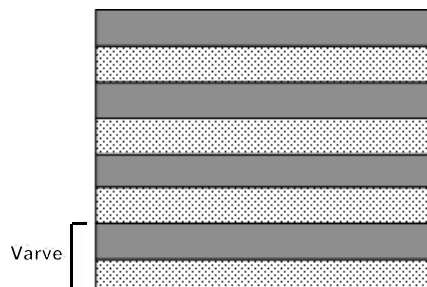


**PART I**  
**Total Value: 60%**

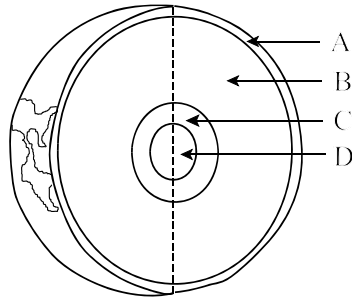
**Instructions: Shade the letter of the correct answer on the computer scorable answer sheet provided.**

1. Which branch of Earth Science studies the composition of extrusive igneous rocks?
  - (A) hydrology
  - (B) meteorology
  - (C) seismology
  - (D) volcanology
2. A geologist found four sedimentary beds - conglomerate, sandstone, siltstone, and shale - laid down, one on top of the other (i.e.,: conglomerate on bottom, shale on top). The geologist concluded that the conglomerate bed was oldest since it was found on the bottom. Which geological principle was used to arrive at this conclusion?
  - (A) cross-cutting relationships
  - (B) fossil correlation
  - (C) superposition
  - (D) uniformitarianism
3. What can be used to determine the absolute age of an igneous rock?
  - (A) comparing the ratio of parent to daughter isotopes in the rock
  - (B) comparing the sizes of crystals found within the rock
  - (C) examining the environment in which the rock is found
  - (D) examining the rock's relative position in an outcrop
4. How many years of deposition does this core sample from a glacial lake represent?



- (A) 2
  - (B) 4
  - (C) 8
  - (D) 16
5. Which period was part of the Paleozoic era?
  - (A) Cambrian
  - (B) Cretaceous
  - (C) Tertiary
  - (D) Triassic
6. In which situation would radiometric dating of a rock most likely produce an error?
  - (A) gaseous daughter material is removed by metamorphism
  - (B) parent rock contains fossils of plant material
  - (C) rocks had been cooled beneath glaciers
  - (D) volcanic eruptions produced successive lava flows

7. Which layers of Earth have fluid properties?



- (A) A and C
- (B) A and D
- (C) B and C
- (D) B and D

8. What is rock or sediment referred to if groundwater moves through it freely?

- (A) aquiclude
- (B) aquifer
- (C) spring
- (D) water table

9. Which process was responsible for the origin of Earth's atmosphere?

- (A) hydrologic cycle
- (B) oxidation
- (C) photosynthesis
- (D) volcanic outgassing

10. Which process explains the origin of Earth's water?

- (A) hydrologic cycle
- (B) meteorite impact
- (C) photosynthesis
- (D) volcanic outgassing

11. Which type of sediment has the greatest rate of permeability?

- (A) clay
- (B) pebbles
- (C) sand
- (D) silt

12. If global warming continues, what impact will this have on the hydrosphere?

- (A) continents will increase in size
- (B) glaciers will decrease in size
- (C) hydrosphere will contain more water
- (D) oceans will contain less water

13. Which always consists of only one type of atom?

- (A) compound
- (B) element
- (C) molecule
- (D) hydrate

14. Which is the **least** reliable indicator of a mineral's identity?

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

15. What are the two most common elements in continental crust?
- (A) Al, O
  - (B) Fe, Al
  - (C) O, Si
  - (D) Si, Al
16. Which is a mineral?
- (A) coal
  - (B) gypsum
  - (C) oil
  - (D) sandstone
17. Which formula is matched to the correct mineral group?
- (A)  $\text{BaSO}_4 \rightarrow$  Sulfate
  - (B)  $\text{CaCO}_3 \rightarrow$  Oxide
  - (C)  $\text{Fe}_3\text{O}_4 \rightarrow$  Carbonate
  - (D)  $\text{ZnS} \rightarrow$  Halide
18. Which best describes the cleavage of halite?
- (A) one plane
  - (B) two planes
  - (C) three planes
  - (D) four planes
19. What accounts for the difference in hardness between graphite and diamond?
- (A) atomic arrangement
  - (B) chemical formula
  - (C) impurities
  - (D) ionic bonding
20. When molten material solidifies, what type of rock forms?
- (A) clastic
  - (B) igneous
  - (C) metamorphic
  - (D) sedimentary
21. What texture is exhibited by rocks that contain crystals that are roughly equal in size and can be identified with the unaided eye?
- (A) coarse grained
  - (B) fine grained
  - (C) glassy
  - (D) porphyritic
22. Which best describes a similarity between pumice and obsidian?
- (A) coarse grained textures
  - (B) composed of volcanic glass
  - (C) formed from felsic magma
  - (D) formed from mafic magma

23. A prospector is trying to determine the name of a mineral by measuring hardness. The mineral can be scratched by an iron nail and glass but cannot be scratched by a copper penny or fingernail. What is the mineral?

Moh's Mineral Hardness Scale	
Talc	1
Gypsum	2
Calcite	3
Fluorite	4
Apatite	5
Feldspar	6
Quartz	7
Topaz	8
Corundum	9
Diamond	10

Approximate Hardness of Common Objects	
Fingernail	2.5
Copper penny	3.5
Iron nail	4.5
Glass	5.5
Steel file	6.5

- (A) Apatite  
(B) Calcite  
(C) Flourite  
(D) Quartz
24. Which rock type is matched to the correct characteristics?

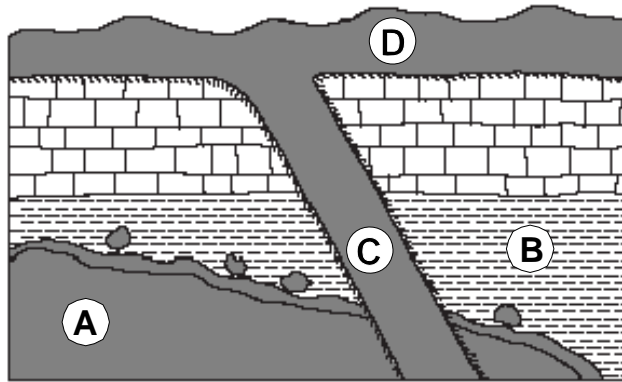
	Rock Type	Silica Content	Crystal Content
(A)	Basalt	High	Large
(B)	Gabbro	Low	Small
(C)	Granite	High	Large
(D)	Rhyolite	Low	Small

25. Which rock is properly matched with its classification?

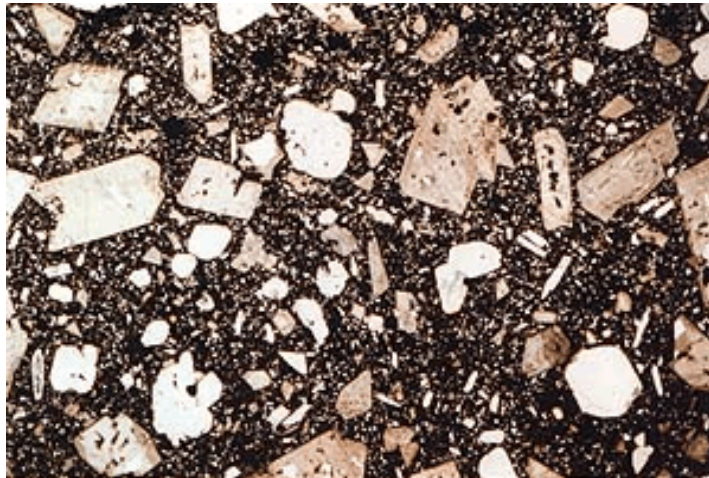
	Rock	Classification
(A)	Gypsum	Clastic
(B)	Halite	Chemical
(C)	Limestone	Clastic
(D)	Sandstone	Chemical

26. On what basis are clastic sedimentary rocks classified?
- (A) colour  
(B) mineral composition  
(C) particle size  
(D) type of bedding

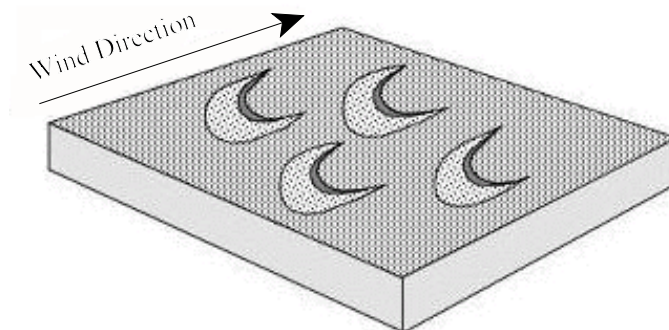
27. At which location will the finest grained igneous rocks be found?



- (A) A  
(B) B  
(C) C  
(D) D
28. The igneous rock below shows a texture consisting of large crystals surrounded by a matrix of smaller crystals. What is the texture of this rock?

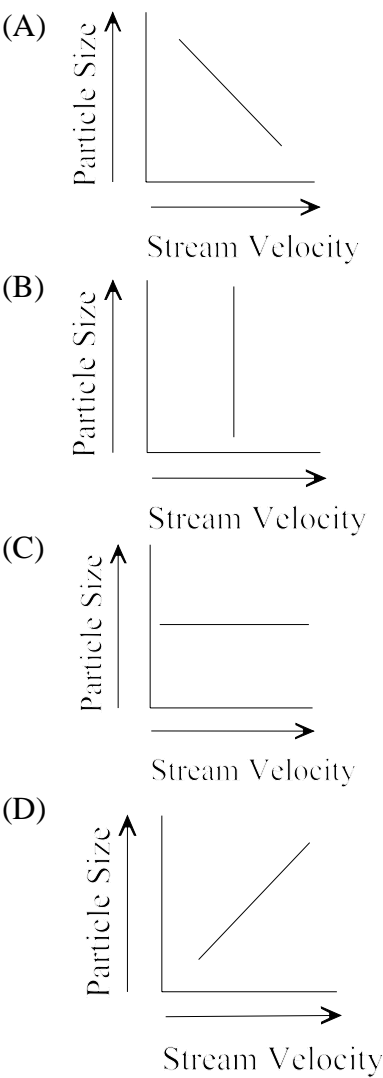


- (A) coarse grained  
(B) fine grained  
(C) pegmatitic  
(D) porphyritic
29. Which type of depositional environment is illustrated in the diagram below?



- (A) desert  
(B) river  
(C) marine  
(D) shoreline

30. Which graph best represents the relationship between a stream’s velocity and the size of the largest particles that it can carry downstream?



31. Which pair shows the correct relationship between metamorphic rock and its parent rock?

	Parent Rock	Metamorphic Rock
(A)	Gypsum	Phyllite
(B)	Limestone	Marble
(C)	Sandstone	Slate
(D)	Shale	Quartzite

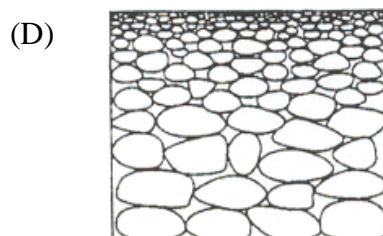
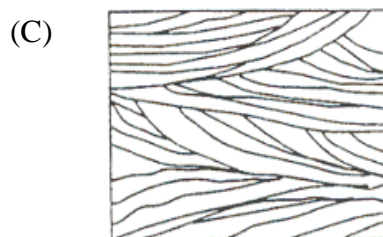
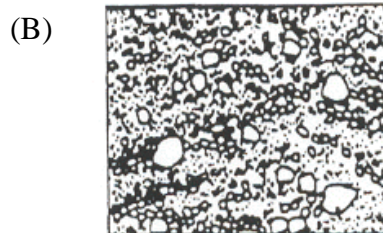
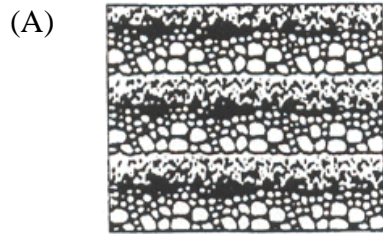
32. Which characteristic describes the continental slope of a continental margin?

- (A) leads into deeper water and is the true edge of the continent
- (B) steep walled submerged valley
- (C) submerged portion of a continent
- (D) thick accumulation of sediment at the base of the margin

33. Earth is made up of very hot material which rises to the top of the mantle, cools, then sinks, reheats and rises again. What term refers to this cyclic action?

- (A) convection currents
- (B) hot spots
- (C) magnetic fields
- (D) tension forces

34. Which cross-section best represents sediments formed at the base of a glacier?



35. What is the classification of normal, reverse and thrust faults?

- (A) dip-slip
- (B) strike-slip
- (C) symmetrical
- (D) transform

36. What main type of force results in a transform fault?

- (A) compression
- (B) elastic
- (C) shear
- (D) tensional

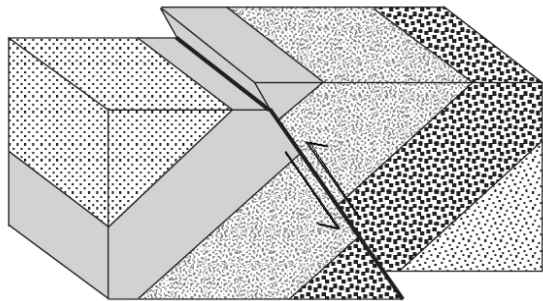
37. The rocks of the Avalon Peninsula and North Africa are similar. Which tectonic process was responsible for the separation of the Avalon from Africa?

- (A) convergence
- (B) elastic rebound
- (C) rifting
- (D) subduction

38. What materials allow the passage of S-waves during an earthquake?

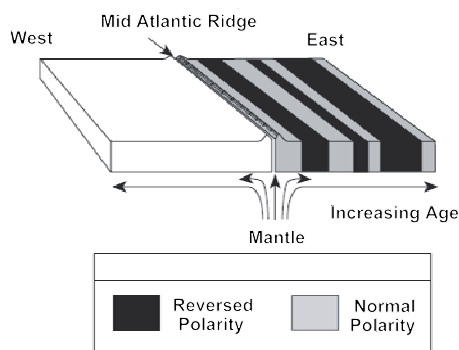
- (A) liquids and gases
- (B) liquids only
- (C) solids and gases
- (D) solids only

39. Which fault is shown in the cross-section below?



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

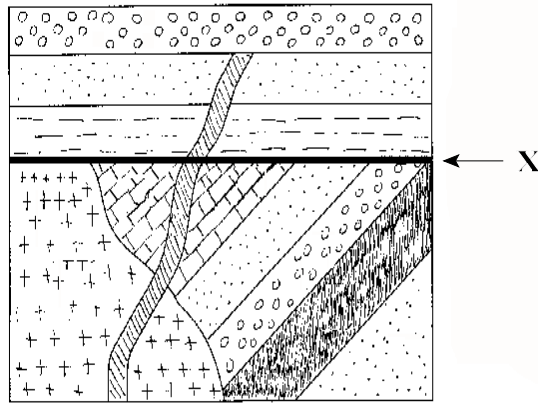
40. The diagram below shows the ocean floor east of the Mid-Atlantic Ridge. Which diagram illustrates the ocean floor west of the Mid-Atlantic Ridge.



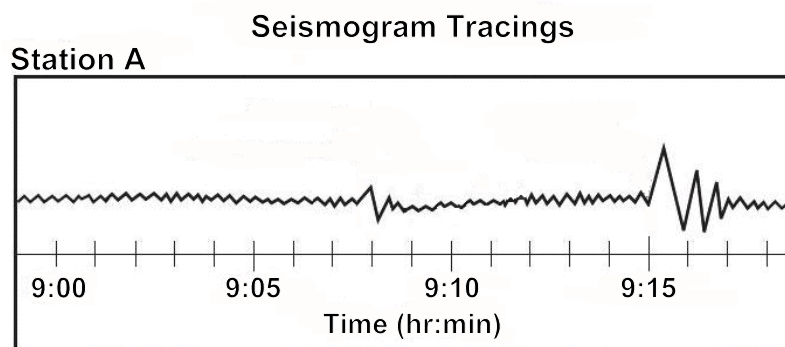
- (A)
- (B)
- (C)
- (D)



41. Which unconformity is identified by X in the diagram below?



- (A) angular  
(B) disconformity  
(C) inclusions  
(D) nonconformity
42. Which scale measures earthquake intensity and is based on damage to structures?
- (A) Benioff  
(B) Modified Mercalli  
(C) Moh's  
(D) Richter
43. Two separate earthquakes have occurred. The first measured 6.5 on the Richter scale, while the second measured 3.5. How many times more energy was released by the first earthquake?
- (A) 30  
(B) 90  
(C) 1000  
(D) 27000
44. What is the P-S wave interval for the seismograph shown below?



- (A) 3 minutes  
(B) 5 minutes  
(C) 7 minutes  
(D) 9 minutes
45. Which type of mineral deposit would we expect to be forming at the present day Mid-Atlantic ridge?
- (A) evaporite  
(B) hydrothermal  
(C) placer  
(D) residual

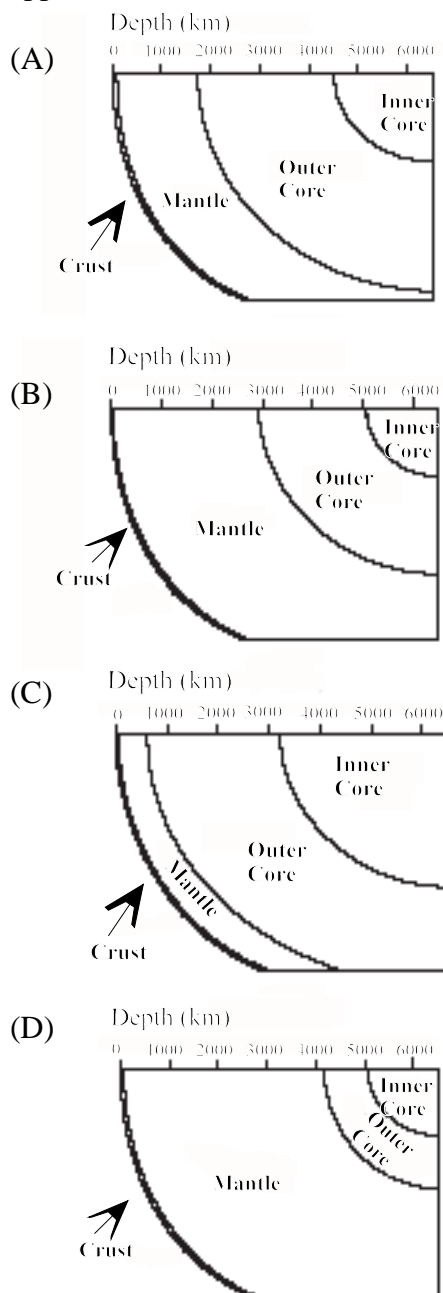
46. Which refers to hydrocarbons such as coal, petroleum, tar sands and natural gas?

- (A) bitumen
- (B) fossil fuels
- (C) kerogen
- (D) renewable fuels

47. Which type of coal results from metamorphism?

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

48. Which diagram most accurately identifies the layers of the Earth's interior and their approximate size?

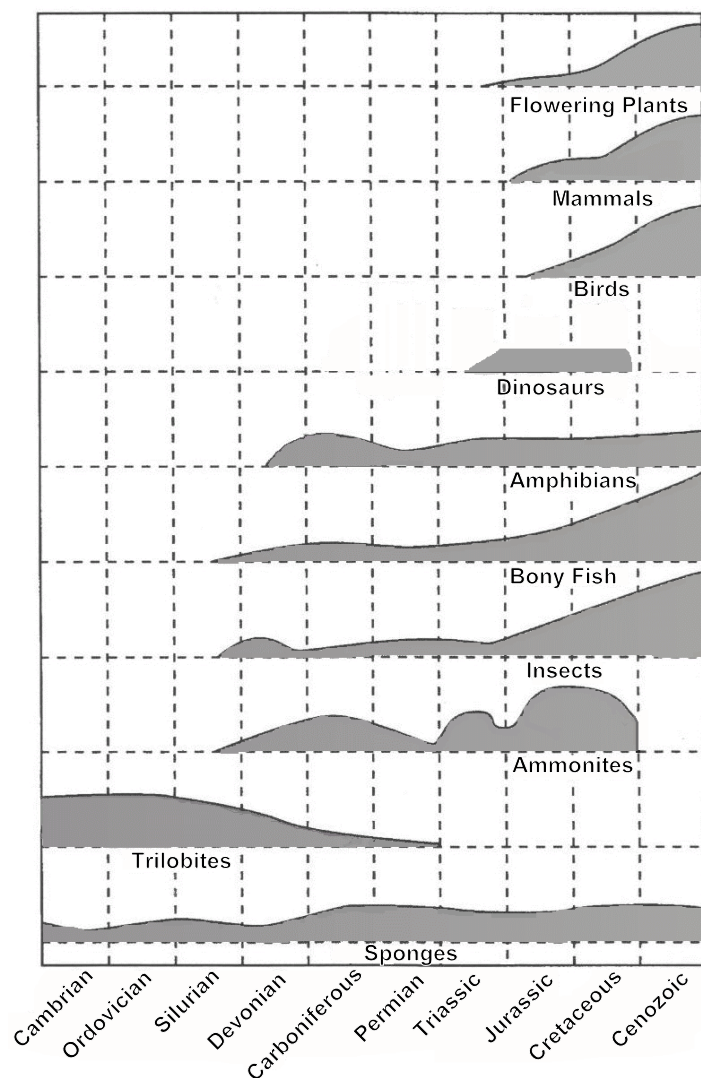


49. What are the characteristics of reservoir rock located in an oil trap?

- (A) high porosity, high permeability
- (B) high porosity, low permeability
- (C) low porosity, high permeability
- (D) low porosity, low permeability

50. Which process results in the formation of rock from sediment?
- (A) convection
  - (B) crystallization
  - (C) erosion
  - (D) lithification
51. Which metamorphic rock has undergone the highest grade of change?
- (A) gneiss
  - (B) phyllite
  - (C) schist
  - (D) slate
52. Fossils are most common in which rock type?
- (A) metamorphic
  - (B) plutonic
  - (C) sedimentary
  - (D) volcanic
53. Which sequence shows the correct progression of life through geologic time?
- First      →      →      →      Last
- (A) amphibians → trilobites → mammals → reptiles
  - (B) amphibians → mammals → trilobites → reptiles
  - (C) trilobites → amphibians → reptiles → mammals
  - (D) trilobites → reptiles → amphibians → mammals
54. Which area on the island of Newfoundland appears to have been formed from the seafloor?
- (A) Central
  - (B) Eastern
  - (C) Southern
  - (D) Western
55. Which rock type would be most common in hot spots like Hawaii?
- (A) andesite
  - (B) basalt
  - (C) diorite
  - (D) granite
56. What is the most probable cause of recent global climate change?
- (A) large scale open pit mining
  - (B) movement of tectonic plates
  - (C) natural changes in Earth's orbit around the Sun
  - (D) production of CO<sub>2</sub> and CH<sub>4</sub>
57. What is the most likely reason to explain the extinction of dinosaurs?
- (A) disease
  - (B) glaciation
  - (C) global warming
  - (D) meteorite impact

58. Based on the graph below, which life-forms appear to be extinct ?



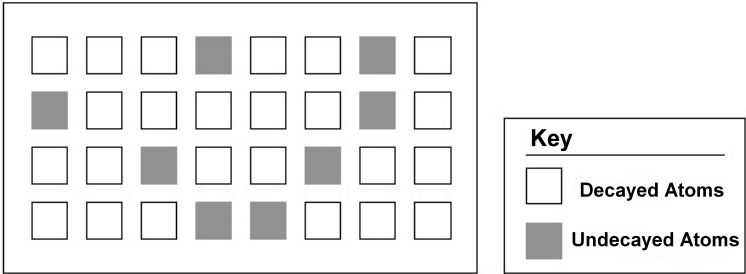
- (A) bony fishes, dinosaurs, and mammals  
(B) insects, sponges, and flowering plants  
(C) sponges, insects, and bony fishes  
(D) trilobites, ammonites, and dinosaurs
59. What temperature trend occurs after large volcanic eruptions send huge amounts of ash into the atmosphere?
- (A) cooler than normal because of a hole in the ozone layer caused by the explosion  
(B) cooler than normal due to the reflection of sunlight by volcanic dust  
(C) warmer than normal due to heat released into the atmosphere by the explosion  
(D) warmer than normal due to heat spread by convection of the volcanic dust
60. What is the essential characteristic of a renewable resource?
- (A) It is a metallic ore with a vitreous lustre.  
(B) Once extracted it will not be replaced.  
(C) There is so much of it that it will never run out.  
(D) With careful management it will last forever.

**PART II**  
**Total Value: 40%**

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

Value

2%      61.(a) The diagram below represents the decay pattern of a radioactive isotope in an igneous rock sample. The half life of the radioactive isotope is 2.3 million years. Use the pattern to determine the age of the rock and show your working in the box below.



2%      (b) According to the solar nebular hypothesis, describe how the solar system formed.

**Value**

2%      62.(a) As a driller, you are considering a location for a new fresh water well. Explain the two characteristics the geological materials must have to produce a flowing artesian well that provides a clean water supply.

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2%      (b) Geologists represent the interior of Earth as having different physical layers. Explain the importance of radioactive decay and gravitational forces in the segregation of Earth’s interior.

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2%      63.(a) Based on the definition of a mineral, ice would be considered a mineral and coal would not. Explain why this is true.

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Value

2% 63.(b) A mineral sample was studied and the following data obtained. Using the data, determine the mineral’s specific gravity.

Mass of Mineral Sample	129.6g
Volume of Water Displaced	18.0 cm <sup>3</sup>

2% (c) Explain how sedimentary rocks may eventually form metamorphic rocks.

2% (d) Both granite and rhyolite are classified as felsic rocks; however, their textures are very different. Describe the texture of each and explain why these textural differences occur

Texture of Granite:

Reason:

Texture of Rhyolite:

Reason:

Value

2%      63.(e) Alfred Wegener’s Theory of Continental Drift failed to explain how the continents actually moved. How does the current Theory of Plate Tectonics explain the movement of continents today?

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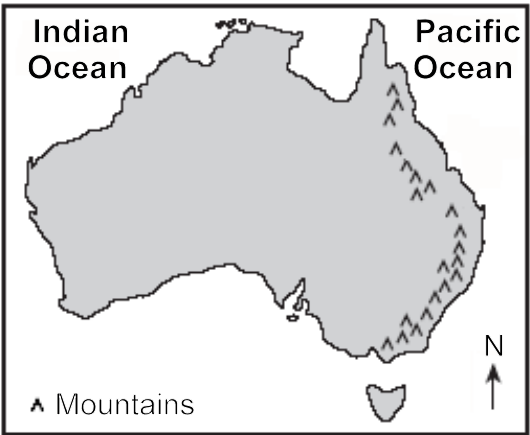
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2%      (f) A range of mountains is found on Australia’s east coast. With reference to plate boundaries, explain how this mountain range may have been formed.



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Value

4% 63.(g) Sketch and describe two types of faults that occur at a convergent plate boundary.

1.	2.
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2% (h) Given the information in the table, draw, name and fully label the volcano described.

Volcano	
•	Alternating slow moving lava flows and explosive ash falls or pyroclastic flow.
•	Rare catastrophic blast eruptions

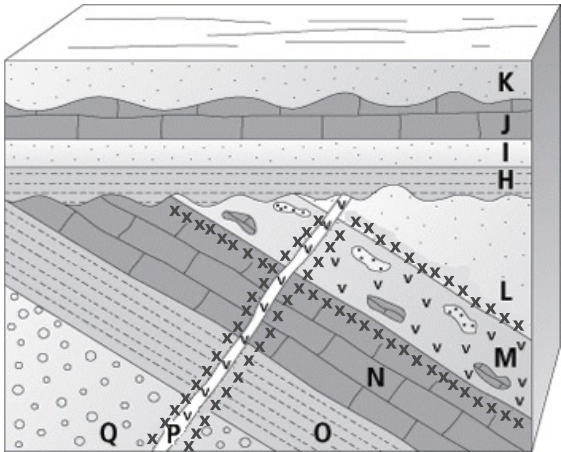
Value

2%

63(i) Draw and explain a glacial feature that will show the direction in which a glacier moved.

4%

(j) Use the diagram below to answer the following questions.



(i) Determine the sequence of events in the formation of the geological cross-section from oldest to youngest.

oldest —————→ youngest

\_\_\_\_\_

(ii) What geologic feature is seen within rock unit M?

\_\_\_\_\_

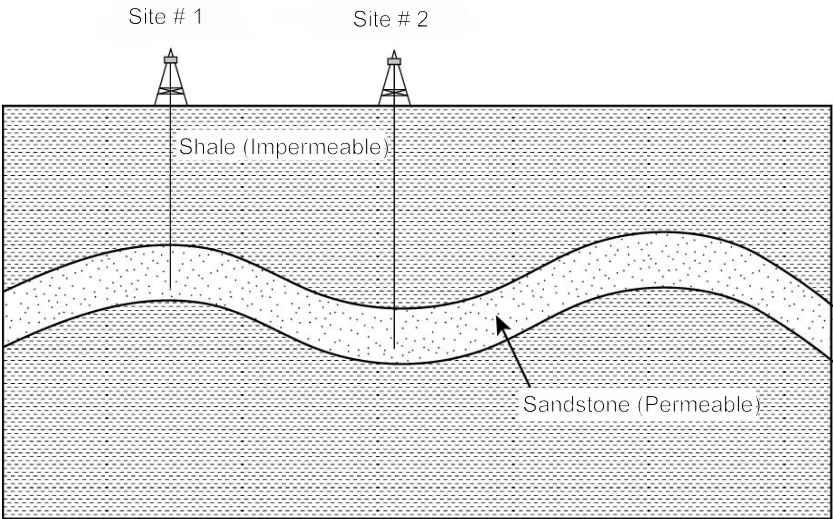
(iii) Explain how this geologic feature in rock unit M would have formed.

Value

2%

63.(k)

A company exploring for oil drills at two separate sites. At which site would you most likely find oil? Explain your choice.



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2%

64.(a)

Explain two reasons why a modern day earthworm is unlikely to become part of the fossil record.

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**Value**

2%      64.(b)    Explain two ways a beetle could become fossilized.

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2%      (c)    With reference to Rodinia and Pangea, use the Plate Tectonics theory to describe what our planet could look like in the future.

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