Part I
Total Value: 50%

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

1. Which branch of Earth Science focuses on the study of fossils?

   (A) astronomy
   (B) meteorology
   (C) paleontology
   (D) seismology

2. Which instrument has provided the greatest amount of information concerning the internal structure of Earth?

   (A) drill rig
   (B) radar
   (C) satellite
   (D) seismograph

3. Based on the habits of modern day corals, a geologist assumes a fossil coral once lived in a warm, shallow marine environment. What principle of geology is illustrated when this assumption is made?

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

4. Which geological time span is referred to as the "Age of Reptiles"?

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

5. Which type of evidence would indicate relative time?

   (A) radiometric dating
   (B) superposition
   (C) tree rings
   (D) varve deposits

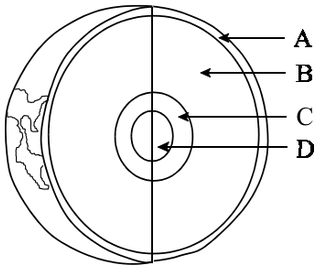
6. Which general trend regarding the density of Earth's interior would be evident as one moves toward Earth's centre?

   (A) alternating increase and decrease
   (B) decrease
   (C) increase
   (D) no change

7. Which statement best describes how Earth's earliest oceans formed?

   (A) Earth was first a sphere of water and solid Earth formed at a later time.
   (B) Large chunks of interstellar ice hit Earth and melted.
   (C) Plant life released water vapor billions of years ago.
   (D) Steam from volcanic gases condensed and accumulated over time.

8. In the diagram below, which layer of Earth is composed of molten nickel and iron?



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

9. According to the Solar Nebular Hypothesis, what is the correct sequence of events leading to the formation of our solar system?

(A) collection of gas and dust → formation of flattened rotating disk → formation of the sun → formation of planets

(B) collection of gas and dust → formation of planets → formation of flattened rotating disk → formation of the sun

(C) formation of the sun → collection of gas and dust → formation of planets → formation of flattened rotating disk

(D) formation of the sun → formation of flattened rotating disk → collection of gas and dust → formation of planets

10. What is the upper limit of ground water?

(A) capillary zone
(B) infiltration point
(C) porous zone
(D) water table

11. What is the correct arrangement of the layers of Earth's atmosphere in order of increasing altitude from the surface?

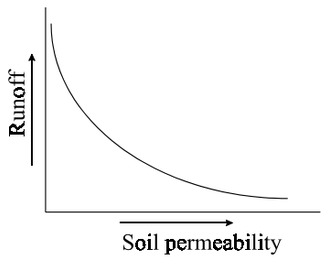
(A) thermosphere → stratosphere → mesosphere → troposphere
(B) thermosphere → troposphere → stratosphere → mesosphere
(C) troposphere → mesosphere → stratosphere → thermosphere
(D) troposphere → stratosphere → mesosphere → thermosphere

12. Which atmospheric layer contains the greatest concentration of ozone?

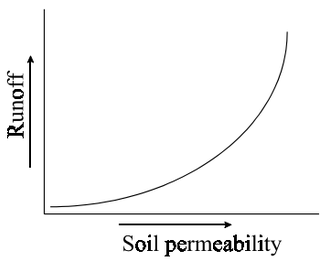
(A) mesosphere
(B) stratosphere
(C) thermosphere
(D) troposphere

13. Which graph shows how soil permeability affects the amount of runoff in an area?

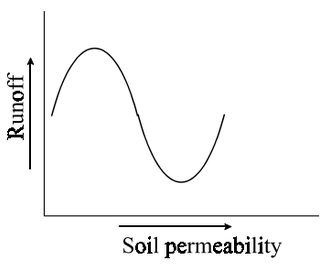
(A)



(B)



(C)



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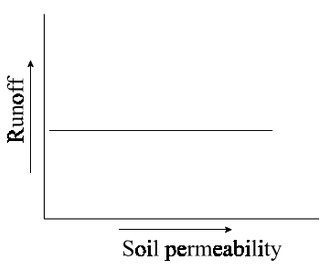


14. Which atmospheric gases have the greatest effect on global warming?

(A) argon and nitrogen
(B) carbon dioxide and water vapour
(C) nitrogen and carbon dioxide
(D) water vapour and oxides of sulfur

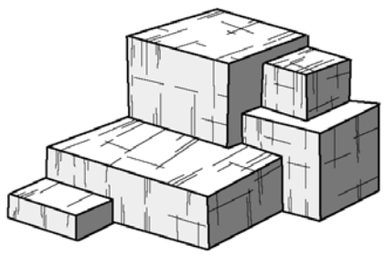
15. Which two elements are the most abundant in Earth's continental crust?

(A) magnesium and iron
(B) magnesium and silicon
(C) oxygen and iron
(D) oxygen and silicon

16. To which rock-forming mineral group does a mineral with the chemical formula PbS belong?

(A) carbonate
(B) halide
(C) sulfate
(D) sulfide

17. How many cleavage planes are shown in the sample of a broken piece of halite given below?



(A) 3
(B) 6
(C) 15
(D) 21

18. Which mineral property is tested using an unglazed porcelain tile?

(A) cleavage
(B) lustre
(C) specific gravity
(D) streak

19. What is the most common chemical structure found in the silicate mineral group?

(A) silicon - aluminum octahedron
(B) silicon - aluminum tetrahedron
(C) silicon - oxygen octahedron
(D) silicon - oxygen tetrahedron

20. Where would you most likely find the largest crystals in a lava flow?

(A) at the bottom
(B) at the top
(C) near the bottom
(D) near the centre

21. Which rock sample best shows the physical properties normally associated with a foliated texture formed during metamorphism?

(A) 

(B) 

(C) 

(D) 

22. Which process results in the formation of clastic (detrital) sedimentary rocks?

(A) physically deposited particles of sediment
(B) precipitation of sediments from sea water
(C) rapid cooling of molten sediments
(D) re-crystallization of carbonate sediments

23. Where is most deposition of sediments likely to occur?

(A) at a site where glacial ice scrapes bedrock
(B) at the mouth of a river where it enters the ocean
(C) on the side of a sand dune facing the wind
(D) on the top of a steep slope in a streambed

24. Which process is likely to cause regional metamorphism?

(A) faulting of rock layers during mountain building
(B) injection of hot fluids through fractures in rock layers
(C) intrusion of a large body of magma during mountain building
(D) lava flowing on the surface of rock layers

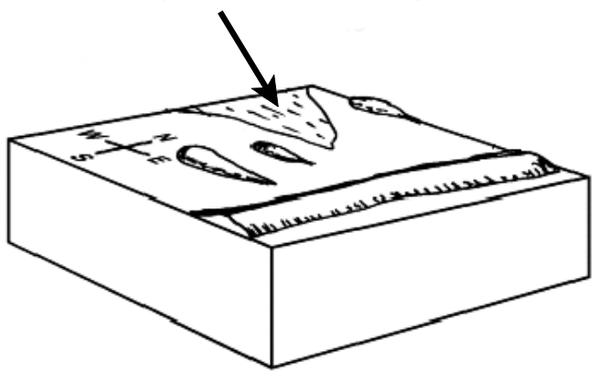
25. Which sequence of change in rock type occurs as shale is subjected to increasing heat and pressure?

(A) shale → schist → slate → phyllite → gneiss
(B) shale → schist → phyllite → slate → gneiss
(C) shale → slate → phyllite → schist → gneiss
(D) shale → slate → schist → phyllite → gneiss

26. If particles shown in the table below are of equal volume and are dropped into a column of water, which would usually settle most rapidly?

	Shape	Density (g/mL)
(A)	flat	2.5
(B)	flat	3
(C)	round	2.5
(D)	round	3

27. Which glacial feature is indicated by the arrow in the diagram below?



(A) drumlins
(B) esker
(C) moraines
(D) striations

28. Which feature and description are correctly paired?

	feature	description of inferred environment
(A)	cross-beds	small layers created by the deposition of debris at the base of a glacier
(B)	mud cracks	rounded mounds created by saturation of sediments
(C)	ripple marks	small ridges produced by wave and current action
(D)	stratification	movement of a rock unit along a crack in the rock

29. Which texture is most often seen in plutonic igneous rocks?

(A) coarse-grained
(B) fine-grained
(C) foliated
(D) glassy

30. What happens at a transform plate boundary?

(A) Major mountain belts are produced by continental collision.
(B) New oceanic crust is produced.
(C) Plates are subducted into the mantle.
(D) Plates move past each other along a fault.

31. At which kind of boundary would you expect to find the highest percentage of basaltic rock?

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

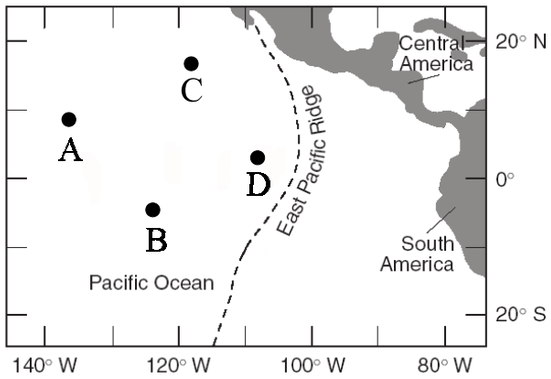
32. What type of fault is illustrated in the diagram below?

(A) normal
(B) reverse
(C) strike-slip
(D) thrust

33. How many times more energy is released by an earthquake measuring 7 on the Richter scale than is released by an earthquake measuring 4 on the Richter scale?

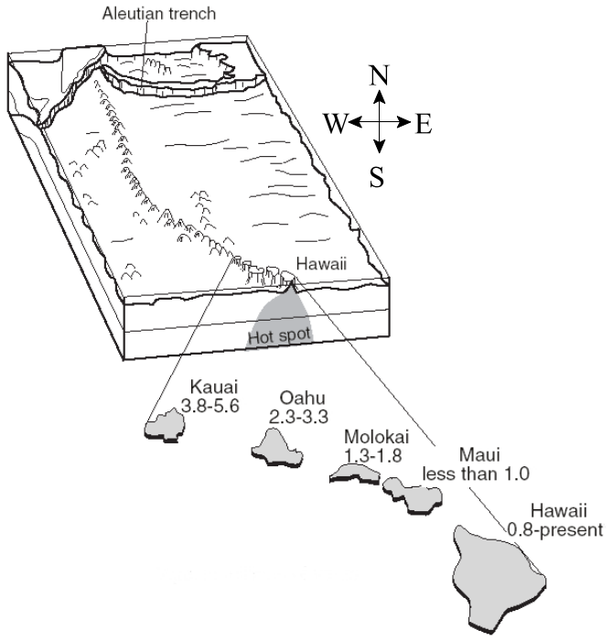
(A) 3
(B) 90
(C) 1000
(D) 27 000

34. In the diagram below, at which drilling site would the oldest igneous rock most likely be found?



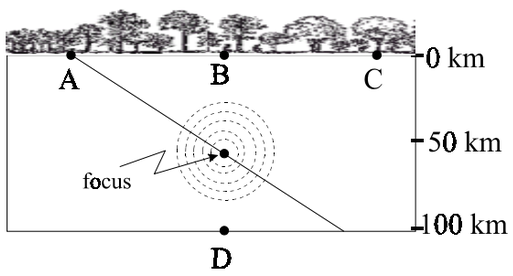
(A) A
(B) B
(C) C
(D) D

35. The diagram below shows the bedrock age (in millions of years) as well as the present location of part of the Hawaiian Island chain. Evidence from the diagram would suggest the Pacific Plate is moving toward which direction?



(A) east
(B) northwest
(C) south
(D) southeast

36. In the diagram below, where is the epicentre of the earthquake located?



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

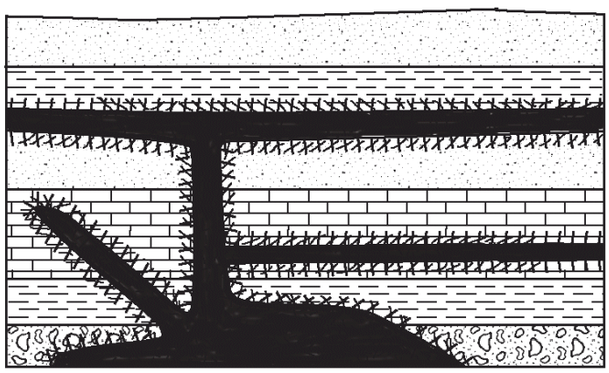
37. How many seismograph stations are needed to locate the epicenter of an earthquake?

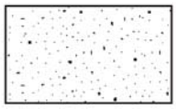
(A) 2
(B) 3
(C) 4
(D) 5

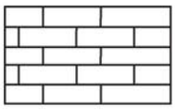
38. Which feature of sedimentary rock allows the correlation of rock layers over long distances?

(A) color of rock
(B) foliation bands
(C) fossil content
(D) thickness of layers

39. In the diagram below, which rock type is the oldest?



(A) 

(B) 

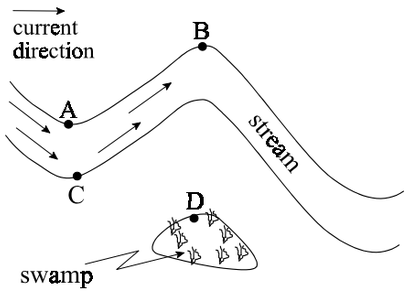
(C) 

(D) 

40. What are the stages in the formation of coal, from the first material deposited to the type of coal formed under the greatest temperature/pressure conditions?

(A) peat → bituminous → anthracite → lignite
(B) peat → bituminous → lignite→ anthracite
(C) peat → lignite → anthracite → bituminous
(D) peat → lignite → bituminous → anthracite

41. At which point would placer deposits most likely form?



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

42. Which best describes an ore mineral?

(A) composed entirely of iron
(B) contains many different varieties of useful elements
(C) contains useful elements that can be profitably mined
(D) large deposit

43. In which rock type would oil and gas be found?

(A) igneous
(B) metamorphic
(C) sedimentary
(D) volcanic

44. Which life form occurred first in the geological record?

(A) amphibians
(B) invertebrates
(C) land plants
(D) mammals

45. Which factor is the most important for aiding in the formation of a fossil?

(A) burial in coarse sediment
(B) high rates of mechanical weathering
(C) presence of hard body parts
(D) slow burial in deep water environment

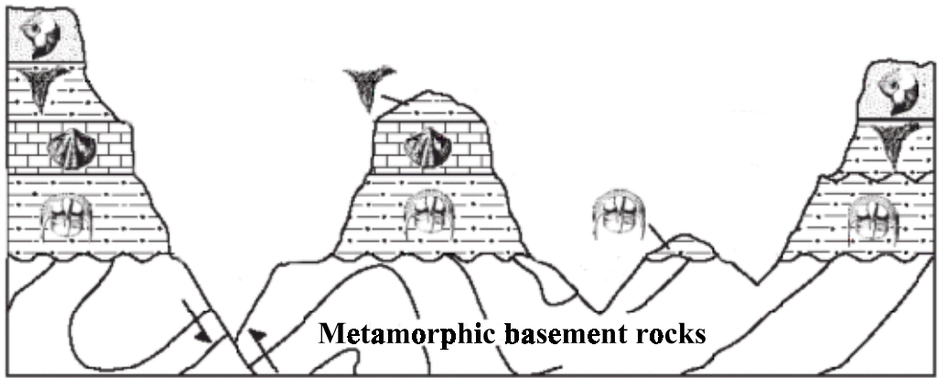
46. What is an example of a trace fossil?

(A) carbon outlines of plant fossils
(B) insects preserved in amber
(C) petrified wood
(D) tracks and trails

47. What "Super Continent" existed before Pangaea?

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

48. Which type of environment is indicated by the fossils found in the sedimentary rock layers below?



(A) glacial
(B) marine
(C) mountain
(D) terrestrial plateau

49. What type of volcano would most likely exist at an oceanic plate - continental plate convergent boundary?

(A) cinder cone
(B) composite cone
(C) hot spot volcano
(D) shield volcano

50. Which is an example of a non-renewable resource?

(A) forest
(B) hydro-electricity
(C) minerals
(D) solar energy

Part II
Total Value: 50%

Instructions: Complete ALL questions in the space provided. Some answers require diagrams. You may use diagrams in any question to aid in your answer.

Value

2% 51(a) Compare the geocentric and heliocentric models of the solar system, using a diagram to illustrate each model.

2% (b) Given the half-life of U-235 is 0.7 billion years, determine the age of a sample of U-235 if 1/16 of the starting material remains. (SHOW YOUR WORKINGS)

2% (c) Briefly describe the change in atmospheric composition brought about by:

(i) a major volcanic eruption

(ii) burning of fossil fuels

Value

3% 51(d) Explain how volcanic outgassing contributed to the formation of Earth's original oceans.

3% (e) Characteristics of a rock determine whether it acts as an aquifer or an aquiclude.

(i) With reference to porosity and permeability, compare a rock which acts as an aquifer and one which acts as an aquiclude.

(ii) Give an example of a rock type that acts as an aquifer and a rock type that acts as an aquiclude.

aquifer rock type: _____

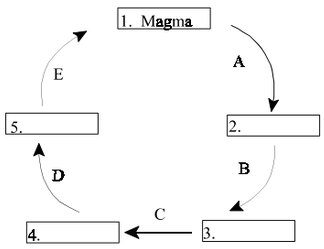
aquiclude rock type: _____

3% 52(a) Explain how the specific gravity of a mineral is determined.

Value

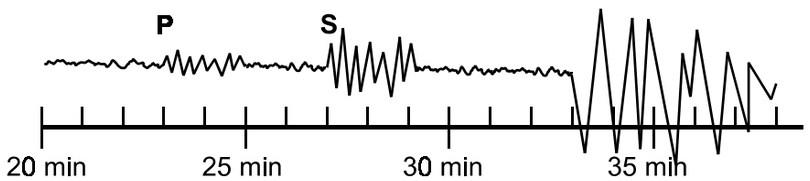
4% 52(b) In the diagram below, rocktypes/materials are indicated by numbers and processes are indicated by letters. Indicate the rock types/materials and processes for the rock cycle diagram by completing the table below.

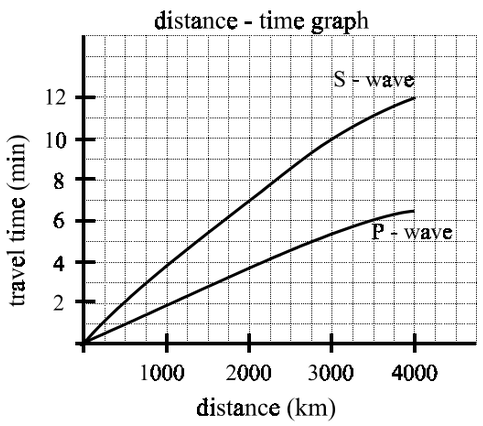
Rock Cycle



	Rock Type / Materials		Process
1.	magma	A.	
2.		B.	weathering and erosion
3.		C.	
4.		D.	
5.		E.	

(c) As a result of an earthquake, the seismogram below was obtained.





2% (i) What is the distance from the recording station to the epicentre?

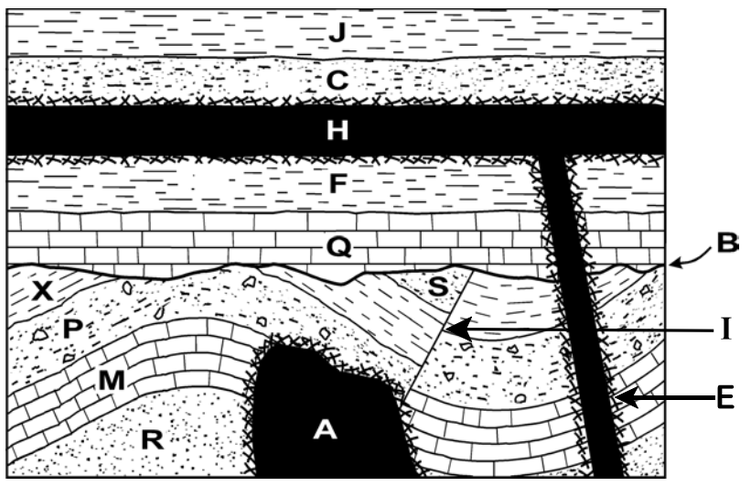
2% (ii) A second recording station located 3000 km from the epicenter recorded the P-wave arrival time at 10:00 AM. At what time did the S-wave arrive at this station?

Value

2% 53(a) Explain why color is **NOT** a reliable property for identifying minerals.

4% (b) Using a labelled diagram, briefly describe what happens at a mid-ocean ridge.

(c) Use the diagram below to answer the questions that follow.



2% (i) Arrange the letters in the order they occur, beginning with the oldest event and ending with the youngest event.

Oldest ⟶ Youngest

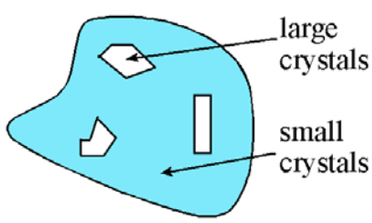
Value

1% 53(c) (ii) What evidence is provided to indicate that H is **NOT** a buried lava flow?

1% (iii) What is represented by the letter B?

4% 54(a) Explain two ways that economic mineral deposits are concentrated within Earth.

2% (b) An igneous rock is found to contain both large and small crystals, as shown below. What conditions were necessary for this rock to form?



Value

2% 54(c) Explain two ways in which a stream can transport materials?

2% (d) Draw a labelled diagram to illustrate the continental margin.

2% 55(a) What information can be gathered from the study of molds and casts but not from petrification?

2% (b) Oil is generally considered a non-renewable resource. Explain why oil sometimes may be considered a renewable resource.

Value

3% 55(c) Explain how the theory of Plate Tectonics accounts for the distribution of earthquakes, volcanoes, and mountain ranges.