Part I
Total Value: 50%

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

1. Which scientific concept has the highest degree of certainty?

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

2. Which branch of Earth Science focuses on the study of Earth's water systems?

   (A) hydrology
   (B) paleontology
   (C) petrology
   (D) seismology

3. Which describes the origins of the universe?

   (A) Big Bang Theory
   (B) Chemosynthetic Theory
   (C) Geocentric Model
   (D) Heliocentric Model

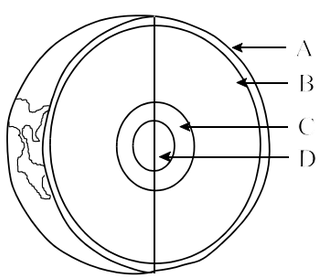
4. Which statement supports uniformatarianism?

   (A) Events that change Earth can not be undone.
   (B) Events that change Earth rarely happen.
   (C) Processes that changed Earth are no longer happening.
   (D) Processes that changed Earth are still happening.

5. Which time span would least likely contain fossil evidence?

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

6. In the diagram below, where is Earth's asthenosphere located?



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

7. Which factors were responsible for separating Earth's interior into layers with different physical properties?

(A) density and heat
(B) outgassing and weathering
(C) uplift and erosion
(D) volcanism and earthquakes

8. What is a major source of energy driving Earth's internal processes?

(A) accretion
(B) gravity
(C) radioactivity
(D) volcanism

9. What is the largest source of fresh water on Earth?

(A) glaciers
(B) groundwater
(C) lakes
(D) rivers

10. Which rock type is an aquifer?

(A) granite
(B) gneiss
(C) sandstone
(D) shale

11. Which would have the greatest negative impact on the quality of groundwater?

(A) agricultural chemicals
(B) burning fossil fuels
(C) land subsidence
(D) stream erosion

12. In which atmospheric layer does weather occur?

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

13. Which atmospheric component shows a yearly cyclic change in concentration due to natural processes?

(A) argon
(B) carbon dioxide
(C) helium
(D) volcanic dust

14. Which kingdom is matched with its general characteristics?

	Kingdom	Characteristics
(A)	Animalia	multicellular, eukaryotic, absorptive
(B)	Fungi	unicellular, prokaryotic, autotrophic
(C)	Monera	unicellular, prokaryotic, absorptive
(D)	Plantae	multicellular, eukaryotic, ingestive

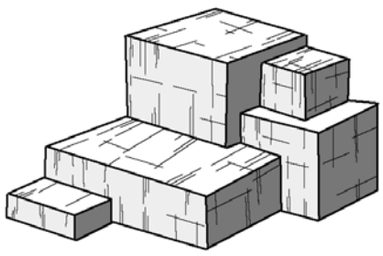
15. Which refers to the appearance and quality of light reflected from the surface of a mineral?

(A) colour
(B) crystal form
(C) luster
(D) streak

16. What is the specific gravity of a 33.3 g sample of calcite that displaces 12.3 mL of water?

(A) 0.37
(B) 1.6
(C) 2.7
(D) 21

17. Which mineral displays cubic cleavage as shown in the diagram below?



(A) diamond
(B) galena
(C) mica
(D) quartz

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

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

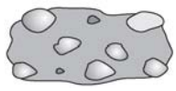
19. Which is an example of a halide?

(A) barite ($BaSO_4$)
(B) calcite ($CaCO_3$)
(C) fluorite (CaF_2)
(D) hematite (Fe_2O_3)

20. What characteristic allows two igneous rocks with the same mineral composition to have different names?

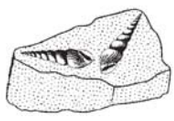
(A) colour
(B) foliation
(C) shape
(D) texture

21. Which rock sample displays a course-grained texture?

(A)  conglomerate

(B)  gneiss

(C)  granite

(D)  limestone

22. Which rock formed in an extrusive environment?

(A) basalt
(B) diorite
(C) gabbro
(D) granite

23. What is the sequence in a continental margin extending seaward from the continent?

(A) shelf → rise→ slope
(B) shelf → slope → rise
(C) slope → rise→ shelf
(D) slope → shelf → rise

24. What is the most common agent of erosion and deposition in deserts?

(A) gravity
(B) soil creep
(C) streams
(D) wind

25. Which sedimentary rock is paired with its classification?

(A) coal - clastic
(B) gypsum - clastic
(C) limestone - chemical
(D) sandstone - chemical

26. Sediments are deposited and sorted as a stream enters a large body of water. How does the particle density and size change as they move further from the shoreline?

	Density	Size
(A)	decrease	decrease
(B)	decrease	increase
(C)	increase	decrease
(D)	increase	increase

27. Which is the sequence for the metamorphism of clay?

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

28. Which rock displays a non-foliated texture?

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

29. Where would rocks formed as a result of regional metamorphism most likely be found?

(A) Hawaii
(B) Iceland
(C) Rocky Mountains
(D) Sahara Desert

30. Which scientist proposed that convection currents beneath the crust are the mechanism for plate movement?

(A) Arthur Holmes
(B) James Hutton
(C) Tuzo Wilson
(D) Xavier Lepichon

31. Which fault is created by tensional forces?

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

32. Where does the largest concentration of earthquakes and volcanic events occur?

(A) areas bordering Atlantic Ocean
(B) areas bordering Pacific Ocean
(C) areas middle of North America
(D) areas middle of South America

33. Which scale measures the structural damage caused by an earthquake?

(A) Mercalli
(B) Moh's
(C) Richter
(D) Time

34. Which boundary would explain the formation of the Himalayan Mountain Range?

(A) continent - continent
(B) normal fault
(C) oceanic - oceanic
(D) transform fault

35. Where are the most hazardous volcanoes located?

(A) along convergent plate boundaries
(B) along mid-ocean ridges
(C) at oceanic hot spots
(D) at transform fault boundaries

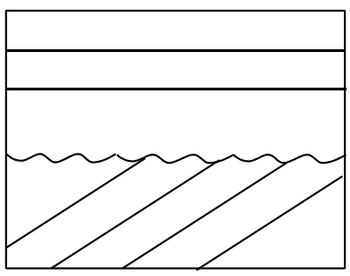
36. Which layer of Earth is composed of molten nickel-iron?

(A) asthenosphere
(B) inner core
(C) lithosphere
(D) outer core

37. An earthquake has a magnitude of 4.6. How many times more energy would be released from a earthquake with a magnitude of 7.6?

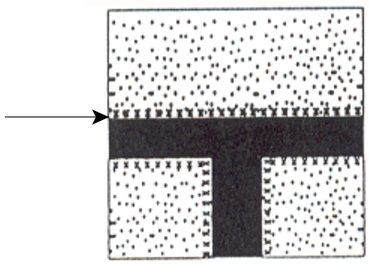
(A) 30
(B) 90
(C) 1000
(D) 27 000

38. Which series of events produces the cross-section below?



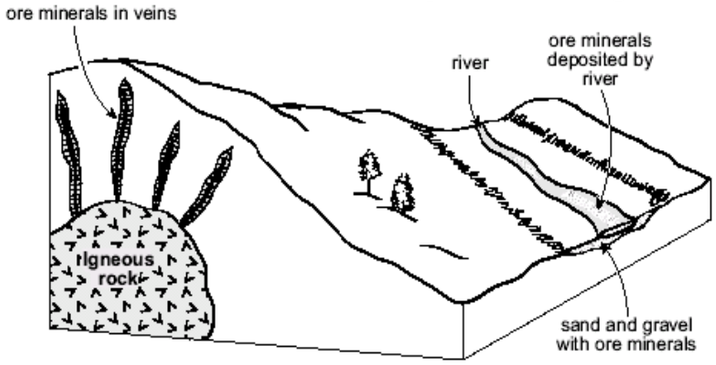
(A) deposition → erosion → tilting → erosion
(B) deposition → tilting → erosion → deposition
(C) erosion → deposition → tilting → deposition
(D) erosion → tilting → deposition → erosion

39. What is the arrow pointing towards in the diagram below?



(A) contact metamorphism
(B) faulting
(C) regional metamorphism
(D) unconformity

40. Which statement best describes the mineral deposits in the diagram below?



(A) In the veins, they are placer deposits.
(B) In the veins, they are hydrothermal deposits.
(C) When deposited by the river, they are metamorphic.
(D) When deposited by the river, they are magmatic.

41. What is the main mineral used in making plaster?

(A) barite
(B) graphite
(C) gypsum
(D) pyrite

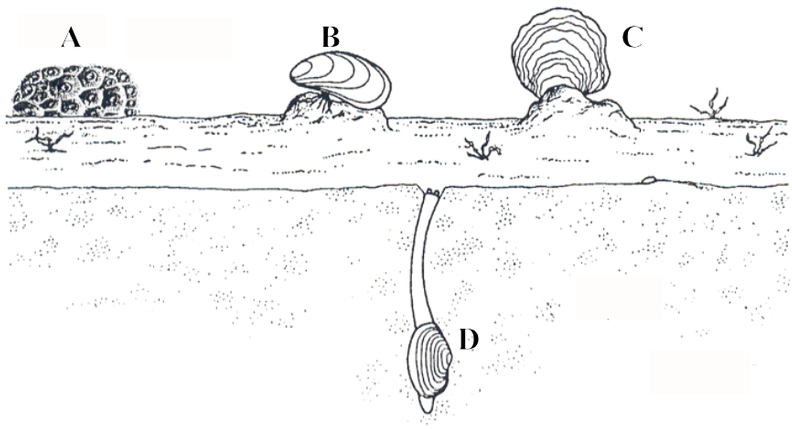
42. Which is hardest and burns cleanest?

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

43. Which best describes the geologic setting where diamonds are most likely formed?

(A) high heat; high pressure
(B) high heat; low pressure
(C) low heat; high pressure
(D) low heat; low pressure

44. A trace fossil is a piece of indirect evidence giving clues to the activities of ancient organisms. Which organism in the diagram below is most likely to leave a trace fossil?



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

45. Which fossil type preserves internal details of an organism?

(A) cast
(B) impressions
(C) molds
(D) petrification

46. In which rock would fossils normally form?

(A) granite
(B) obsidian
(C) shale
(D) slate

47. Which best describes the progression of life forms from Precambrian to Cenozoic?

(A) bacteria → dinosaurs → trilobites → mammoths
(B) bacteria → trilobites → dinosaurs→ mammoths
(C) dinosaurs → bacteria → mammoths → trilobites
(D) dinosaurs → mammoths→ bacteria→ trilobites

48. What continental arrangement, proposed by Wegener, is believed to have existed 200 million years ago?

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

49. Which supports the idea that plate tectonic activity is continuing in present time?

(A) activity along the San Andreas fault
(B) formation of fossils in shallow seas
(C) increased global temperatures
(D) weathering due to glacial activity

50. Which is a direct result of global warming?

(A) decreased sea levels; decreased polar ice
(B) decreased sea levels; increased polar ice
(C) increased sea levels; decreased polar ice
(D) increased sea levels; increased polar ice

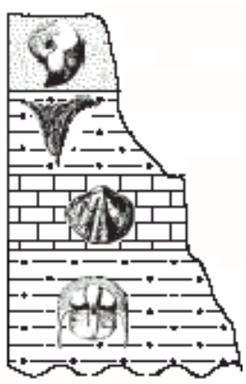
Part II
Total Value: 50%

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) 1200 g of a radioactive element has decayed to produce 75 g of the element. If the half-life of the mineral is 0.40 billion years, what is the age of the sample? Show calculations.

2% (b) Refer to the diagram below to describe the relationship between superposition and relative time.



Value

2% 51.(c) In what two ways does the solar nebular hypothesis explain the formation of our solar system?

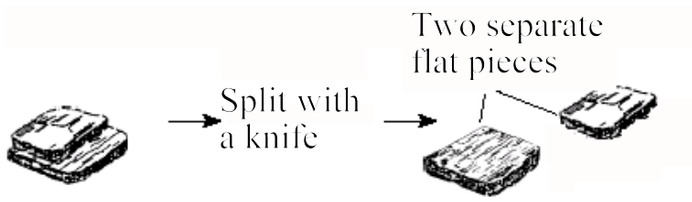
3% (d) With the aid of diagrams, explain the effect of a drought on the water table.

Value

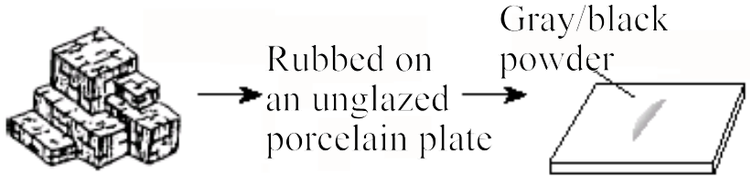
3% 51.(e) Refer to the layers of the atmosphere to describe three ways the biosphere is protected from harmful solar radiation.

3% 52.(a) The diagrams below show three minerals undergoing a physical test. Identify and describe the physical property being tested for each test.

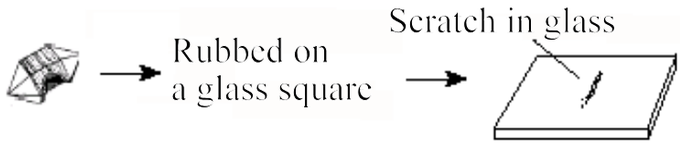
(i)



(ii)



(iii)



Value

2% 52.(b) (i) Describe the difference in the chemical composition of silicate minerals and carbonate minerals.

(ii) Give an example of each mineral.

silicate: _____

carbonate: _____

2% (c) Why is coal considered to be a rock, and not a mineral?

2% (d) Describe the texture of both granite and basalt. How did the texture of each rock form?

(i) granite:

(ii) basalt:

Value

2% 52.(e) How can contact metamorphism distinguish an igneous intrusion from a buried lava flow?

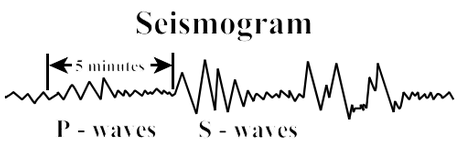
2% 53.(a) Describe two glacial features that indicate the direction of glacial movement.

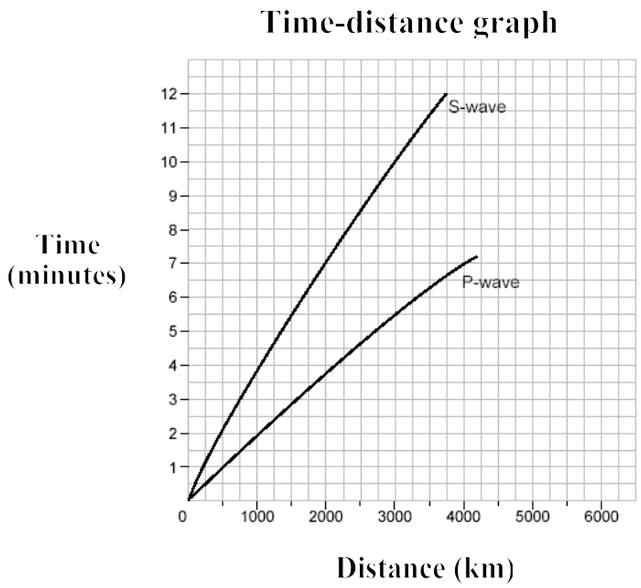
2% (b) Describe the environment required to produce ripple marks.

Value

4% 53.(c) The table below provides information collected at seismic stations A, B, and C for the same earthquake.

Seismic Station	*P* - Wave Arrival Time	*S* - Wave Arrival Time	Difference in Arrival Times	Distance to Epicenter (km)
A	08:48:30	No S - waves		
B	08:42:00		00:04:30	
C	08:46:00			3500





(i) Why are no S - waves recorded at station A?

(ii) What is the distance from station B to the epicentre? Show workings.

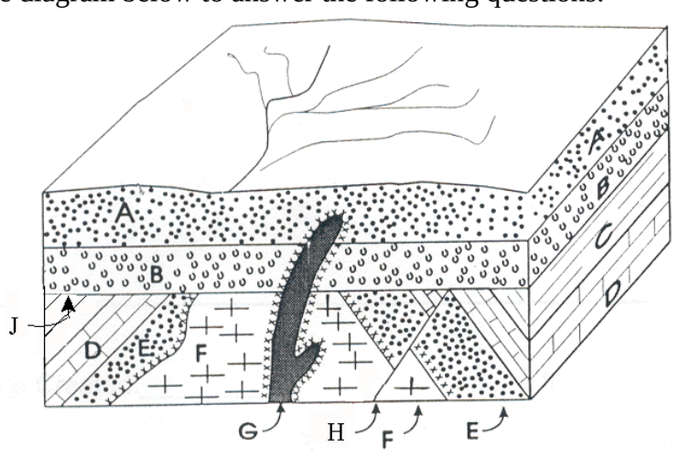
(iii) What is the arrival time of the S - wave for station C? Show workings.

Value

2% 53.(d) With the aid of a clearly labelled diagram, describe the difference between a normal fault and a reverse fault.

2% 54.(a) Explain why it is impossible for oceanic crust to be older than 200 million years.

3% (b) Use the diagram below to answer the following questions.



(i) Arrange all letters in the diagram above in the order in which they occurred, beginning with the oldest.

(ii) What is the feature at J? Explain how it formed.

Value

54.(b) (iii) What evidence indicates that the fault occurred after the intrusion of unit F?

(c) Describe how each of these deposits is formed.

2% (i) evaporites:

2% (ii) oil:

2% 55.(a) Why are earthworms unlikely to be fossilized?

2% (b) What are two ways delicate organisms, such as insects, can be preserved in the fossil record?

Value

2% 55.(c) How did biosphere conditions change as the composition of the atmosphere changed?

2% (d) Using Plate Tectonics, explain why the Hawaiian Islands vary in age and amount of volcanic activity.