PART I
Total Value: 50%

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

1. Which refers to how Plate Tectonics explains the present location of the continents?

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

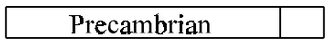
2. Which branch of Earth Science would be **most** involved with the processing of ore?

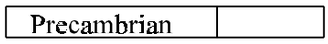
   (A) hydrology
   (B) mineralogy
   (C) paleontology
   (D) volcanology

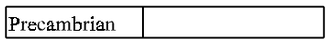
3. A geologist determines the age of a rock to be 2.1 billion years old according to Uranium 235-Lead 207 (half life 0.7 billion years). What was the original amount of Uranium 235 in the rock if there are now 15g remaining?

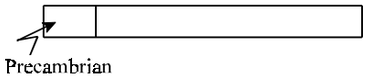
   (A) 5g
   (B) 7.5g
   (C) 45g
   (D) 120g

4. Which bar graph of the geological time scale represents the relative amount of time occupied by Precambrian?

   (A) 

   (B) 

   (C) 

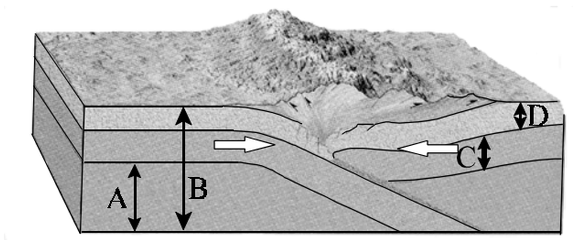
   (D) 

5. "The same geologic processes now at work were also active in the past. Earth's physical features were formed by these processes over long periods of time."

   This is a statement of which fundamental geological principle?

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

6. Which layer indicates the mantle?



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

7. The Moho is the boundary between which two layers?

(A) crust and mantle
(B) inner core and outer core
(C) lower mantle and upper mantle
(D) outer core and mantle

8. Which **best** describes a difference between oceanic and continental crust?

(A) Oceanic crust is granitic; continental crust is basaltic.
(B) Oceanic crust is less dense than continental crust.
(C) Oceanic crust is older than continental crust.
(D) Oceanic crust is thinner than continental crust.

9. A porous and permeable sandstone is layered between an unfractured limestone and a shale. If the sandstone contains groundwater, which term would be applied to the sandstone?

(A) aquiclude
(B) aquiduct
(C) aquifer
(D) aquitard

10. Which reservoir contains 97% of all water on Earth?

(A) atmosphere
(B) glaciers
(C) groundwater
(D) oceans

11. Which aquifer would be **best** for purifying groundwater that is contaminated with harmful sewage bacteria?

(A) cavernous limestone
(B) course gravel
(C) fine sand
(D) highly fractured granite

12. What are the two **most** important heat absorbing gases in the lower atmosphere?

(A) argon and oxygen
(B) oxygen and nitrogen
(C) ozone and chlorofluorocarbon (CFC)
(D) water vapor and carbon dioxide

13. Which factor has the greatest effect on the amount of UV radiation reaching Earth's surface?

(A) decreasing concentrations of helium
(B) decreasing concentrations of ozone
(C) increasing concentrations of argon
(D) increasing concentrations of greenhouse gases

14. Which processes **best** describe "life"?

(A) metabolism, photosynthesis, respiration
(B) photosynthesis, reproduction, growth
(C) respiration, metabolism, growth
(D) reproduction, growth, metabolism

15. Which is **NOT** a characteristic of minerals?

(A) definite chemical composition
(B) either a liquid or a solid
(C) formed by inorganic processes
(D) possess a crystalline structure

16. What does the cleavage property of a mineral generally represent?

(A) Chemical bonds are weak in specific directions.
(B) It always shows the true crystal shape of that mineral.
(C) It contains soluble molecules.
(D) It shows the degree of metamorphism that occurred during formation.

17. To which major mineral group does calcite ($CaCO_3$) belong?

(A) carbonates
(B) oxides
(C) silicates
(D) sulfates

18. Why might a sample of quartz sandstone fizz when exposed to a drop of acid?

(A) Quartz readily reacts with acid.
(B) The acid has gone bad.
(C) The clays are undergoing disintegration.
(D) The sandstone is cemented with carbonate.

19. Which is an example of an extrusive igneous rock?

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

20. What would a porphyritic texture indicate about a rock?

(A) It contains large broken fossil fragments.
(B) It experienced two different cooling environments.
(C) It was deposited in a near shore environment.
(D) It will have highly developed foliation.

21. According to the data given in the table below, which statement is correct?

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) A fingernail will scratch calcite, but not quartz.
(B) A fingernail will scratch quartz, but not calcite.
(C) A piece of glass can be scratched by quartz, but not by calcite.
(D) A piece of glass can be scratched by calcite, but not by quartz.

22. What can be used to classify igneous rocks?

(A) bedding
(B) foliation
(C) fossils
(D) texture

23. Which type of coal was exposed to metamorphic processes?

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

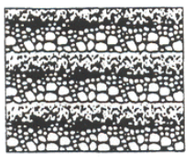
24. Which property is a feature of a sedimentary rock?

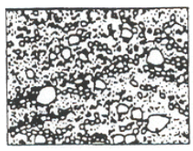
(A) foliation
(B) glassy texture
(C) layering
(D) vesicules

25. Which sedimentary rock would be composed of particles of varying sizes?

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

26. Which cross section best represents the sediment that was transported and deposited by wind?

(A) 

(B) 

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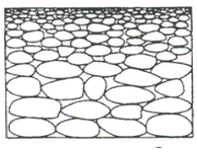
(D) 

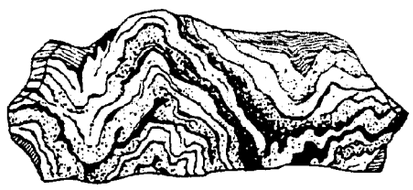
27. What is the metamorphic equivalent of limestone?

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

28. Which Canadian scientist made major contributions to the development of the Plate Tectonic theory?

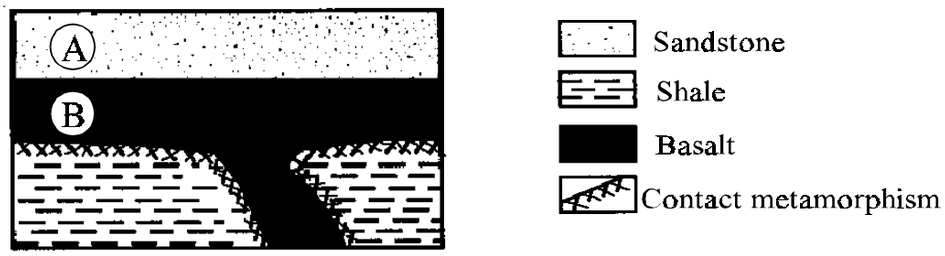
(A) Alfred Wegener
(B) Arthur Holmes
(C) James Hutton
(D) Tuzo Wilson

29. This diagram shows a large folded mountain structure. What would be the dominant rock type present?



(A) igneous extrusive
(B) igneous intrusive
(C) metamorphic
(D) sedimentary

30. The diagram below shows a cross section through a portion of Earth's crust.



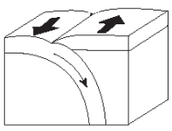
What does Unit B represent?

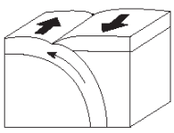
(A) buried lava flow
(B) intrusion
(C) oil trap
(D) volcanic rock

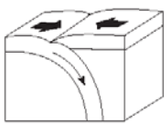
31. What evidence indicates Earth's asthenosphere is not molten?

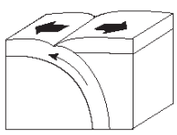
(A) Holes drilled into the asthenosphere have never found any magma.
(B) If the asthenosphere were molten, then the crust would sink in it.
(C) S waves pass through the asthenosphere without any difficulty.
(D) The frequency of deep earthquakes suggests that the asthenosphere is brittle.

32. In which diagram do the arrows best represent the motions of Earth's crust at an oceanic trench?

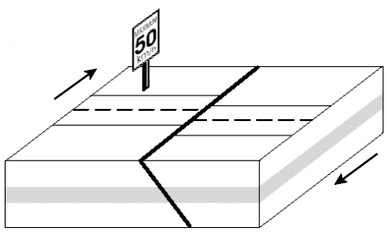
(A) 

(B) 

(C) 

(D) 

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



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

34. What type of stress causes strata to be folded?

(A) compression
(B) expression
(C) shearing
(D) tension

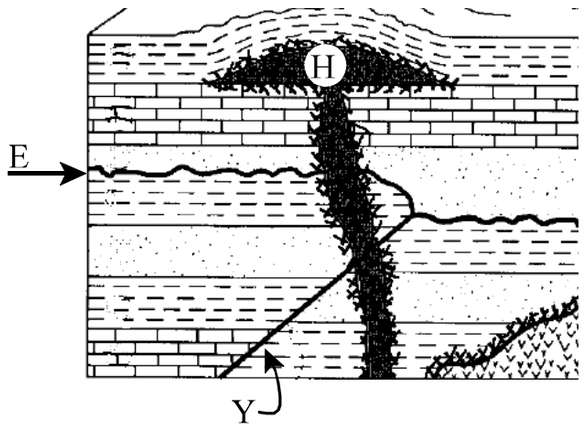
35. The Himalayan Mountains are located along a portion of the southern boundary of the Eurasian Plate. At the top of Mt. Everest (8 800 meters) in the Himalayan Mountains, climbers have found fossilized marine shells in the surface bedrock. From this observation, which conclusion can be made about the origin of the Himalayan Mountains?

(A) Sea level has been lowered more than 8 788 meters since the fossilization.
(B) The bedrock containing the fossil shells is part of an uplifted sea floor.
(C) The Himalayan Mountains formed at a divergent plate boundary.
(D) The Himalayan Mountains were formed by volcanic activity.

36. What does going up one whole unit on the Richter scale represent?

(A) A 10 fold increase in damage done by the quake.
(B) A 10 fold increase in energy release.
(C) A 30 fold increase in damage done by the quake.
(D) A 30 fold increase in energy release.

Use the diagram below to answer the next two questions.



37. What geologic feature is indicated by the letter "E" in the diagram?

(A) angular unconformity
(B) buried lava flow
(C) disconformity
(D) intrusion

38. Which geologic principle indicates that rock unit "H" formed after fault "Y"?

(A) cross-cutting relationships
(B) original horizontality
(C) superposition
(D) uniformitarianism

39. What is the correct matching for a plate boundary and its corresponding volcano type?

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

40. In which environment would the mineral gypsum form?

(A) deep marine
(B) plutonic igneous
(C) shallow marine
(D) volcanic igneous

41. In which location of Newfoundland and Labrador would you find a world class ore deposit containing nickel, copper, and cobalt?

(A) Baie Verte
(B) Labrador City
(C) St. Lawrence
(D) Voisey's Bay

42. Which natural resource is currently being extracted from the Hibernia and Terra Nova sites?

(A) asbestos
(B) crude oil
(C) dimension stone
(D) hematite

43. In what type of rocks are fossil fuels found?

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

44. Which bedrock type would most likely contain fossils?

(A) cambrian shale
(B) middle-proterozoic quartzite
(C) pleistocene basalt
(D) precambrian granite

45. Which organism would have the **best** chance of becoming part of the fossil record?

(A) ant
(B) butterfly
(C) fish
(D) horse

46. Major changes throughout the past mark the beginning and ending of divisions in geologic time. What marked the end of Paleozoic time?

(A) extinction of numerous species of invertebrates
(B) extinction of numerous species of reptiles
(C) increasing numbers of land plants
(D) increasing numbers of mammals

47. Rodinia was the supercontinent that existed before Pangea. It is believed that present continents will once again form a supercontinent. Which geologic principle is the basis for this assumption?

(A) cross-cutting relationships
(B) original horizontality
(C) superposition
(D) uniformitarianism

48. Iceland is a volcanic island situated on the northern section of the Mid Atlantic Ridge. Which rock would be most likely found at this location?

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

49. Which is **NOT** a possible explanation for global climate change?

(A) natural (astronomical) changes in Earth's orbital characteristics
(B) the blocking of solar radiation by volcanic dust in the atmosphere
(C) the depletion of mineral resources
(D) the production of excess greenhouse gases

50. Which pair of fossils can be found in Ordovician (505 - 438 million years ago) bedrock?

(A)  and 

(B)  and 

(C)  and 

(D)  and 

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) Using an example for each, explain the difference between absolute time and relative time.

2% b) A stone arrowhead was found embedded in a thigh bone of a wooly mammoth. Would you select the arrowhead or the thigh bone for testing if only carbon-14 dating technology was available? Explain.

2% c) 4.6 billion years ago, Earth's interior was a uniform mixture while today it is segregated into distinct layers. Explain what caused this segregation to happen.

3% d) When fluid is being pumped out of a well, the rate of flow must be specific so that the well does not dry up. Explain.

Value

2% 51.e) Each year major forest fires sweep through parts of North America. State and explain two reasons why these fires will affect the short-term concentration of atmospheric CO_2.

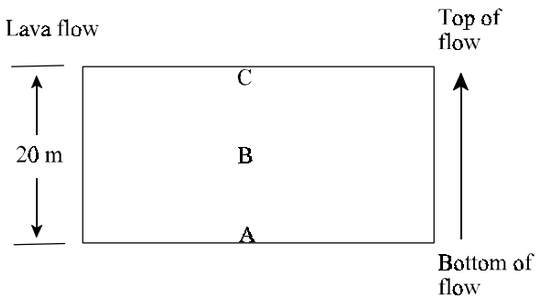
2% 52.a) A rock sample was weighed and then placed in a graduated cylinder which contained 45 mL of water. Using the information given below, determine the density of the sample shown. **Show ALL calculations.**

mass of sample	150 g
reading on graduated cylinder without sample	45 mL
reading on graduated cylinder with sample	75 mL

2% b) Using specific mineral examples, explain the difference between fracture and cleavage.

Value

3% 52.c) The diagram below represents a cooled lava flow.



Texture of Rock	
A	fine
B	coarse
C	glassy

Explain why there are three differences in texture within the same lava flow.

2% d) A river empties into a larger body of water. How will the sedimentary deposits change as distance from the river mouth increases? Explain why.

2% e) With regards to sorting, how does glacial till differ from stratified drift (outwash)?

Value

2% 53.a) Describe the conditions under which a very coarse-grained granite forms.

3% b) Describe one possible condition under which regional metamorphism can occur.

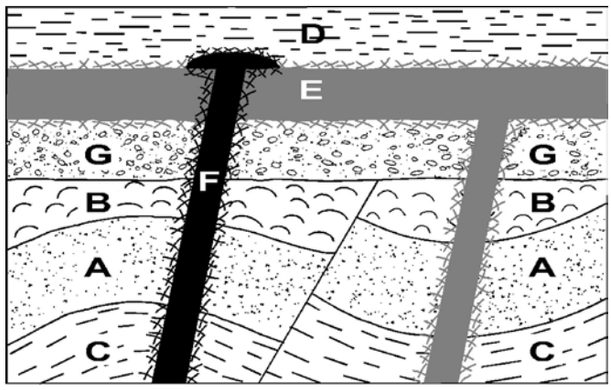
2% c) Describe two pieces of evidence that Wegener used to support the theory of Continental Drift.

2% d) Contrast the characteristics of Primary and Secondary waves.

Value

4% 53.e) Why are volcanoes at convergent boundaries more explosive than those at divergent boundaries?

4% 54.a) Describe the sequence of events that lead to the formation of this geological cross-section.



Value

4% 54.b) Distinguish between hydrothermal and depositional methods of the formation of economic mineral deposits.

2% 55.a) Give two reasons why we know so little about Precambrian life forms.

2% b) It is hypothesized that a large asteroid or comet may have collided with Earth about 65 million years ago. Explain how this impact was responsible for the mass extinctions at the end of the Mesozoic.

Value

3% 55.c) Use the diagram below and your knowledge of the theory of Plate Tectonics to explain how the three geologic zones of the island portion of Newfoundland and Labrador were formed.