite
(B) basalt
(C) granite
(D) rhyolite

23. If rhyolite has a lower specific gravity than gabbro, which statement is true?

(A) Andesite has a higher specific gravity than gabbro.
(B) Andesite has a lower specific gravity than gabbro.
(C) Basalt has a higher specific gravity than rhyolite.
(D) Basalt has a lower specific gravity than rhyolite.

24. Which is a chemical sedimentary rock?

(A) conglomerate
(B) limestone
(C) sandstone
(D) shale

25. Which part of a stream load contributes mostly to the formation of rounded sediments?

(A) bed
(B) dissolved
(C) surface
(D) suspended

26. Which best indicates the direction of glacier movement?

(A) drumlin
(B) erratic
(C) esker
(D) kettle

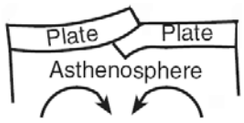
27. Which rock exhibits a non-foliated texture?

(A) gneiss
(B) quartzite
(C) schist
(D) slate

28. Which process most likely produced feature A in the picture below?

(A) earthquake vibrations
(B) plate tectonics
(C) volcanic eruption
(D) wind erosion

29. Which shows how mantle convection currents are moving beneath colliding lithospheric plates?

(A)


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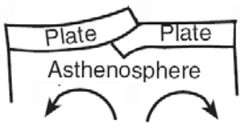

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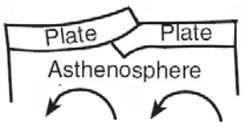

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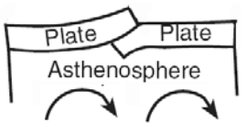


30. A series of older, extinct volcanoes extends north from a large active volcano in the center of a tectonic plate. Which most likely formed all these volcanoes?

(A) deep-ocean trench
(B) hot spot
(C) mid-ocean ridge
(D) plate boundary

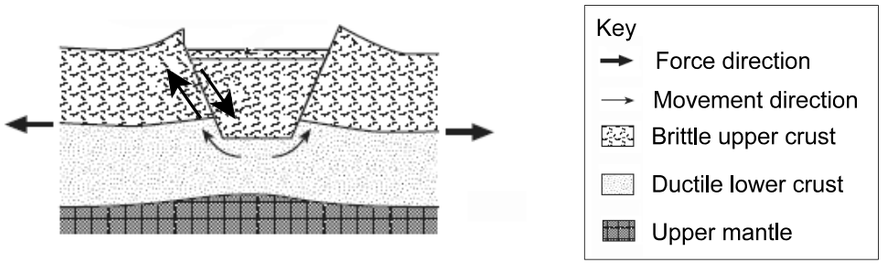
31. At which plate boundary are island arcs found?

(A) oceanic - continental
(B) oceanic - oceanic
(C) divergent
(D) transform

32. Who proposed the theory of continental drift?

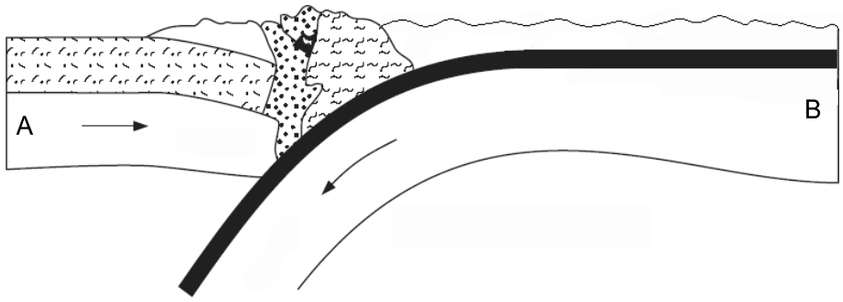
(A) Alfred Wegener
(B) Arthur Holmes
(C) James Hutton
(D) Tuzo Wilson

33. Which geologic feature is formed in the cross-section below?



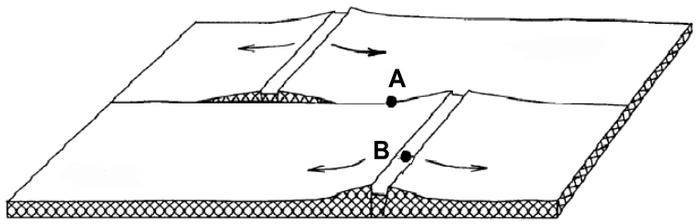
(A) mid-ocean ridge
(B) rift valley
(C) transform fault
(D) trench

34. Which best describes plates A and B below?



	A	B
(A)	continental	continental
(B)	continental	oceanic
(C)	oceanic	continental
(D)	oceanic	oceanic

35. Which type of plate boundary is present at points A and B in the diagram below?



	A	B
(A)	divergent	divergent
(B)	divergent	transform
(C)	transform	divergent
(D)	transform	transform

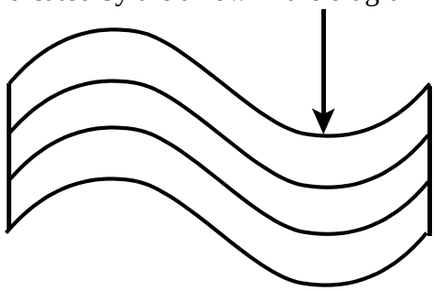
36. Which was formed by a continent - continent collision?

(A) Aleutian Islands
(B) Hawaiian Islands
(C) Himalayan Mountains
(D) Rocky Mountains

37. Which best indicates how two plates moved to form the structures below?

	Direction	Force
(A)	away from each other	compressional
(B)	away from each other	tensional
(C)	towards each other	compressional
(D)	towards each other	tensional

38. Which type of fold is indicated by the arrow in the diagram below?



(A) anticline
(B) overturned
(C) recumbent
(D) syncline

39. Which is evidence for plates sinking back into Earth's interior as rigid slabs?

(A) deep focus earthquakes
(B) hot-spot volcanoes
(C) rifting at mid-ocean ridges
(D) transform faults

40. Why do P- and S- waves have separate curves on a time-distance graph?

(A) They travel at different velocities through the same rock.
(B) They travel at similar velocities through different rocks.
(C) They travel different paths through the inner core.
(D) They travel similar paths through the outer core.

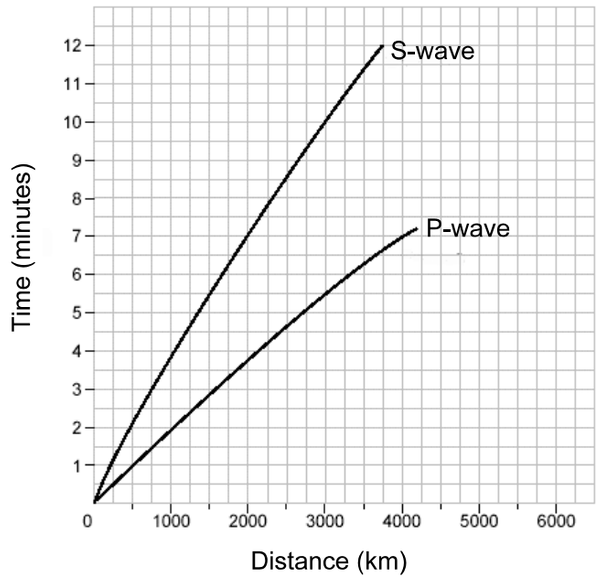
41. Which is a low angle (< 45°) fault that occurs in a compressional environment?

(A) normal
(B) reverse
(C) thrust
(D) transform

42. An earthquake with a magnitude of 7.2 did not cause any buildings to collapse. How would this earthquake be rated on the Richter and Mercalli scales?

	Richter	Mercalli
(A)	high	high
(B)	high	low
(C)	low	high
(D)	low	low

43. If the difference in arrival times between P- and S-waves on the graph below is 2.5 minutes, what is the distance from the epicentre of the earthquake to the seismograph station?



(A) 600 km
(B) 100 km
(C) 1500 km
(D) 2500 km

44. What most often triggers a tsunami?

(A) avalanche
(B) earthquake
(C) hurricane
(D) land slide

45. Which is directly associated with hydrothermal activity?

(A) crude oil
(B) native copper
(C) placer gold
(D) rock gypsum

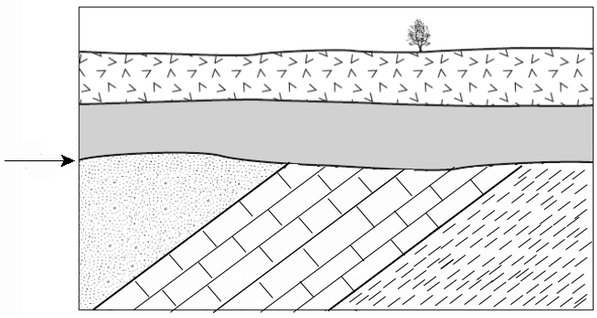
46. What property of gold enables it to form placer deposits?

(A) high density
(B) high hardness value
(C) low density
(D) low hardness value

47. Which type of volcano and plate boundary is present in the diagram below?

	Volcano	Plate Boundary
(A)	composite	convergent
(B)	composite	divergent
(C)	shield	convergent
(D)	shield	divergent

48. Which geologic structure is indicated by the arrow below?



(A) angular unconformity
(B) conformity
(C) disconformity
(D) nonconformity

49. Which mineral is correctly matched with its economic use?

	Mineral	Economic Use
(A)	barite	drilling mud
(B)	galena	cement
(C)	pyrite	copper wire
(D)	sphalerite	lead pipe

50. Which best describes coal?

(A) chemical precipitate
(B) glassy texture, volcanic
(C) low density, mafic
(D) organic plant remains

51. Which would form the best cap rock for an oil reservoir?

(A) dolomite
(B) limestone
(C) sandstone
(D) shale

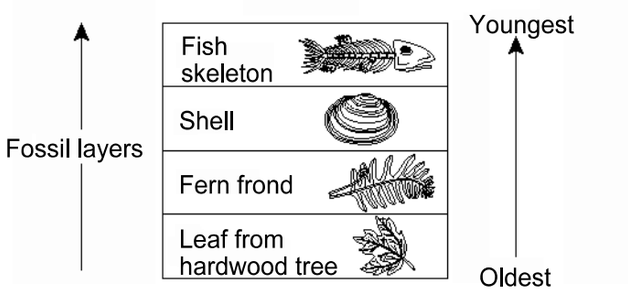
52. Which method of fossilization preserves intricate details of internal structures?

(A) carbonization
(B) mold
(C) replacement
(D) tracks

53. In which environment would a trilobite have originated?

(A) beach
(B) deep ocean
(C) forest
(D) shallow ocean

54. The diagram below represents fossils uncovered in a sedimentary rock succession. Which best describes the environmental change associated with this area?



(A) bog that was replaced by the seawater
(B) forest that was replaced by a freshwater lake
(C) freshwater lake that was replaced by a forest
(D) seawater that was replaced by a bog

55. During which age did land plants originate?

(A) Cenozoic
(B) Mesozoic
(C) Paleozoic
(D) Precambrian

56. Which best compares oxygen concentration in Earth's atmosphere over time?

	Precambrian	**Cenozoic**
(A)	high	high
(B)	high	low
(C)	low	high
(D)	low	low

57. Which is the best area on the island of Newfoundland to collect rocks formed by island arcs?

(A) central
(B) eastern
(C) northern
(D) western

58. Which occurred before Pangaea?

(A) Eurasia
(B) Gondwanaland
(C) Laurasia
(D) Rodinia

59. What is the most widely accepted theory for the extinction of dinosaurs?

(A) disease
(B) meteorite impact
(C) ozone depletion
(D) predation

60. Which became extinct during the late Paleozoic?

(A) bacteria
(B) dinosaurs
(C) mammals
(D) trilobites

PART II
Total Value: 40%

Instructions: Complete all items in this section. Your responses must be clearly presented in a well-organized manner.

Value

2% 61.(a) An organism contained 28 kg of carbon-14. If the half life of carbon-14 is 5730 years, what mass of carbon-14 remains in a fossil of this organism that is approximately 22 920 years old? Show all workings.

2% (b) A geologist discovered volcanic ash covered by 12 layers of sediment from the bottom of a glacial lake. The geologist concluded that these layers were varves. Use a diagram to explain how long ago the volcanic eruption occurred?

2% 62.(a) If volcanic activity had never taken place on Earth, explain what affect this would have had in relation to the origin of the atmosphere and hydrosphere.

Value

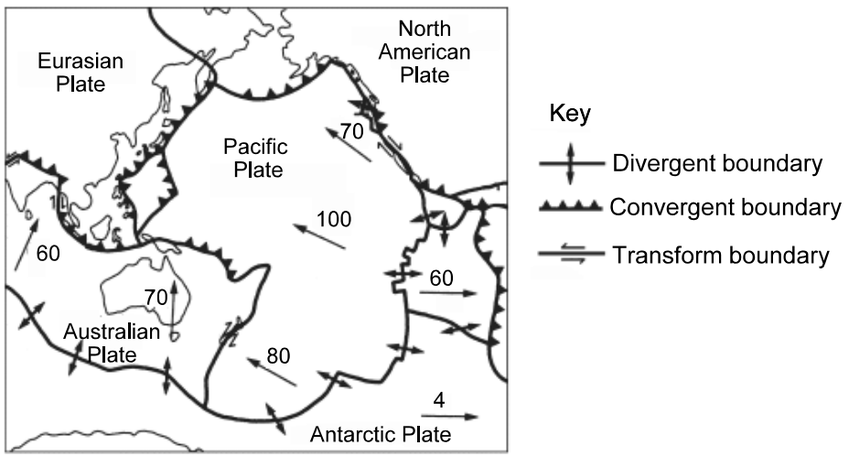
2% 62.(b) When a hole was drilled into a thick layer of sandstone a large amount of water was found to flow. Explain what can be concluded about the porosity and permeability of the sandstone.

3% 63.(a) With the aid of a diagram, describe how our knowledge of the asthenosphere and convection currents allow us to explain plate motion.

Value

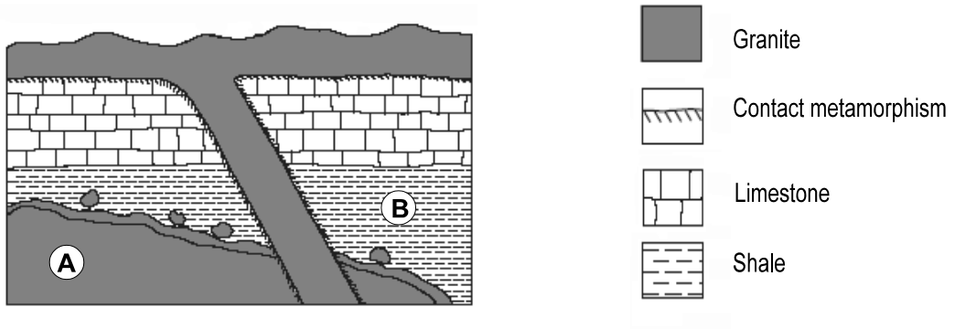
3% 63.(b) Describe the conditions that give rise to the formation of andesite at oceanic-continental plate boundaries.

2% (c) Describe two resulting characteristics of the Australian Plate - Antarctic Plate boundary if the direction of movement was reversed.



Value

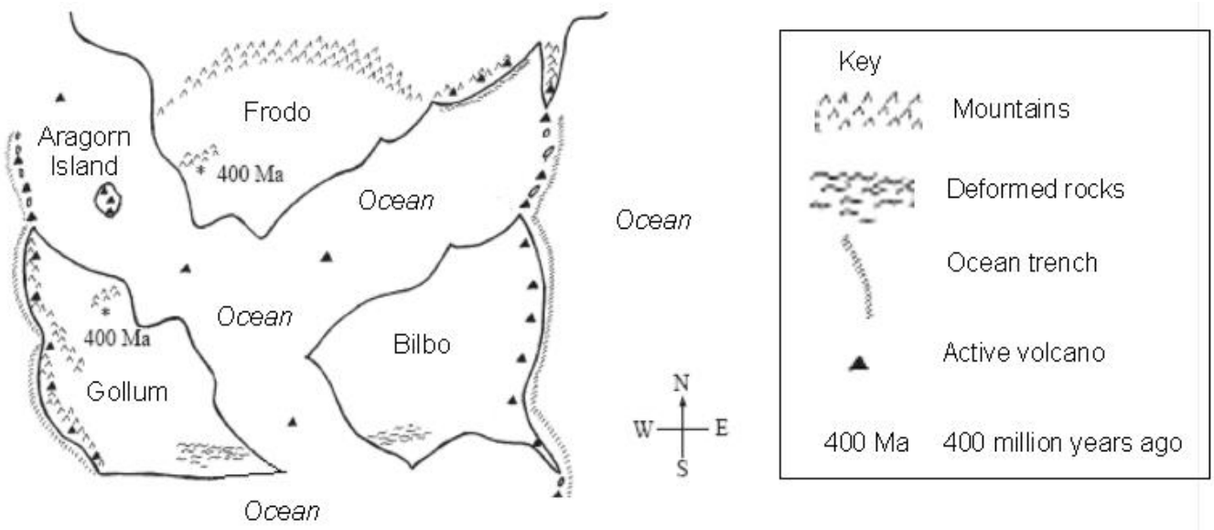
2% 63.(d) Describe two features from the cross-section below which show that the contact between rock unit A and B is an erosion surface.



2% (e) Give two reasons why swamps provide a suitable environment for coal formation.

Value

4% 63.(f) The map below shows the surface of a fictional planet which is very similar to Earth.



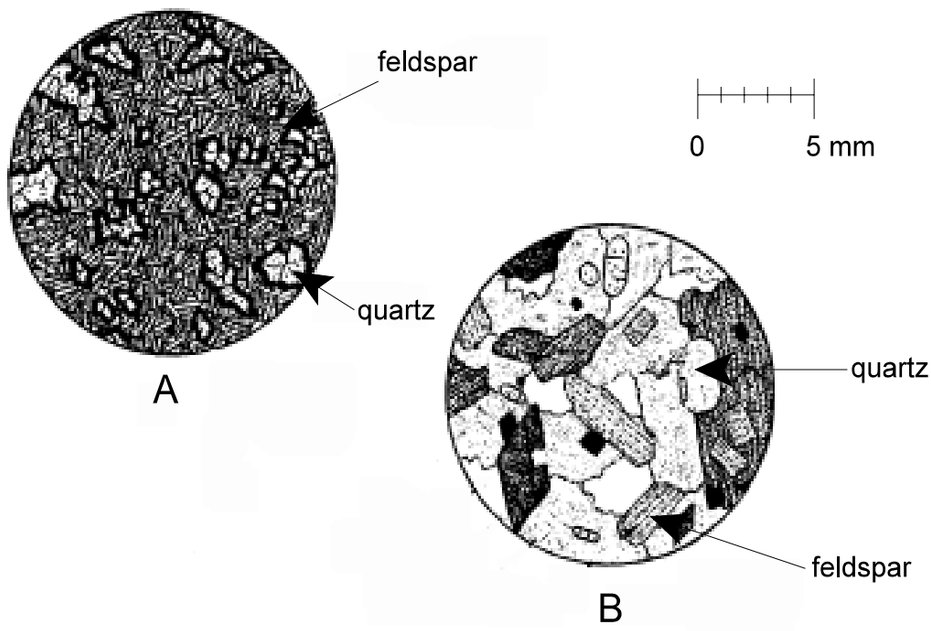
The planet has three large continents: Frodo, Gollum, and Bilbo, that are separated by oceans. There are very high mountain ranges, seismic activity, and active volcanoes.

(i) What two pieces of evidence support the theory that Gollum and Frodo were once joined?

(ii) Assuming that the planet has a similar rock chemistry to Earth, describe the composition of the lava and the eruptive style of the volcanoes on Aragorn Island.

Value

5% 63.(g) The diagram below represents crystals of two igneous rocks.



(i) Name one texture represented in A. _____

(ii) Why is the texture in A different from that of B?

_____

_____

_____

_____

_____

_____

_____

_____

(iii) In what tectonic setting did A and B form?

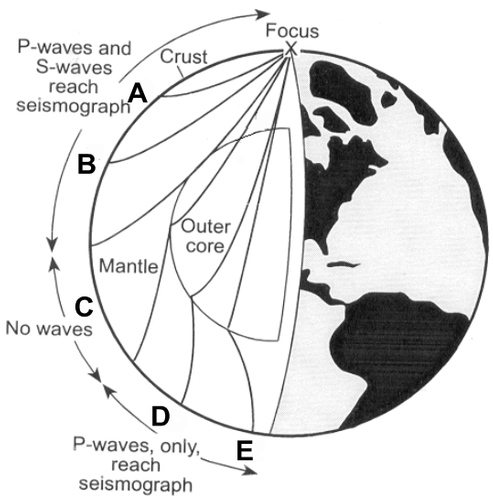
A: _____

B: _____

Value

2% 63.(h) Why is anthracite often found in association with slate rather than shale or sandstone?

3% (i) In the diagram below, both P-waves and S-waves were received at seismic stations A and B, only P-waves were received at seismic stations D and E, and no waves were received at seismic station C. Explain why this occurred.



Value

2% 64.(a) What is one similarity and one difference between rocks produced at convergent and transform plate boundaries?

2% (b) Explain two ways volcanism affects natural systems on Earth.

2% (c) Explain two ways human activity has affected natural systems on Earth.