



# **Geology 12**

## **Resource Exam B**

### Exam Booklet



## PART A: MULTIPLE CHOICE

Value: 64 marks

Suggested Time: 60 minutes

**INSTRUCTIONS:** For each question, select the **best** answer.

Data icons occur throughout the examination to indicate that useful information may be found in the Data Pages to help answer a particular question.

**Data**  
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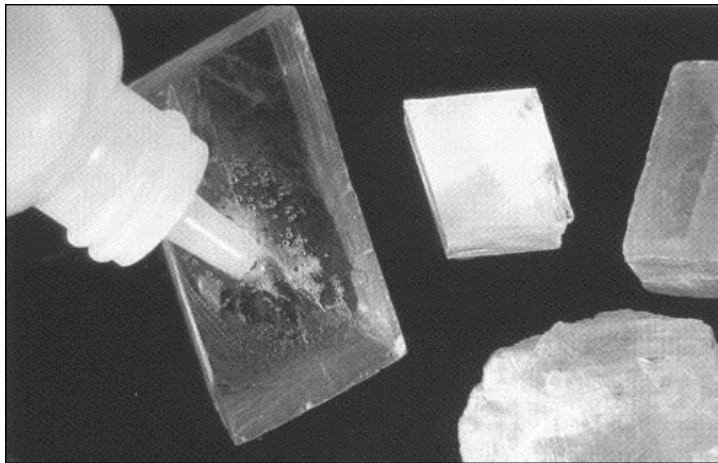
StudentBounty.com

1. Which of the following processes forms igneous rock?
  - A. lithification of mud
  - B. cementation of debris
  - C. solidification of magma
  - D. recrystallization of sediment
  
2. Which of the following geological principles is summarized by the phrase “the present is the key to the past”?
  - A. evolution
  - B. superposition
  - C. catastrophism
  - D. uniformitarianism
  
3. Which of the following groups of elements is most abundant in the Earth’s crust?
  - A. silicon, iron, gold
  - B. aluminum, iron, gold
  - C. oxygen, aluminum, iron
  - D. oxygen, silicon, aluminum

4. Which of the following properties can **best** be used to distinguish between plagioclase feldspar and quartz?
- A. lustre
  - B. streak
  - C. colour
  - D. cleavage

Use the following photograph of a mineral sample to answer question 5.

**Data**  
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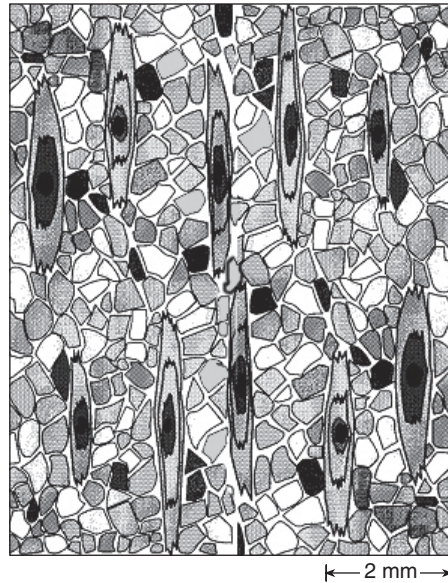
5. The mineral specimen shown in the photograph can be scratched by a copper penny and fizzes in acid. What is its hardness?
- A. 1
  - B. 2
  - C. 3
  - D. 4

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6. Which of the following processes will form chert?
- A. cementation of pebbles
  - B. drying out of clay minerals
  - C. compaction of olivine grains
  - D. precipitation of dissolved silicate (quartz)

7. In which type of metamorphic rock are fossils **most likely** preserved?
- A. slate
  - B. schist
  - C. gneiss
  - D. quartzite

Use the following sketch of the texture of a metamorphic rock to answer question 8.



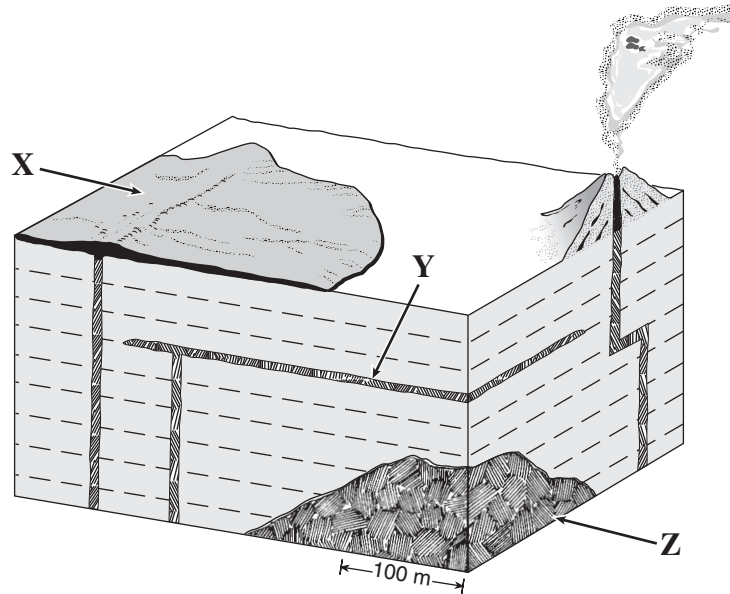
8. Which directions of compression caused the parallel alignment of the long crystals in the metamorphic rock?
- A.  $\Rightarrow \Leftarrow$
  - B.  $\Leftarrow \Rightarrow$
  - C.  $\Uparrow$   
 $\Downarrow$
  - D.  $\Downarrow$   
 $\Uparrow$

Use the following photograph to answer questions 9 and 10.



9. The photograph shows a basalt lava. Under what conditions did the distinctive rounded shapes form?
- A. rapid cooling underwater
  - B. explosive volcanic eruption
  - C. high pressure within the mantle
  - D. slow cooling deep underground
10. Although igneous in origin, the chilled margins between the rounded shapes show no visible crystals. What is the name of this kind of igneous texture?
- A. glassy
  - B. foliated
  - C. vesicular
  - D. fragmental

Use the following diagram of a variety of igneous features to answer questions.

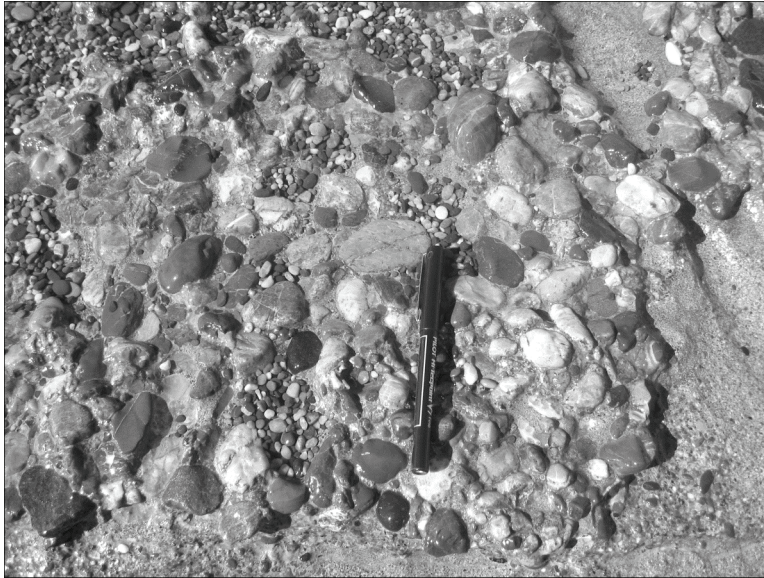


11. Layer **X** is composed of basalt. Why are large olivine crystals found in many basalt flows?
- A. Olivine is the last mineral to crystallize from a magma.
  - B. Olivine is the first mineral to crystallize from a magma.
  - C. Olivine is a low density mineral and would float to the top of a flow.
  - D. Olivine is a common mineral in the crust, and does not melt into the basalt flow.
12. The rock in the intrusion at **Y** consists of 60% dark ferromagnesian minerals and 40% plagioclase feldspar. Which of the following is the **best** description of the intrusion?
- A. It is a mafic sill.
  - B. It is a mafic dike.
  - C. It is an intermediate sill.
  - D. It is an intermediate dike.
13. The granite batholith located at **Z** contains crystals of different sizes. In the middle of the batholith the crystals are large, but close to the country rock the crystals are very small. What is the **likely** reason for this difference?
- A. The magma in the middle was more silicic.
  - B. The magma in the middle contained less water.
  - C. The magma in the middle cooled faster than near the country rock.
  - D. The magma close to the country rock cooled faster than in the middle.

**Data**  
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**Data**  
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Use the following photograph to answer question 14.



© Geocomp Media

14. Which of the following is the **best** name for the rock shown in the photograph?

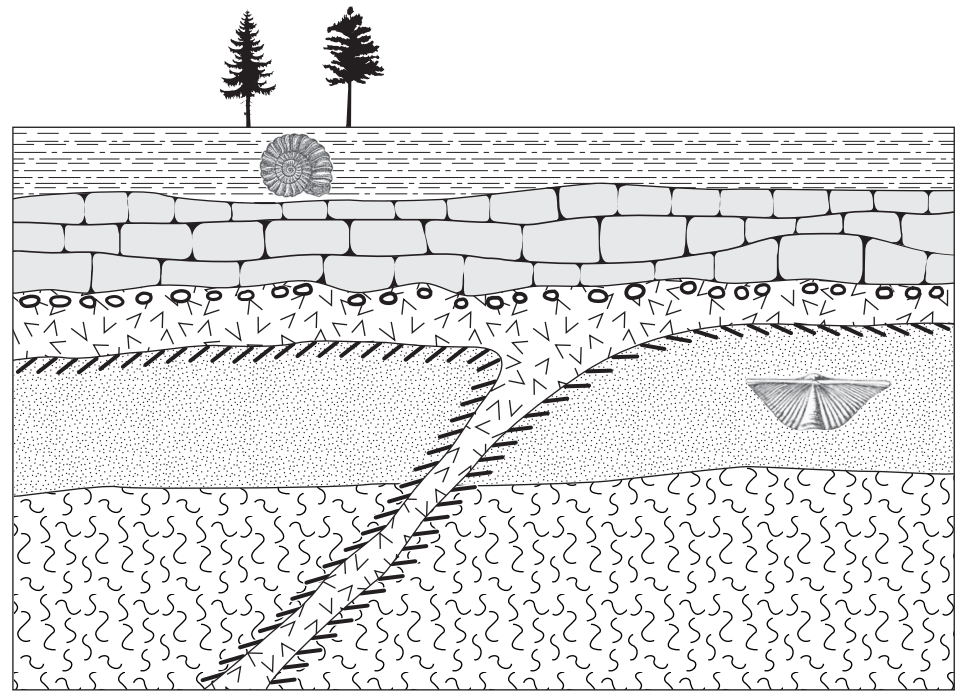
- A. breccia
  - B. siltstone
  - C. sandstone
  - D. conglomerate
- 

15. If a new planet were found between Venus and Mercury, which of the following features would it **most likely** have?

- A. a ring system
- B. a radius greater than 10 000 km
- C. a density greater than  $3.0 \text{ g/cm}^3$
- D. an average surface temperature of  $-250^\circ\text{C}$



Use the following geological cross section to answer question 16.

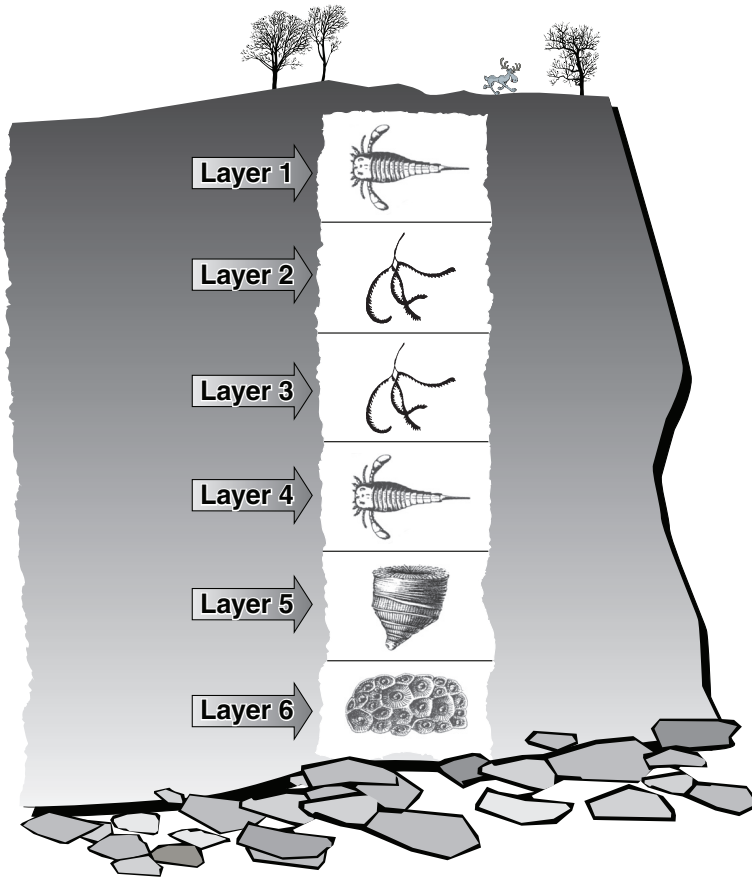


legend	
	Shale
	Limestone
	Sandstone
	Igneous intrusion ≈ 310 m.y.
	Contact metamorphism
	Vesicles
	Gneiss ≈ 500 m.y.

16. What is the **best** relative age of the fossil in the sandstone layer?
- A. younger than the intrusion
  - B. younger than the limestone
  - C. older than the intrusion, older than the gneiss
  - D. older than the intrusion, younger than the gneiss

**Data**  
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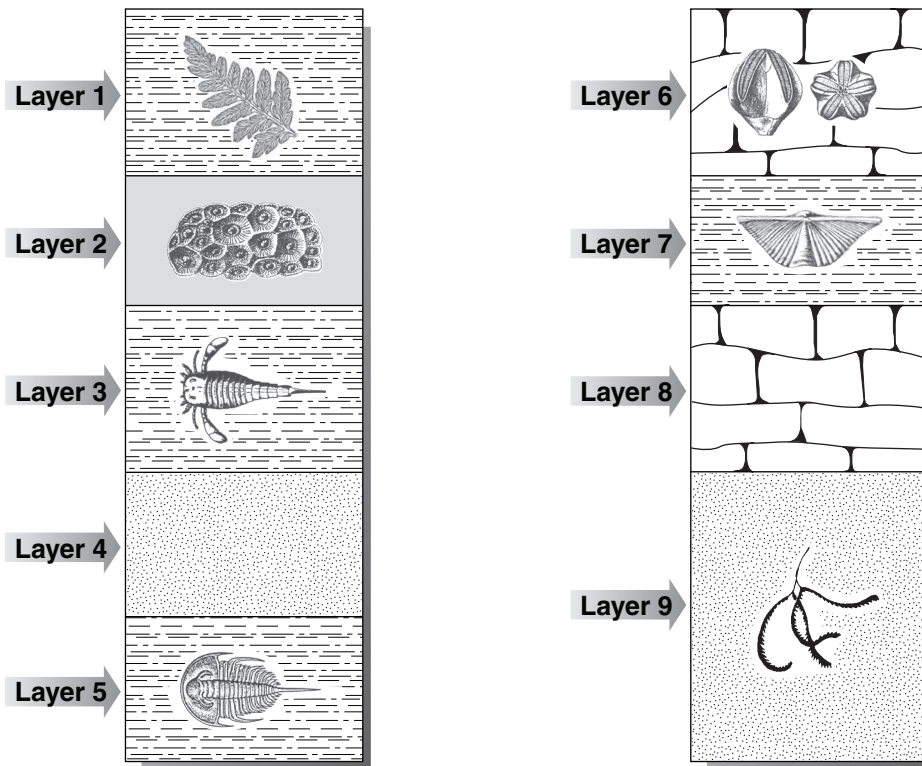
17. A geologist finds a sequence of fossils in a cliff face as shown below.



Which layer is the youngest?

- A. 1
- B. 2
- C. 5
- D. 6

For question 18, refer to the diagram below of two geological cross sections.  
Each layer in a column corresponds to a different period.

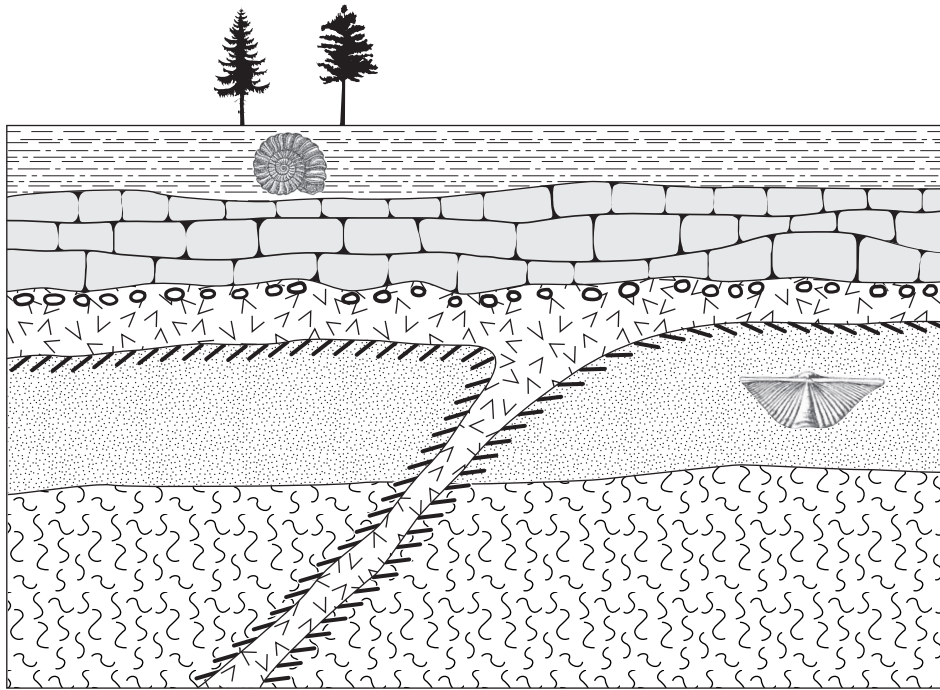


18. Which of the following layers can be correlated with each other?

- A. 1 and 2
- B. 2 and 6
- C. 3 and 5
- D. 4 and 7

**Data**  
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Use the following geological cross section to answer question 19.  
 Each layer represents a different geological period.

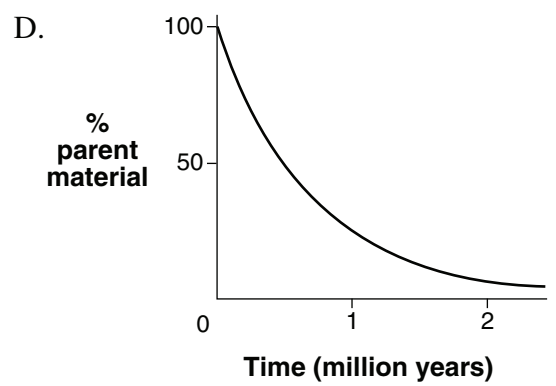
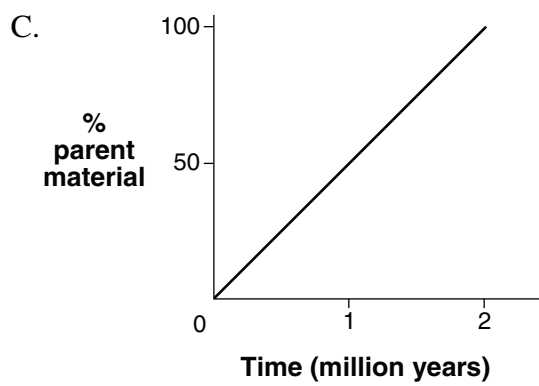
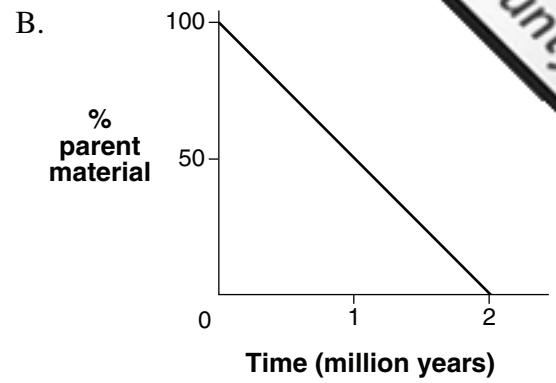
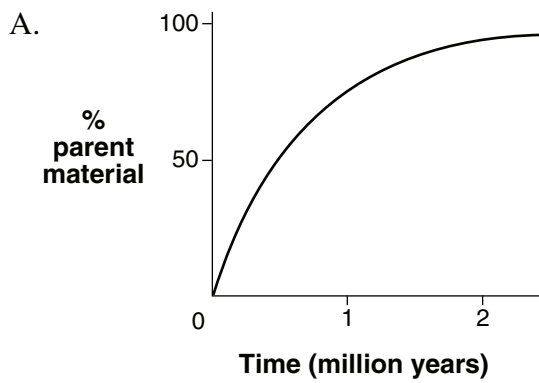


Legend			
	Shale		Igneous intrusion ≈ 310 m.y.
	Limestone		Contact metamorphism
	Sandstone		Vesicles
			Gneiss ≈ 500 m.y.

19. What is the **most likely** age of the limestone layer?
- A. Triassic
  - B. Permian
  - C. Mississippian
  - D. Silurian

**Data**  
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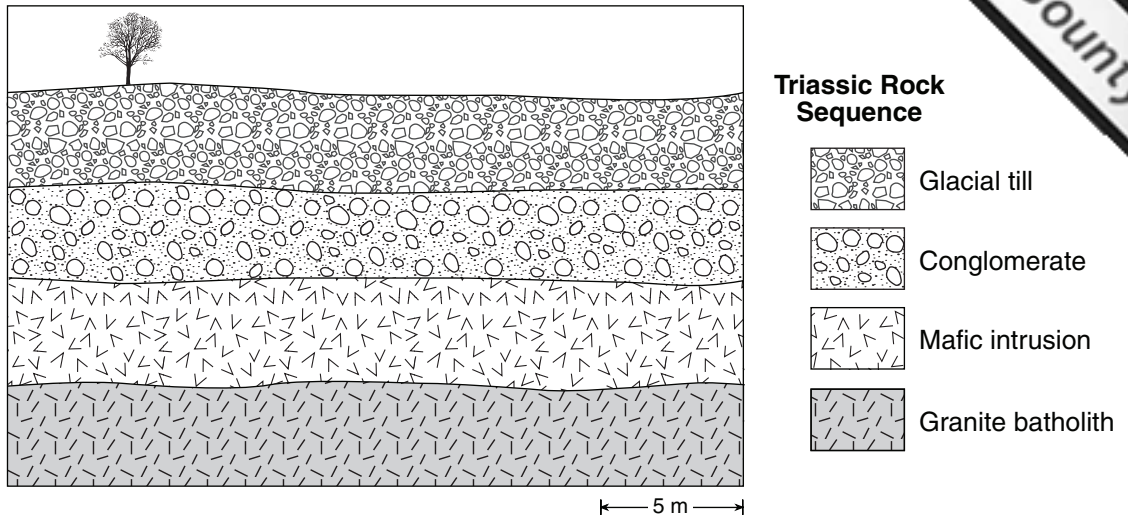
20. Which of the following graphs correctly shows the decay of a radioactive isotope?



21. How much of the original radioactive parent material would be left in a rock sample after three half-lives?

- A.  $\frac{1}{2}$
- B.  $\frac{1}{3}$
- C.  $\frac{1}{6}$
- D.  $\frac{1}{8}$

Use the following geological cross section to answer question 22.



22. Which of the following methods would give the **best** absolute age of the layer it is measuring?

- A. uranium-lead dating of the mafic intrusion
- B. dating the granite batholith by superposition
- C. rubidium-strontium dating of the conglomerate
- D. carbon-14 dating of the boulders in the glacial till

**Data**  
Page 4

Use the following table showing sequences of Earth's history to answer questions.

<i>Youngest</i>			
I	II	III	IV
first flowering plants	mammals dominate	first humans	amphibians dominate
invertebrates dominate	fish dominate	Rocky Mountains form	Pleistocene glaciation
formation of oldest rocks	reptiles dominate	fish dominate	Pacific Coast orogeny
<i>Oldest</i>			

23. Which two of the above sequences list the events in the correct order?

- A. I and II
- B. I and III
- C. II and III
- D. II and IV



24. The fossil shown below is composed of calcite and shows no internal features of the original organism when sawed in half.

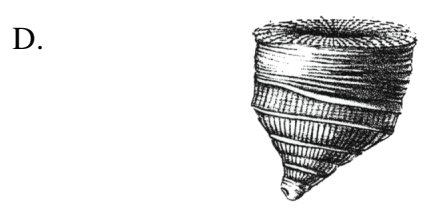
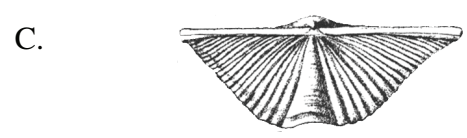
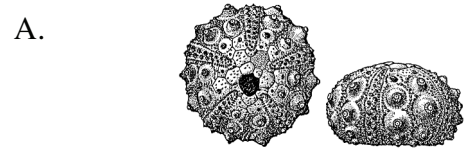


The fossil is

- A. a cast.
- B. a mold.
- C. carbonized.
- D. permineralized.

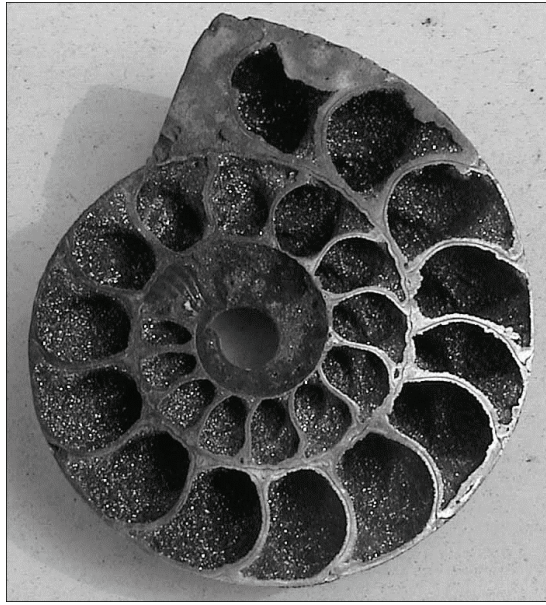
25. The most useful fossils for matching layers of sedimentary rock that are separated by large distances are referred to as
- A. trace fossils.
  - B. index fossils.
  - C. micro fossils.
  - D. extinct fossils.

26. Which of the following fossils is a graptolite?






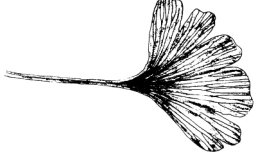


Use the following photograph to answer question 27.



© Adam Sedgewick

27. In what environment would the organism that formed the fossil shown in the photograph have lived?
- A. river sandbar
  - B. tropical swamp
  - C. saltwater marine
  - D. mountain stream

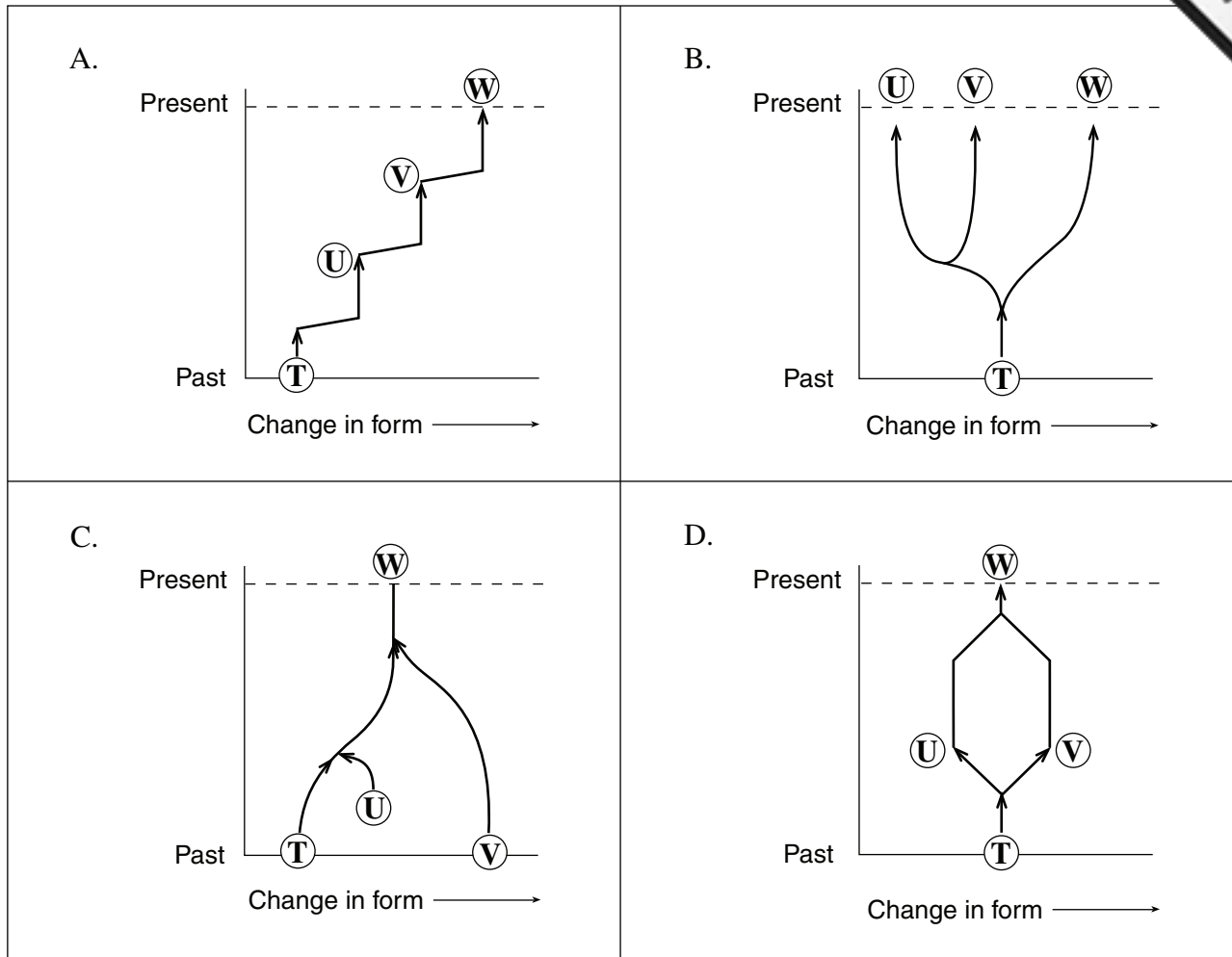
Use the following table of fossil samples to answer question 28.

Sample #	Sketch	Original environment
I		marine
II		terrestrial
III		deep marine
IV		shallow marine

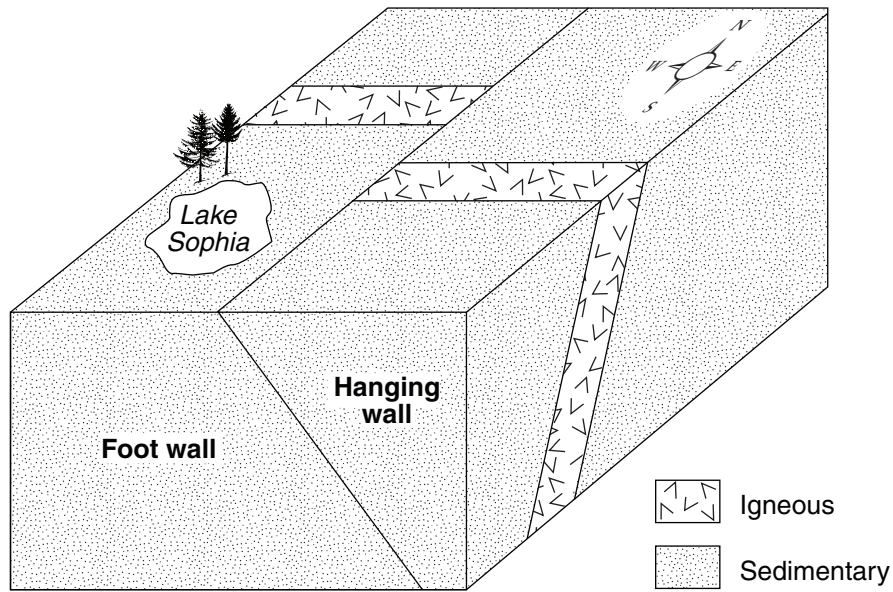
28. Which fossil does **not** match its original environment?

- A. I
- B. II
- C. III
- D. IV

29. Which of the following diagrams **best** illustrates the evolutionary concept of adaptive radiation? The letters T, U, V and W represent different species.

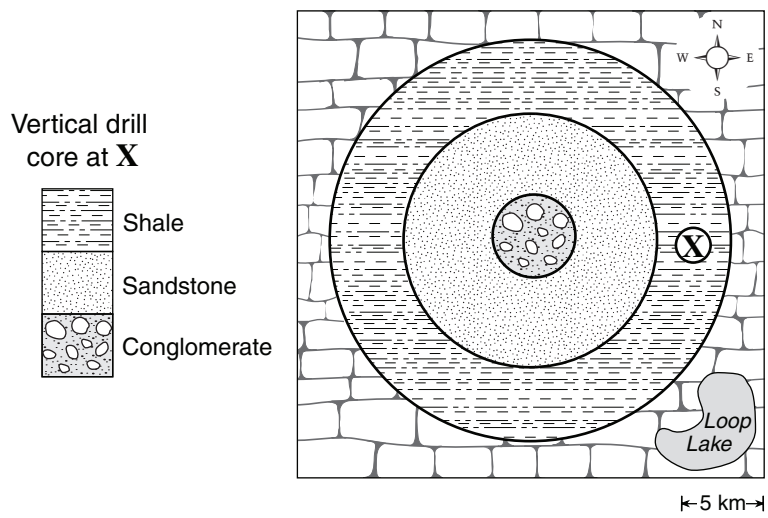


Use the following block diagram of a reverse fault and dike to answer questions.



30. Which of the following statements correctly describes the orientation of features shown in the block diagram?
- A. The fault dips east.
  - B. The fault strikes west-east.
  - C. The dike strikes north-south.
  - D. The dike dips east.

Use the following map of a completely flat area to answer questions 31 and 32.



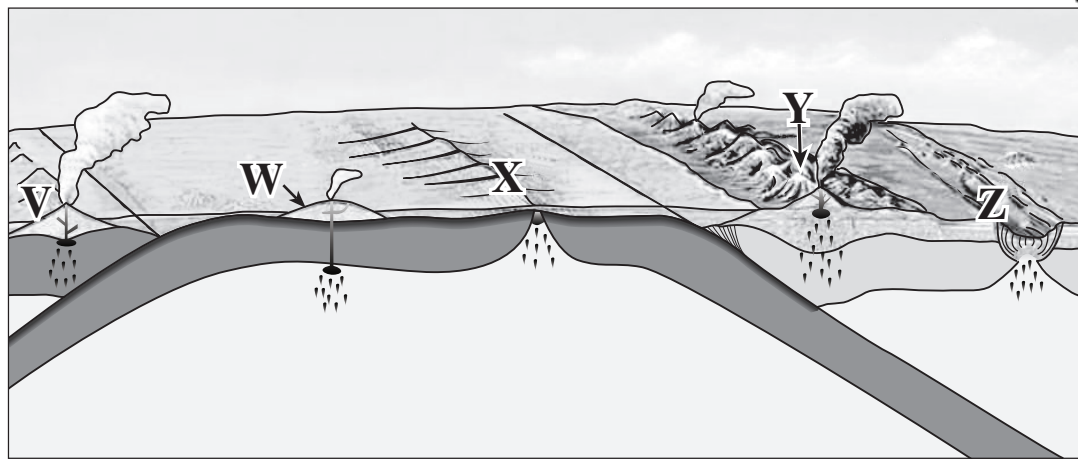
31. Based on the vertical drill core shown, what is the structure shown on the map?

- A. dome
- B. basin
- C. syncline
- D. anticline

32. What would the strike-dip symbol be at location X?

- A.
- B.
- C.
- D.

Use the following cross section of plate boundaries to answer questions 33 to 34.



33. What kind of plate interaction is **not** shown in the cross section?

- A. subduction boundary
- B. oceanic–oceanic convergence
- C. oceanic–continental convergence
- D. continental–continental convergence

34. At which location are tectonic plates moving apart?

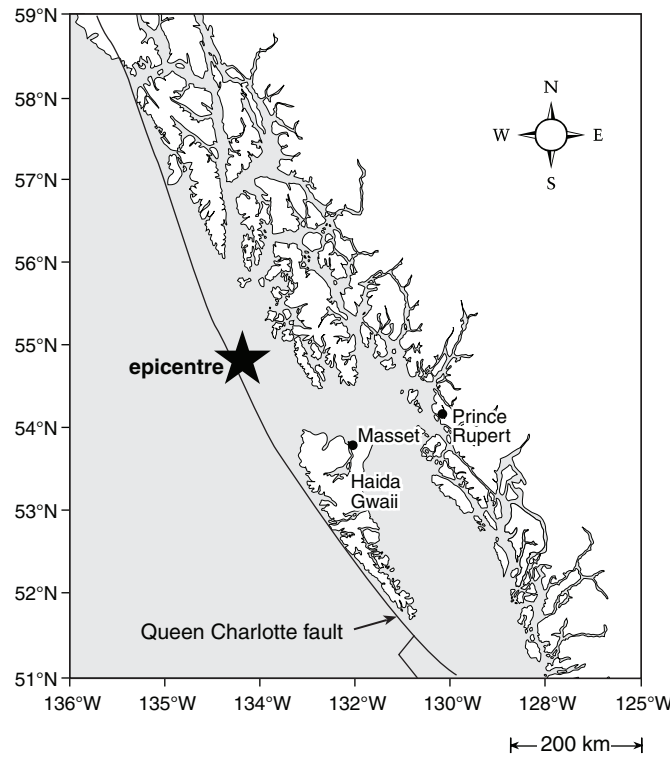
- A. V
- B. W
- C. Y
- D. Z

Use the following photograph to answer question 35.



35. At what two locations would volcanoes similar to the one shown in the photograph be found?
- A. V and W
  - B. V and Y
  - C. W and X
  - D. Y and Z
36. Which locations would experience **only** shallow earthquakes (less than 60 km deep)?
- A. X and Z
  - B. W and Y
  - C. V and X
  - D. V and Y
- 
37. Which of the following is considered to be a driving force for plate tectonics?
- A. hot spot eruptions
  - B. Earth's strong magnetic field
  - C. convection in the upper mantle
  - D. movement of material in the outer core
38. Which of the following has **not** been considered as an earthquake precursor?
- A. unusual animal behaviour
  - B. changes in the tilt of the ground
  - C. changes in height of tides before an earthquake
  - D. increases in the amount of radon gas in well water

Use the following map and description of a large earthquake in western British Columbia to answer questions 39 to 42.



The following is an account given by a farmer living in Masset, located in the Haida Gwaii islands of BC, who experienced a major earthquake with a Richter magnitude of 7.8.

*“I was knocked out of my bed by a sudden jolt. It sounded like a freight train coming and I felt the ground shaking in an up and down motion.*

*About 10 seconds later, I felt the ground shake violently under my feet in a side to side motion. Outside, I could see the swings on the kids’ swingset and the trees in my backyard started swaying even though there was no wind. I fell down to my hands and knees to steady myself. The walls of the house seemed to bend and twist, as if they were made of rubber. My neighbour’s barn, built by his grandfather, collapsed into a jagged pile of kindling, and I could see the inside of his house where parts of the walls collapsed. I saw his tractor sinking where mud was oozing out of the ground.*

*There was a brief lull in the shaking, then the ground started to roll. On the whole, the shaking only lasted about half a minute. After it was all over, my house looked basically untouched except for some cracks in the chimney. I saw my neighbour leave his house by a second floor window which was now at the level of the ground – the first floor had sunk right into the ground.”*

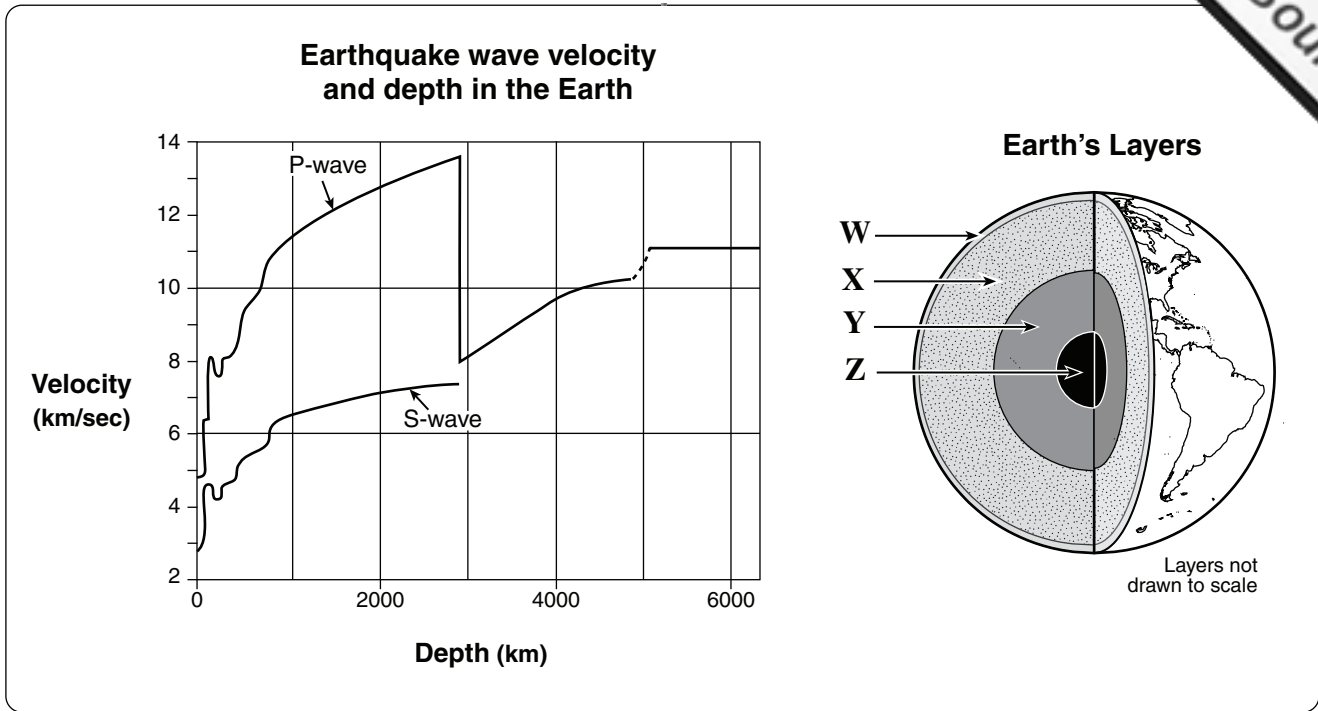
*Al Shookup, eyewitness*



39. What was the mechanism responsible for the sudden release of energy during this earthquake?
- A. fault creep
  - B. tectonic recoil
  - C. elastic rebound
  - D. isostatic rebound
40. Seismograph stations in Masset and Prince Rupert recorded this earthquake. What is the minimum number of **additional** seismograph stations required to determine the location of the epicentre?
- A. 0
  - B. 1
  - C. 2
  - D. 3
41. Although the earthquake was given a Richter magnitude of 7.8, the farmer's land and his neighbour's land were given different Mercalli ratings. Which of the following would be the **best** Mercalli rating for the neighbour's farm?
- A. V
  - B. VI
  - C. VIII
  - D. XII
42. Which of the following processes **most likely** caused the neighbour's house to sink?
- A. plate rifting
  - B. crustal uplift
  - C. soil liquefaction
  - D. stress fracturing

**Data**  
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Use the following diagrams to answer questions 43 and 44.



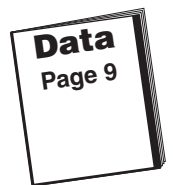
43. According to the graph, which layers do S-waves travel through?

- A. W and X
- B. X and Y
- C. Y and Z
- D. W and Z

44. Which of the following reasons explains why the seismic wave velocities drop dramatically at a depth of about 200 km?

- A. The waves enter the rigid lithosphere.
- B. The waves enter the plastic asthenosphere.
- C. Energy is reflected at a boundary between layers.
- D. Energy has been lost travelling to such a great depth.

45. Under what conditions are rocks more likely to bend than break?
- A. slow deformation at low temperatures
  - B. slow deformation at high temperatures
  - C. rapid deformation at low temperatures
  - D. rapid deformation at high temperatures
46. What are joints?
- A. faults
  - B. foliation
  - C. crystal faces
  - D. cracks in rocks
47. Mercury has no deformed craters or fold mountain belts. Which of the following is the **most likely** explanation for this observation?
- A. Mercury has no atmosphere.
  - B. Mercury is geologically very active.
  - C. There is little tectonic activity on Mercury.
  - D. The surface temperature of Mercury is very high.
48. Which of the following features do Venus and Earth have in common?
- A. rocky crusts
  - B. length of day
  - C. cratered moons
  - D. strong magnetic fields
49. Which of the following is a commercial use of gypsum?
- A. jewellery
  - B. food additive
  - C. construction material
  - D. source of precious metal



Use the following information to answer question 50.

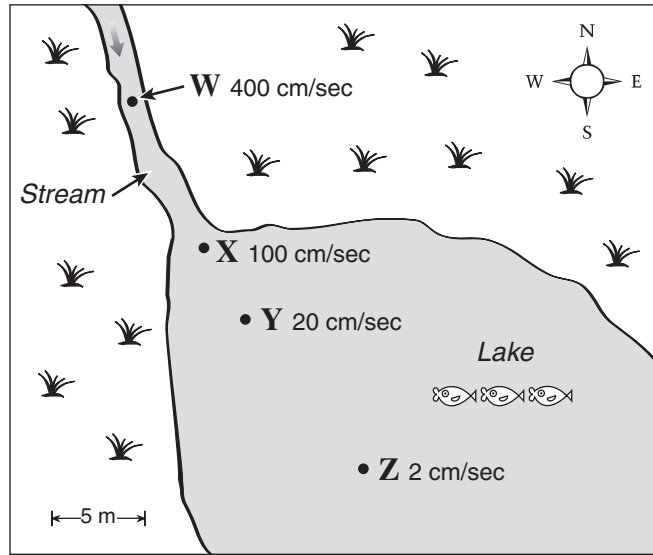
Formation of Energy Resources	
I	Marine microorganisms die.
II	Organic material is heated and compressed.
III	Organic material is buried by sediment.
IV	Hydrocarbons sink through permeable rock because they are denser than water.
V	Trees die in a swamp.
VI	Hydrocarbons rise through permeable rock because they are less dense than water.

50. Which of the following describes the order of formation of an oil deposit?
- A. I, II, III, IV
  - B. I, III, II, VI
  - C. V, III, II, IV
  - D. V, II, III, VI
- 
51. Copper and gold mineralization has been found in veins around a granite intrusion. Which of the following is **most likely** responsible for the mineralization?
- A. hydrothermal solutions
  - B. placer deposition
  - C. crystal settling
  - D. evaporation

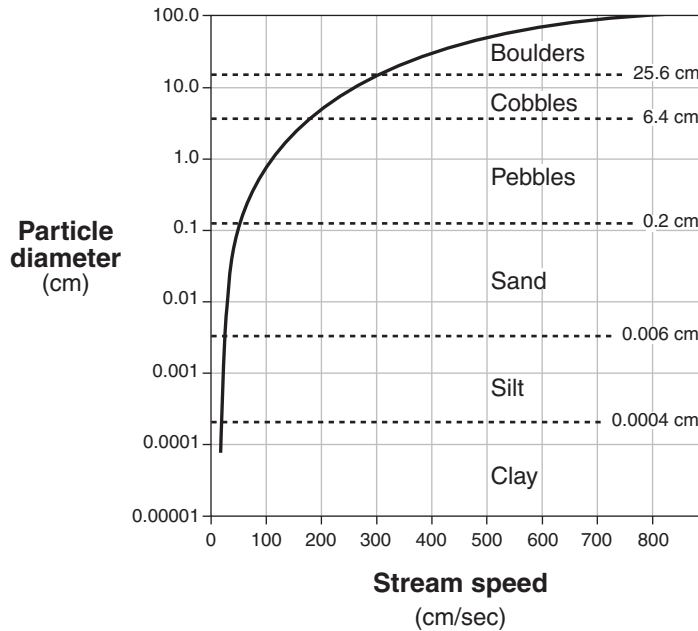
52. Which of the following processes is **not** a type of mass wasting?
- A. creep
  - B. landslide
  - C. avalanche
  - D. exfoliation
53. Which of the following processes is an example of chemical weathering?
- A. Granite is sandblasted by a desert wind.
  - B. Limestone is dissolved by groundwater.
  - C. Shale is scratched by rocks at the base of a glacier.
  - D. Sand grains on a beach are rounded by wave action.
54. V-shaped valleys in mountainous regions result mainly from river erosion. Which of the following would also contribute to the “V” shape of these mountain valleys?
- A. mass wasting
  - B. wind erosion
  - C. reverse faulting
  - D. glacial deposition

Use the following diagrams to answer question 55.

Map of water velocities of stream and lake



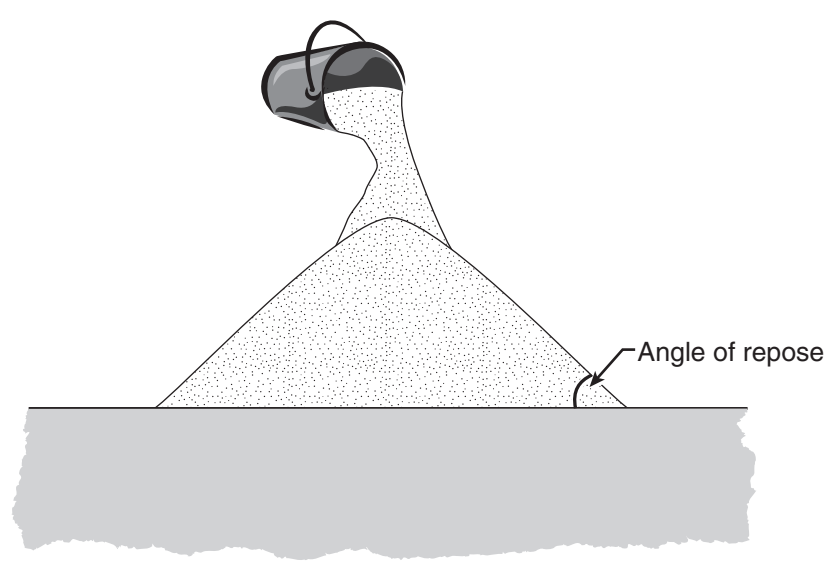
Graph showing particle diameter and stream speed



55. At which location would the water be moving clay, silt, sand and pebbles, but not cobbles or boulders?

- A. W
- B. X
- C. Y
- D. Z

Use the following diagram to answer question 56.



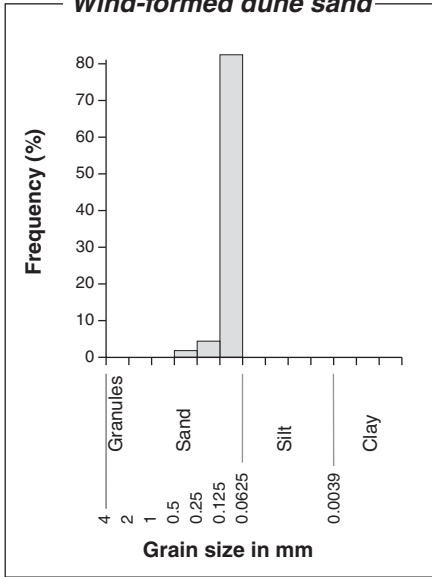
*The angle of repose is the steepest angle at which a slope of unconsolidated material is stable.  
The angle of repose is different for different materials.*

56. A geologist is trying to stabilize a clay slope where the soil is continually creeping and slumping down onto a road. Which of the following sediments, when added, would best help to stabilize the slope?

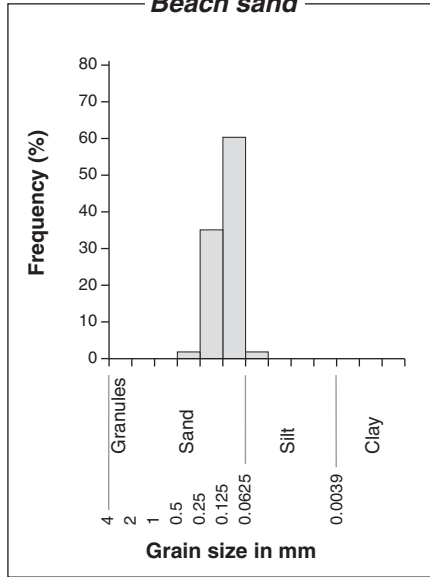
	<b>Sediment</b>	<b>Average particle size in mm</b>	<b>Particle shape</b>	<b>Angle of repose in degrees</b>
A.	coarse sand	2	angular	38
B.	coarse sand	2	rounded	35
C.	large pebbles	100	angular	47
D.	large pebbles	100	rounded	43

Use the following sediment-sorting graphs to answer questions 57 and 58

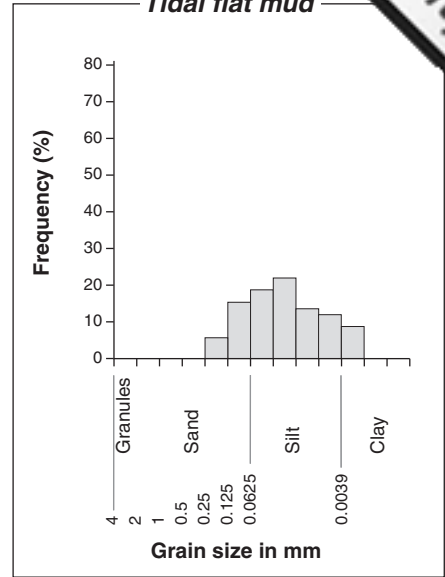
**Wind-formed dune sand**



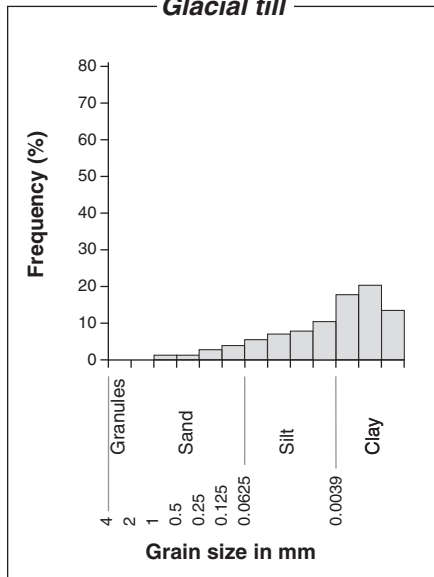
**Beach sand**



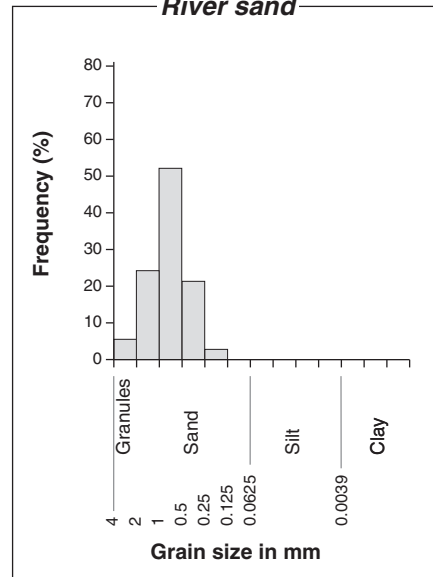
**Tidal flat mud**



**Glacial till**



**River sand**

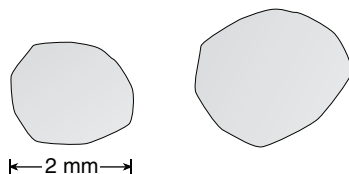




57. Which of the following is most poorly sorted?

- A. river sand
- B. beach sand
- C. tidal flat mud
- D. wind-formed dune sand

58. From which sediment shown on the graphs were the following quartz grains **most likely** extracted?



- A. river sand
- B. glacial till
- C. tidal flat mud
- D. wind-formed dune sand

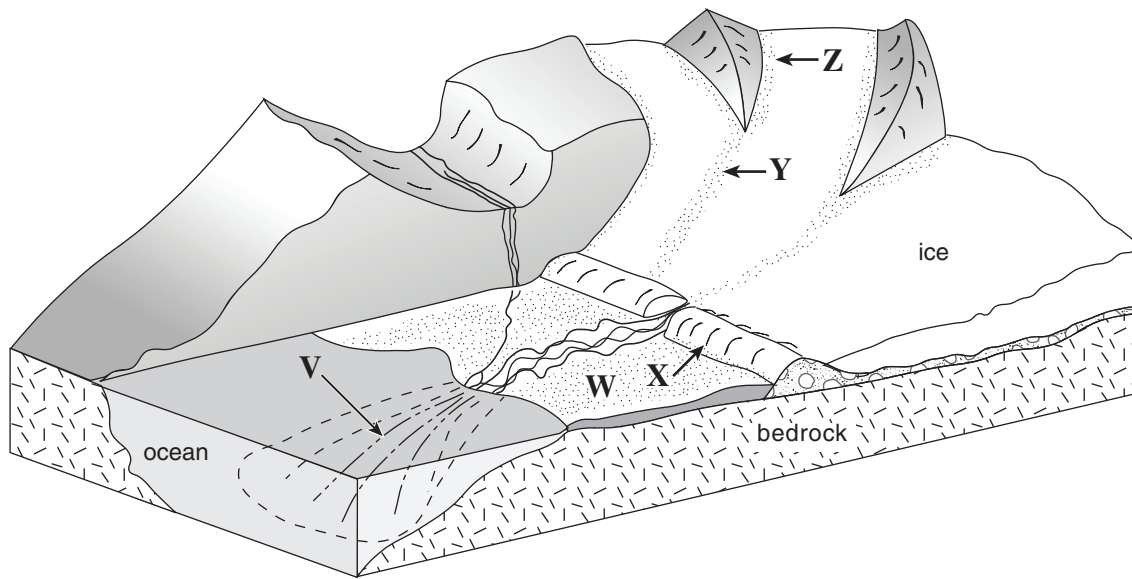
Use the following table to answer question 59.

Mineral	Percent Composition of Minerals		
	River sand	Beach sand	Wind-formed dune sand
Quartz	50	70	87
Feldspar	20	20	9
Mica (biotite and muscovite)	15	8	4
Amphibole	15	2	0
<b>Total %</b>	<b>100</b>	<b>100</b>	<b>100</b>

59. Which of the following conclusions can be drawn from the data in the table?

- A. Quartz has a hardness of 8.
- B. Amphibole weathers most easily.
- C. Mica is very stable at the Earth's surface.
- D. Feldspars cannot be transported by water.

Use the following diagram of a mountainous region containing a glacier to answer questions 60 and 61.



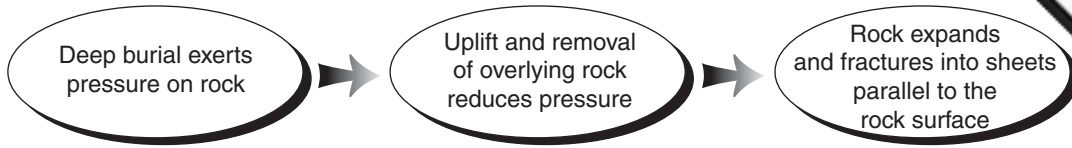
60. At which location is lateral moraine found?

- A. W
- B. X
- C. Y
- D. Z

61. Compared to the sediments found at X, the sediments in the delta at V are

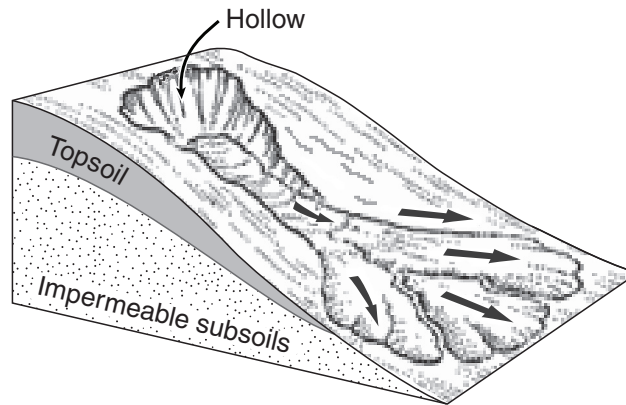
- A. better sorted, more angular.
- B. better sorted, more rounded.
- C. poorly sorted, more angular.
- D. poorly sorted, more rounded.

Use the following flow chart to answer question 62.



62. What geological process is represented by the sequence of events in the flow chart?
- A. exfoliation
  - B. lithification
  - C. mass wasting
  - D. chemical weathering

Use the following block diagram of an erosional process to answer question 63.



63. Which of the following **best** describes the erosional process shown in the diagram?

	Name of Erosional Process	Likely Cause of Erosional Process
A.	debris flow	poor drainage
B.	rotational slump	freezing and thawing
C.	soil creep	poor drainage
D.	rock fall	freezing and thawing

Use the following photograph of a sedimentary structure to answer question



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←—10 cm—→

64. In which of the following environments would this sedimentary structure be found?
- A. desert dune
  - B. tidal mud flats
  - C. deep ocean in cold water
  - D. shallow in a very warm sea

**This is the end of the multiple-choice section.  
Answer the remaining questions directly in the Response Booklet.**

