



Geology 12

Resource Exam A

Exam Booklet

PART A: MULTIPLE CHOICE

Value: 64 marks

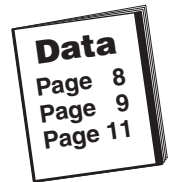
Suggested Time _____

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

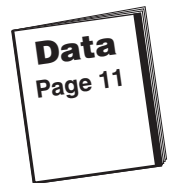
Data icons occur throughout the examination to indicate that useful information may be found in the Data Pages to help answer a particular question.



1. The mineral shown in Photograph 1 cannot be scratched by a fingernail, but can be scratched by a copper penny. What is the mineral?
A. halite
B. quartz
C. calcite
D. sphalerite



2. Photograph 2 shows layers of two different clastic sedimentary rocks. Dilute acid was placed on the rocks with no reaction. Identify both rocks.

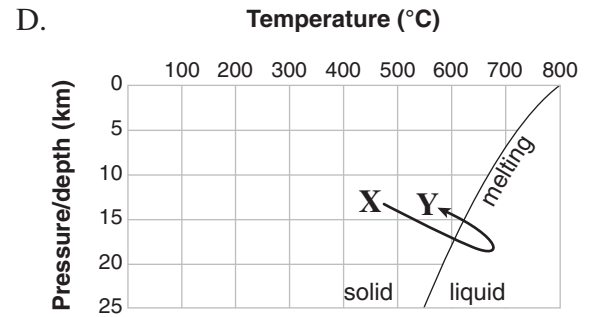
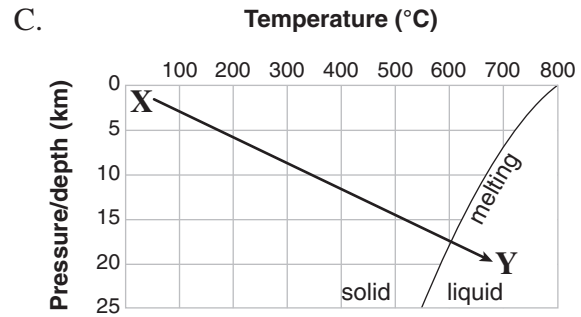
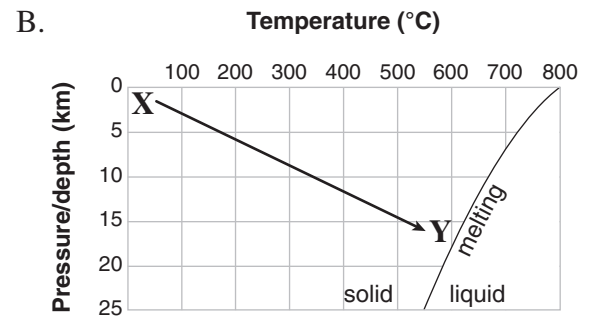
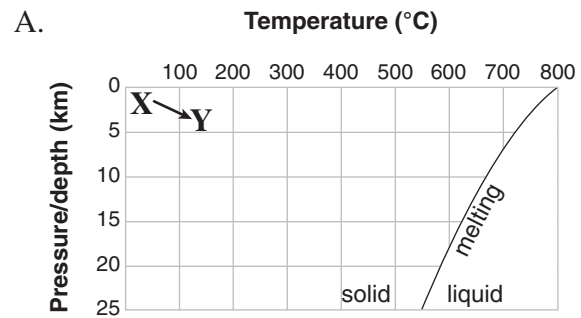


| | Rock at X | Rock at Y |
|----|------------------|------------------|
| A. | sandstone | conglomerate |
| B. | breccia | limestone |
| C. | sandstone | breccia |
| D. | conglomerate | sandstone |

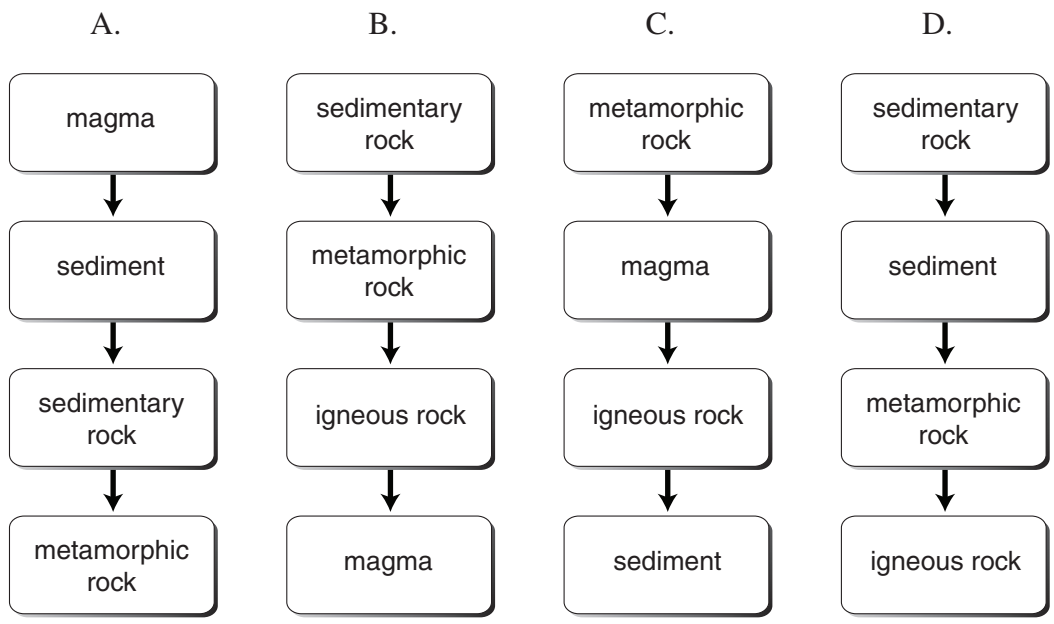
3. What rock would be formed if the sediment shown in Photograph 3 became lithified?
- A. chert
 - B. breccia
 - C. limestone
 - D. rock gypsum
4. Photograph 4 shows a new lava flow advancing over a previous flow. Identify both types of lava flow.

| | New Lava | Previous Lava |
|----|----------|---------------|
| A. | aa | pillow |
| B. | aa | pahoehoe |
| C. | pahoehoe | aa |
| D. | pillow | pahoehoe |

5. The arrow on each of the following diagrams indicates the changes in pressure and temperature conditions that occur during a geological process. Which diagram represents the change in conditions during the transformation of gneiss, X into granite, Y?



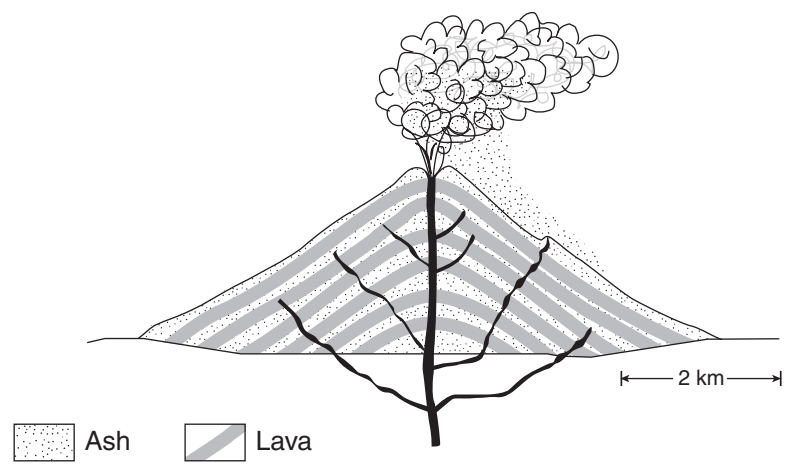
6. Which sequence of the materials below shows no missing steps, and could occur during the rock cycle?



7. An igneous rock contains many one-centimetre diameter crystals of olivine. Which of the following statements about the igneous rock would be true?

- A. It cooled very slowly at temperatures between 600° C and 800° C.
- B. It cooled very rapidly at temperatures between 600° C and 800° C.
- C. It cooled very slowly at temperatures between 1100° C and 1200° C.
- D. It cooled very rapidly at temperatures between 1100° C and 1200° C.

Use the following diagram of a volcano to answer question 8.



8. What type of volcano is shown in the diagram?

- A. shield
- B. lava dome
- C. cinder cone
- D. composite

9. According to Hutton's "Principle of Uniformitarianism," the Earth's sedimentary rocks

- A. were all formed recently.
- B. are continuously being formed.
- C. ceased being formed billions of years ago.
- D. were deposited when the planet first formed.

10. What does the presence of garnet and mica indicate about the formation of the schist shown in Photograph 5?

- A. It formed by rusting of another rock.
- B. It formed by precipitation from seawater.
- C. It formed by erosion along a stream bottom.
- D. It formed under high pressure and temperature.

11. Which of the following minerals is most likely to occur **only** in silicic igneous rocks?

- A. olivine
- B. pyroxene
- C. muscovite
- D. amphibole

12. Which of the following characteristics is explained by planetary growth (accretion) during the formation of the solar system?

- A. Mercury has craters.
- B. Venus has volcanoes.
- C. Earth has earthquakes.
- D. Mars has lake sediments.

13. Which list correctly shows the order of abundance of silicon, oxygen and iron in the Earth's crust?

| | Most Abundant | | Least Abundant |
|----|---------------|---------|----------------|
| A. | silicon | iron | oxygen |
| B. | oxygen | silicon | iron |
| C. | silicon | oxygen | iron |
| D. | oxygen | iron | silicon |

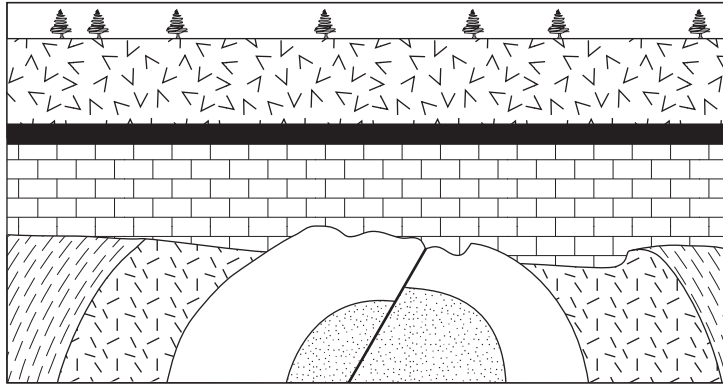
14. Which of the following groups of earth materials all belong to the same rock family?

- A. chert, sandstone, gypsum
- B. obsidian, granite, gneiss
- C. conglomerate, shale, slate
- D. schist, gneiss, rock salt

15. Which of the following **best** classifies a rock that formed from the burial of a coral reef?

- A. clastic
- B. evaporite
- C. organic/biological
- D. chemical precipitate

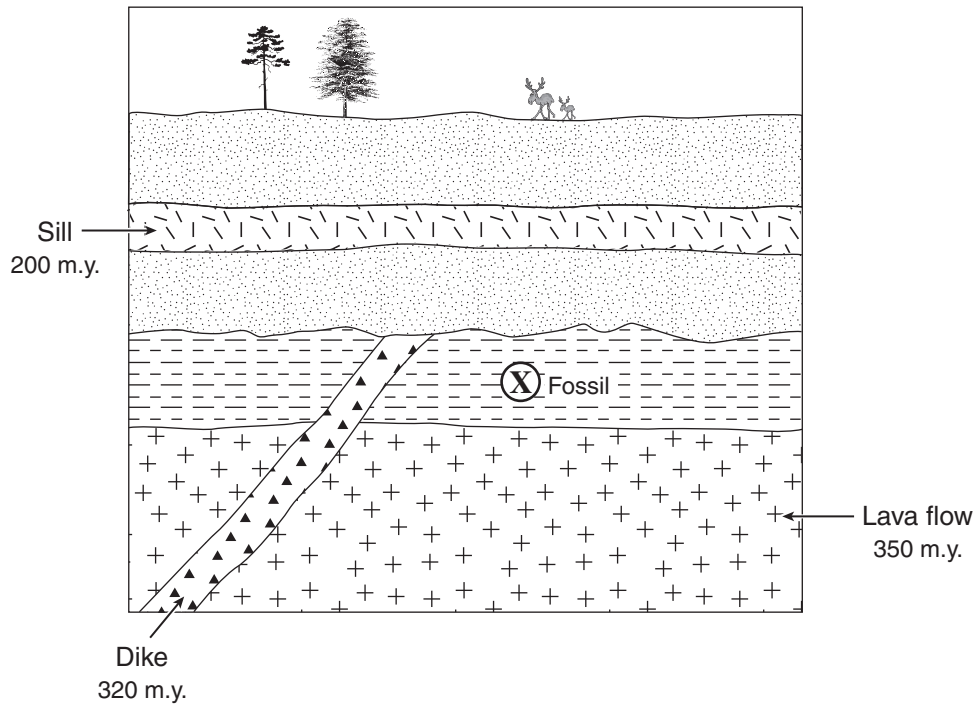
Use the following geological cross section to answer question 16.



16. Which of the following lists of events would best account for the sequence of geological structures shown in the cross section?

| | A. | B. | C. | D. |
|-----------------|------------|------------|------------|------------|
| <i>youngest</i> | deposition | faulting | deposition | faulting |
| | faulting | deposition | erosion | deposition |
| | deposition | erosion | faulting | erosion |
| | faulting | folding | folding | deposition |
| <i>oldest</i> | erosion | deposition | deposition | folding |

Use the following geological cross section containing both igneous and sedimentary rocks to answer question 17.
The absolute ages of the igneous rocks are given.



17. What is the probable age of a fossil at X in the cross section?
- A. Jurassic
 - B. Triassic
 - C. Permian
 - D. Mississippian

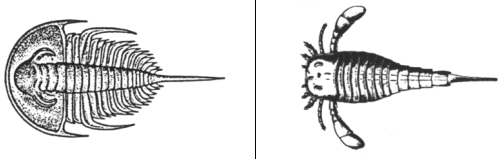
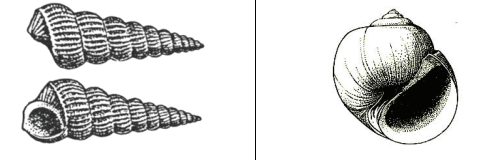
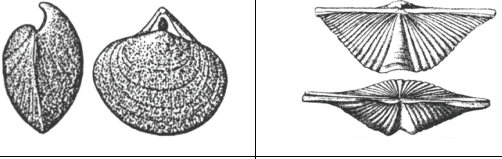
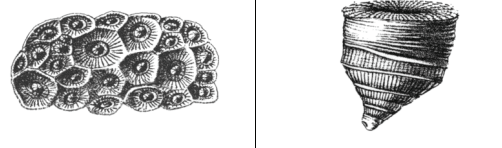
Data
Page 4

18. Why is it **not** possible to date Pliocene fossils with the carbon-14/nitrogen-14 dating technique?
- A. Carbon-14 is not found in living organisms.
 - B. Carbon-14 decomposes as soon as organisms die.
 - C. Nitrogen-14 is a gas and escapes from the samples.
 - D. There would not be enough carbon-14 remaining to measure accurately.

Data
Page 4

19. As a result of radioactive decay of an isotope, how much original parent isotope remains after four half-lives?
- A. 3.12%
 - B. 6.25%
 - C. 12.5%
 - D. 25.0%

20. Which of the following pairs of organisms are brachiopods?

| FOSSILS | |
|---------|---|
| A. |  |
| B. |  |
| C. |  |
| D. |  |

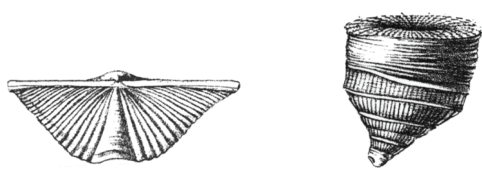
21. Which of the following is a trace fossil?
- A. teeth
 - B. shells
 - C. bones
 - D. burrows

22. Which of the following is a characteristic of index fossils?
- A. They lived only on land.
 - B. They were geographically widespread.
 - C. They were large enough to resist total decay.
 - D. They did not evolve (change) their form for several geologic periods.

23. Photograph 6 shows a cross section of a fossil shell made entirely of pyrite. What type of preservation produced this fossil?
- A. replacement
 - B. carbonization
 - C. mold formation
 - D. original preservation

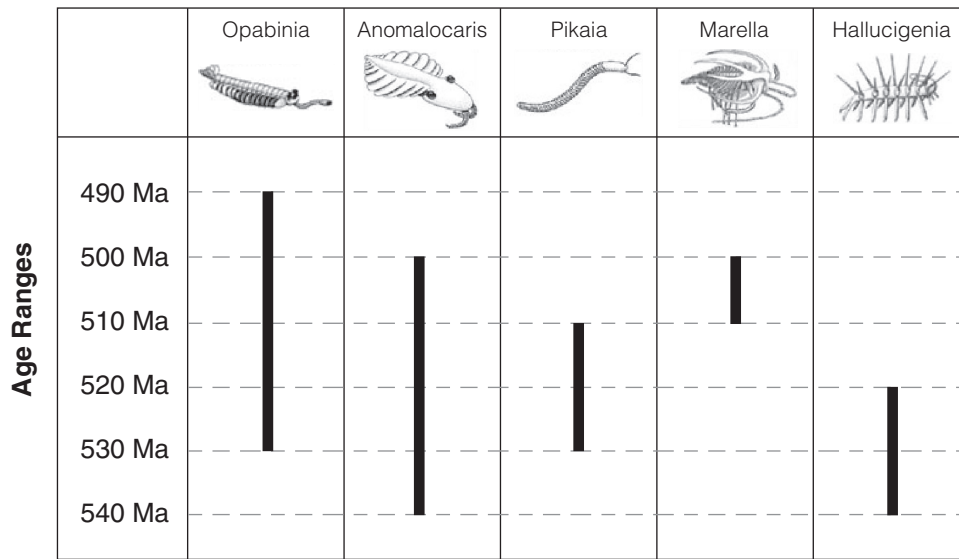
24. Which of the following principles is described by the phrase:
- “In times of environmental change, organisms that are better adapted to their environment are more likely to survive.”*
- A. natural selection
 - B. faunal succession
 - C. adaptive radiation
 - D. punctuated equilibrium

25. A shale contains the fossils shown below. What was the probable environment in which the sediments were deposited?

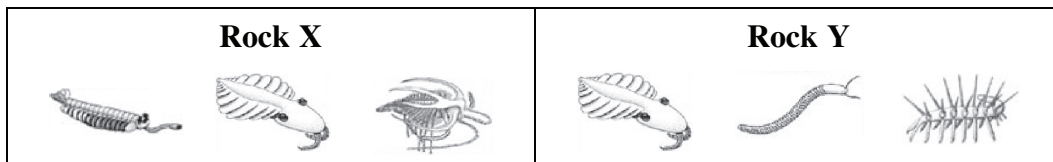


- A. forest
- B. desert
- C. marine
- D. swamp

Use the following diagram of the age ranges of five Cambrian fossils to answer question 26.



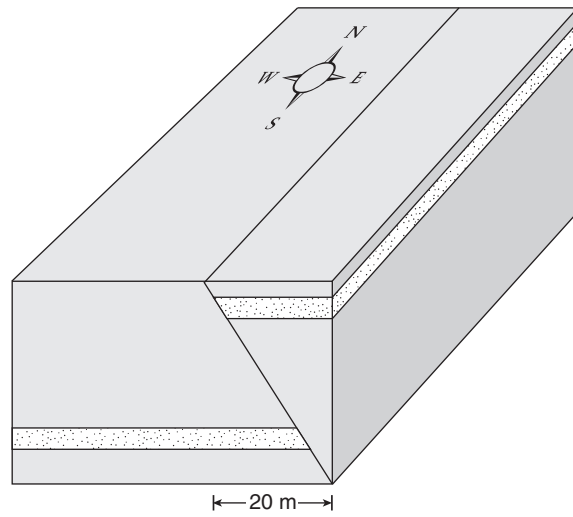
Two Cambrian rocks, X and Y, were collected and the fossils within them compared.



26. How does the age of Rock Y compare to the age of Rock X?

- A. Rock Y is older.
- B. Rock Y is younger.
- C. They are the same age.
- D. The relative ages cannot be determined.

Use the following block diagram showing layers of rock cut by a fault to answer questions 27 and 28.



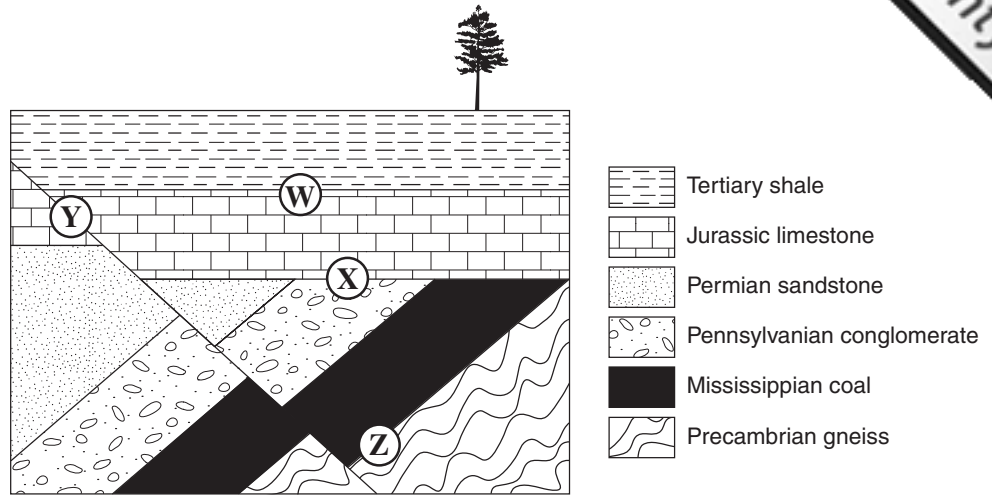
27. The strike direction of the fault is

- A. east.
- B. north.
- C. northeast.
- D. northwest.

28. What type of fault is shown in the diagram?

- A. normal
- B. reverse
- C. transform
- D. strike-slip

Use the following diagram to answer question 29.
Each layer represents a complete geological period.



29. Which labelled feature is **not** an unconformity?

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

Data
Page 4

30. Which of the following dates (in millions of years before present) **most likely** corresponds to a time of mass extinction?

- A. 251 Ma
- B. 400 Ma
- C. 544 Ma
- D. 4600 Ma

Data
Page 3
Page 4

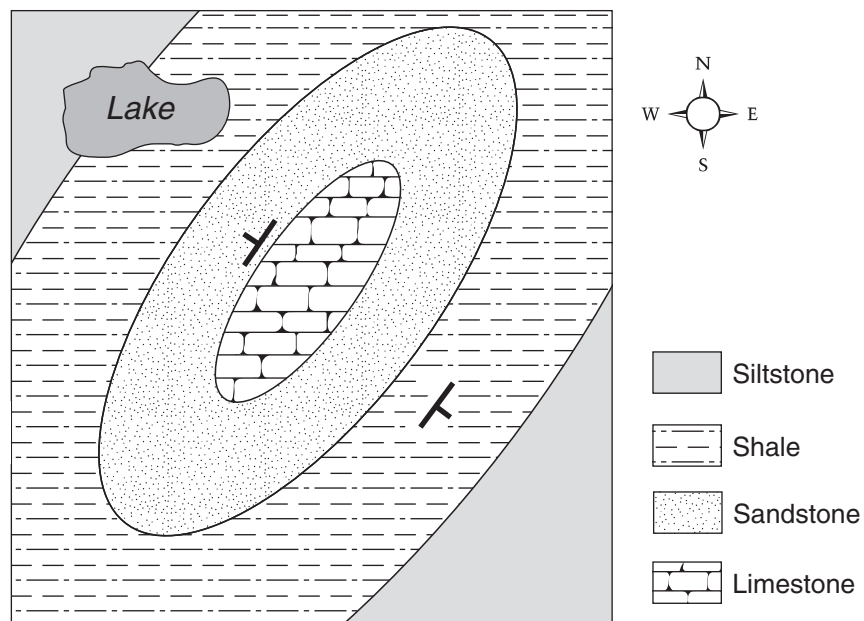
Use the following table showing sequences of Earth's history to answer question 31.

| Youngest | | | |
|---------------------------|-------------------|----------------------|------------------------|
| 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 |
| Oldest | | | |

31. 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

Use the following geological map to answer question 32.

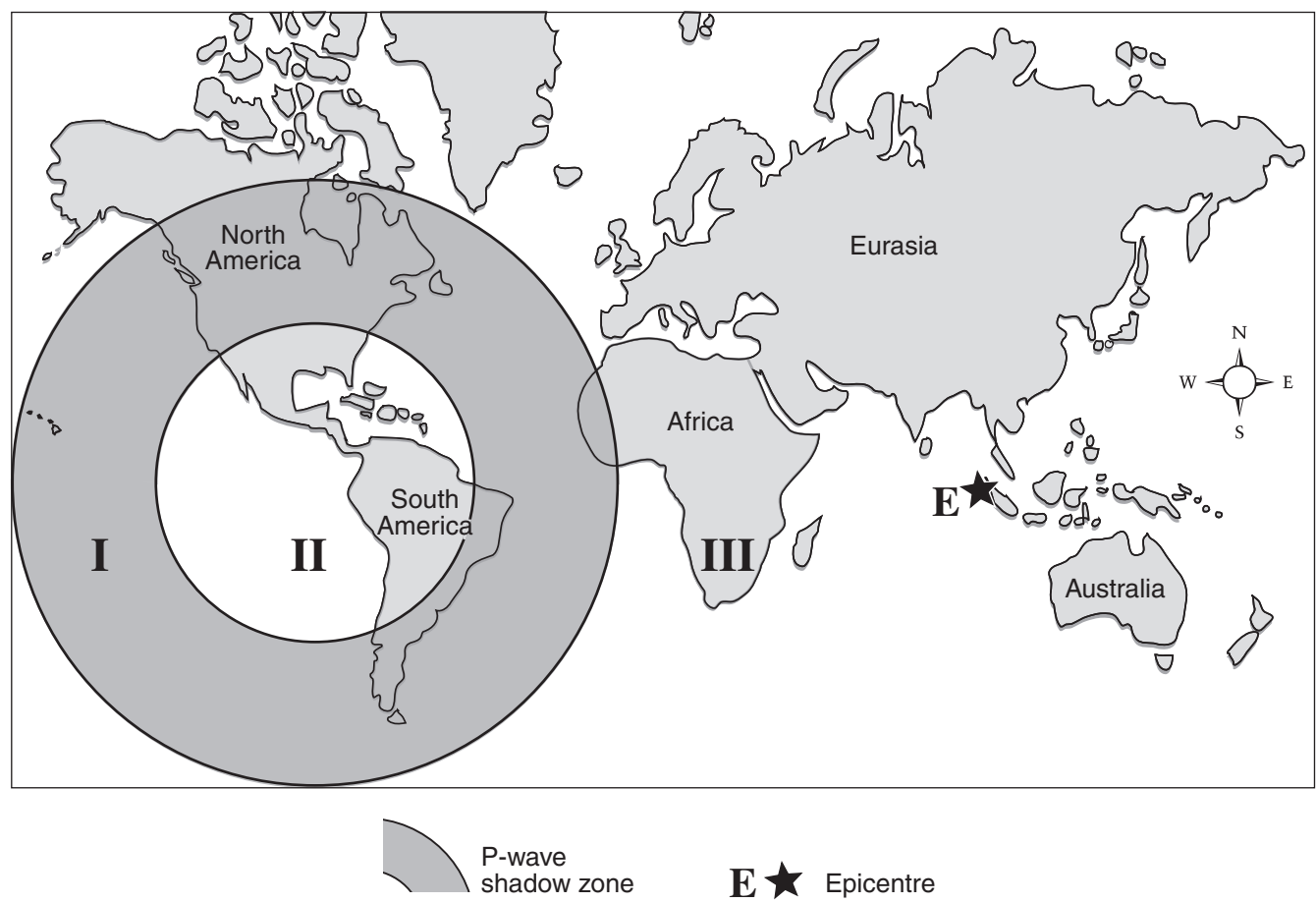


32. What geological structure is shown on the map above?

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

33. Which two Solar System objects are known to have geological rock structures like the ones shown in Photograph 7?
- A. Mars and Earth
 - B. Moon and Mars
 - C. Moon and Venus
 - D. Earth and Venus

Use the following map to answer question 34.



34. The map above shows the boundaries of the P-wave shadow zone resulting from the Indonesian earthquake of December 26, 2004. Which of the locations, I, II and III would have received the P-waves?
- A. I only
 - B. I and II only
 - C. I and III only
 - D. II and III only

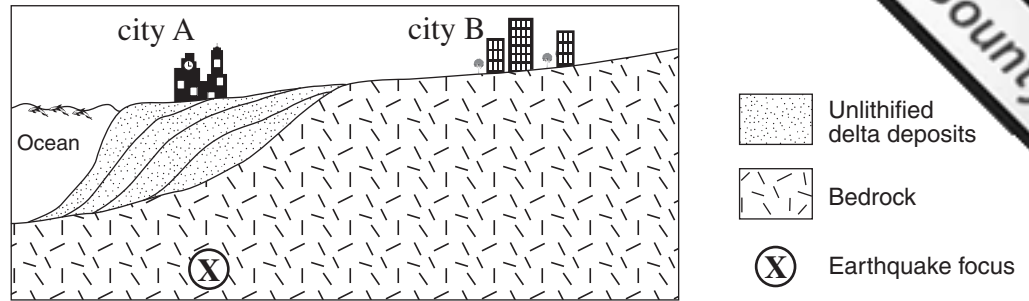
Use the following photograph of a geological structure to answer questions 35 and 36.



Image courtesy Ólafur Ingólfsson, http://www3.hi.is/~oi/svalbard_photos

35. What type of geological structure is clearly shown in the photograph?
- A. folds
 - B. faults
 - C. joints
 - D. unconformities
36. What type of force **most likely** created these structures?
- A. shear
 - B. tensional
 - C. gravitational
 - D. compressional

Use the following cross-sectional sketch to answer question 37.



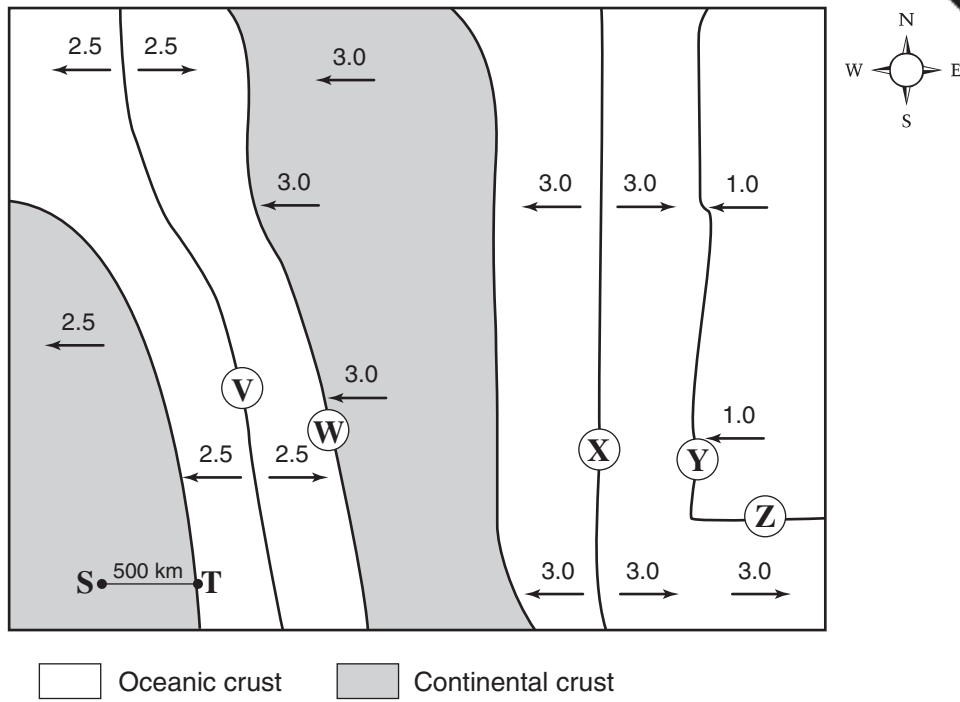
37. An earthquake occurs at X. City B will experience

- A. less intensity and the same magnitude as city A.
- B. greater intensity and a higher magnitude than city A.
- C. the same intensity and the same magnitude as city A.
- D. the same intensity and a higher magnitude than city A.

38. Which of the following would be the **least** important factor to consider when designing an earthquake-resistant building?

- A. the expected velocity of seismic waves
- B. the magnitude of the largest earthquake expected
- C. the expected length (duration) of the earthquake shocks
- D. the nature of the rock or soil upon which the structure is built

Use the following tectonic map of plate velocities to answer questions 39-41.
 Plate movement velocities are shown in centimetres per year.



39. How many tectonic plates are shown on the map?
- A. 3
 - B. 4
 - C. 5
 - D. 7
40. Which location is at a transform plate boundary?
- A. V
 - B. W
 - C. Y
 - D. Z
41. Locations S and T shown in the southwest corner of the map are 500 km apart. How much will the distance between them change in one year?
- A. 2.5 cm, closer
 - B. 0 cm, no change
 - C. 5 cm, farther apart
 - D. 2.5 cm, farther apart

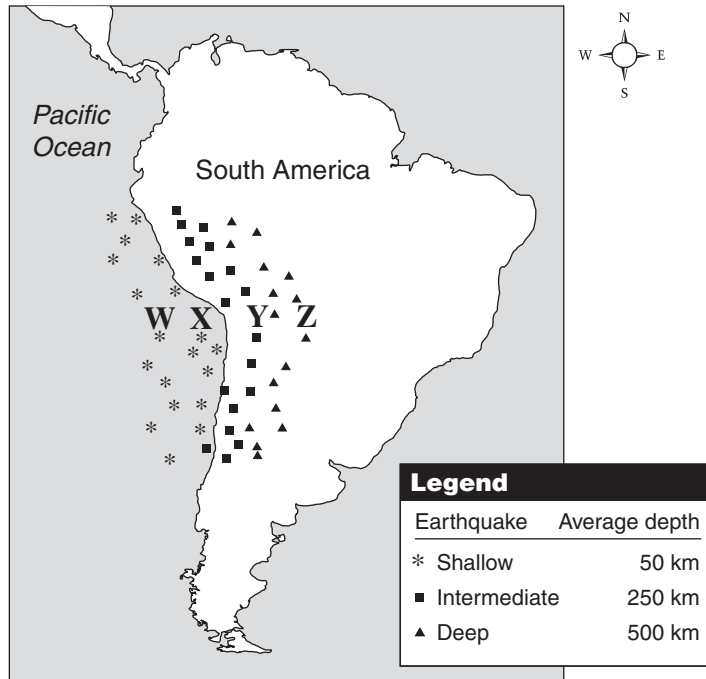
42. According to the plate tectonic theory, which process is **most likely** to be occurring at the site of mountain building in the interior of a continent (e.g., the Himalayan Mountains)?
- A. seafloor spreading
 - B. rising hot mantle plumes
 - C. continental plate–continental plate collision
 - D. continental plate–oceanic plate convergence

43. Which of the following eruption and lava types is most likely produced at the Earth’s surface above a subduction zone?

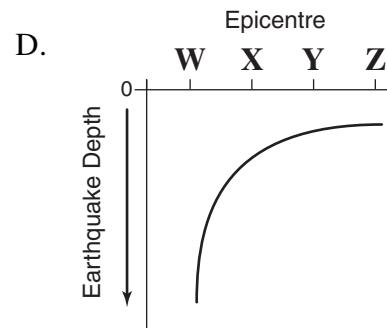
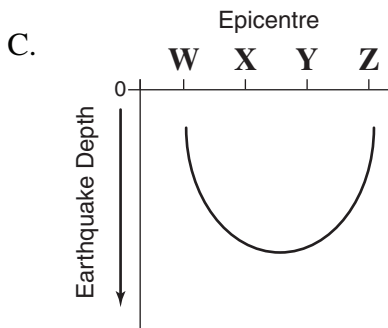
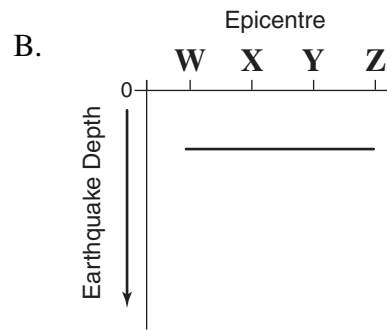
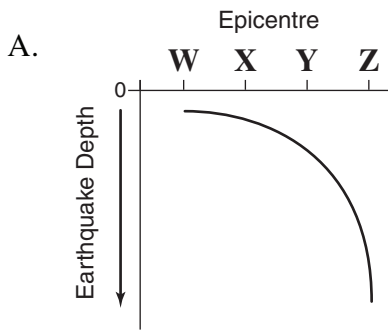
| | Type of Eruption | Type of Lava |
|----|-------------------------|-----------------------|
| A. | shield | andesite and rhyolite |
| B. | composite cone (strato) | andesite and rhyolite |
| C. | plateau | basalt |
| D. | fissure flow | basalt |

Use the following map of earthquake depths along the western side of South America to answer question 44.

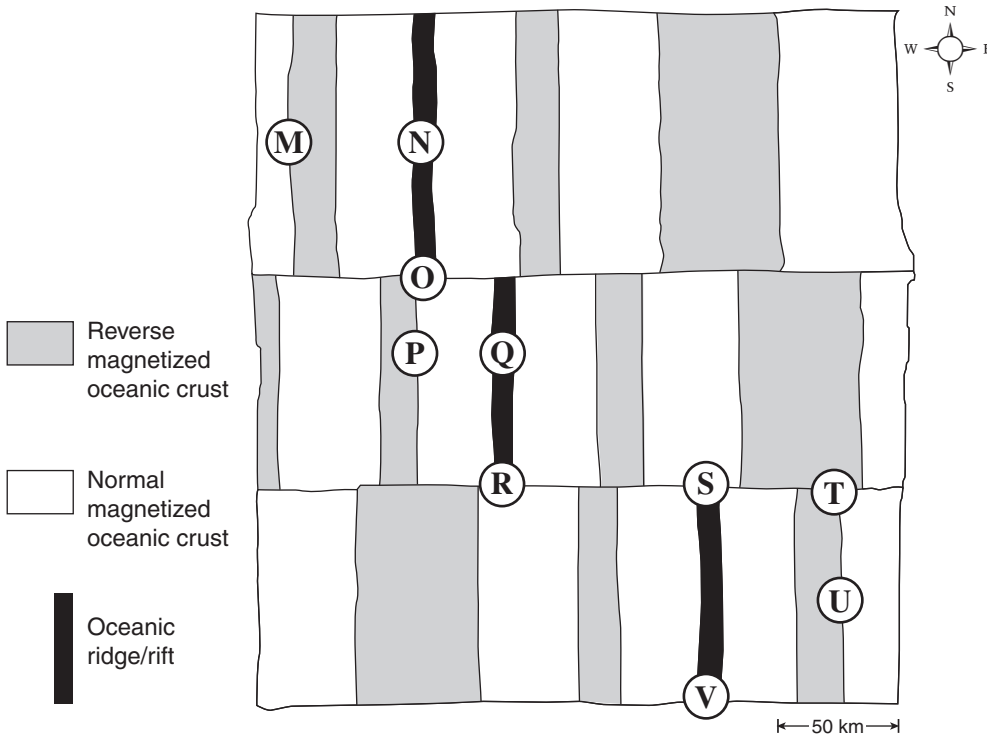
W, X, Y and Z are specific epicentre locations.



44. Which of the following graphs shows the depth of earthquakes beneath epicentres W, X, Y and Z?

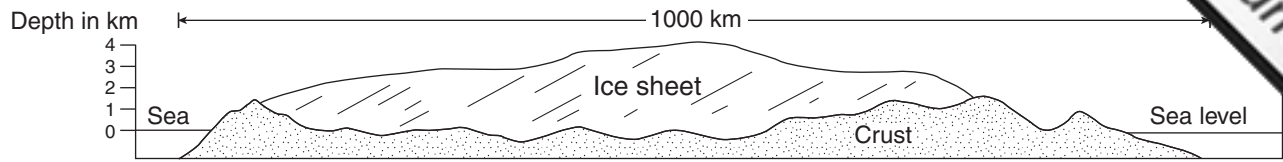


Use the following map of the ocean floor to answer questions 45 to 47.



45. Where would shallow earthquakes occur along a **strike-slip fault**?
- A. between M and N
 - B. between N and O
 - C. between R and S
 - D. between T and U
46. Which two locations would have rocks the same age?
- A. M and N
 - B. M and U
 - C. R and T
 - D. V and U
47. What plate tectonic process most likely produced the crustal pattern shown on the map?
- A. subduction
 - B. seafloor spreading
 - C. continental collision
 - D. mantle plume hot spots

Use the following diagram showing a cross section of the Antarctic Ice Sheet to answer question 48.



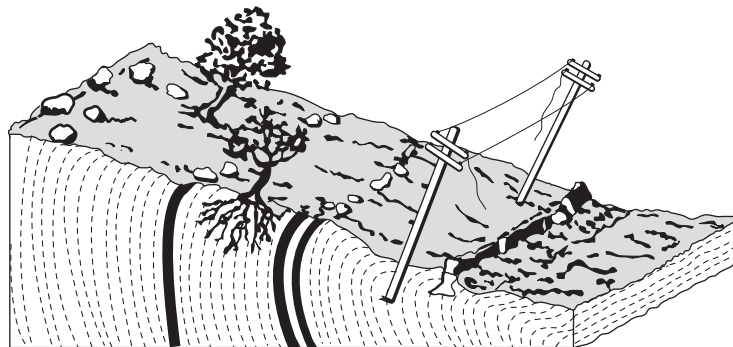
48. If all the ice were to melt, the underlying crust in the centre would

- A. start to rise.
- B. start to sink.
- C. remain at its present elevation.
- D. rise then sink back to its present elevation.

49. Which of the following is a process of chemical weathering?

- A. oxidation
- B. jointing
- C. frost wedging
- D. thermal expansion

Use the following diagram to answer question 50.

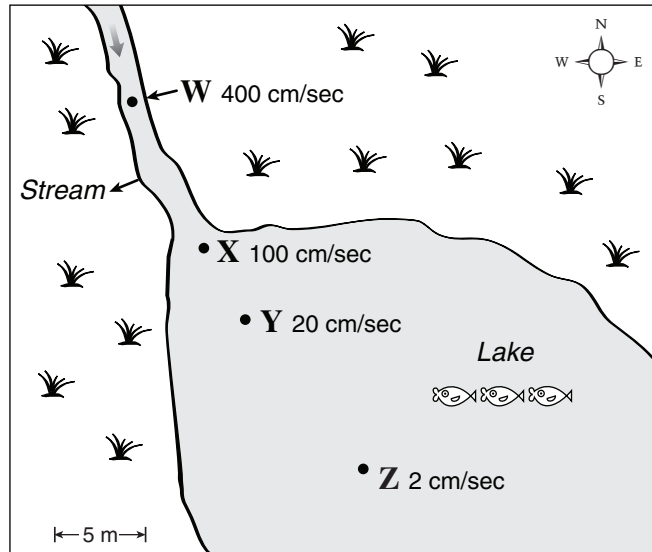


50. What type of mass wasting is shown in the diagram?

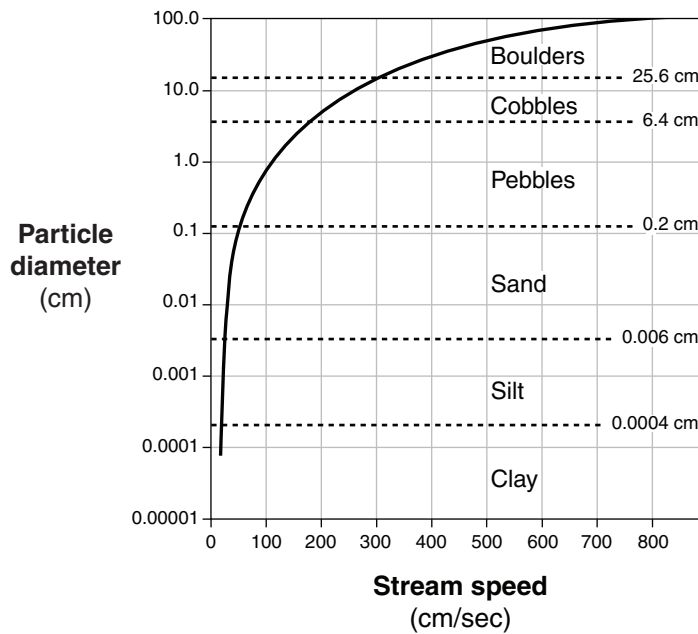
- A. slump
- B. landslide
- C. soil creep
- D. debris flow

Use the following diagrams to answer question 51.

Map of water velocities of stream and lake



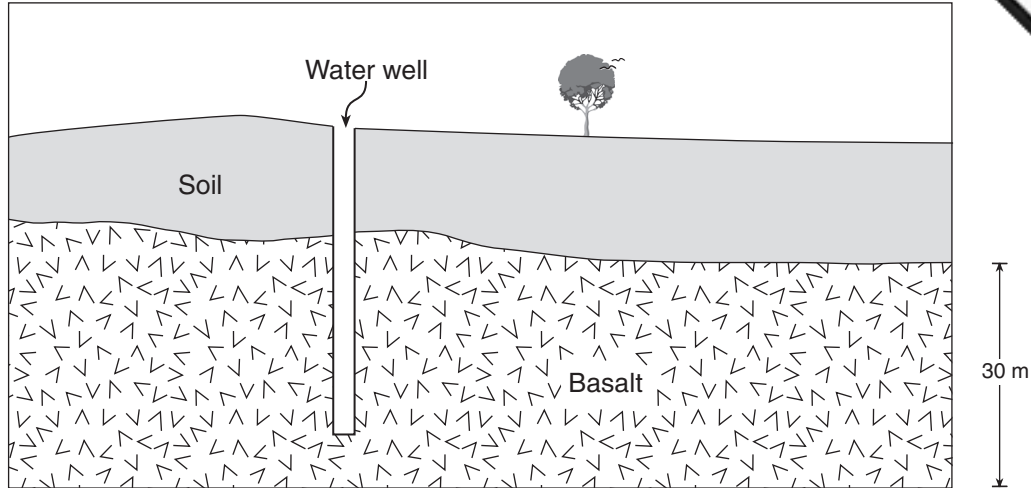
Graph showing particle diameter and stream speed



51. 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

Refer to the following cross section to answer question 52.



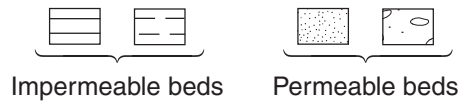
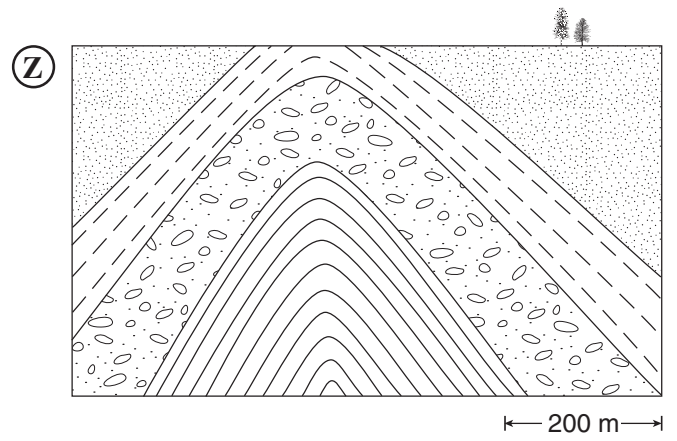
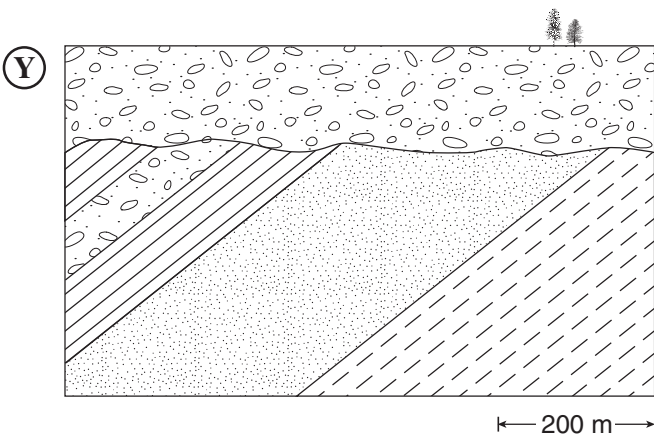
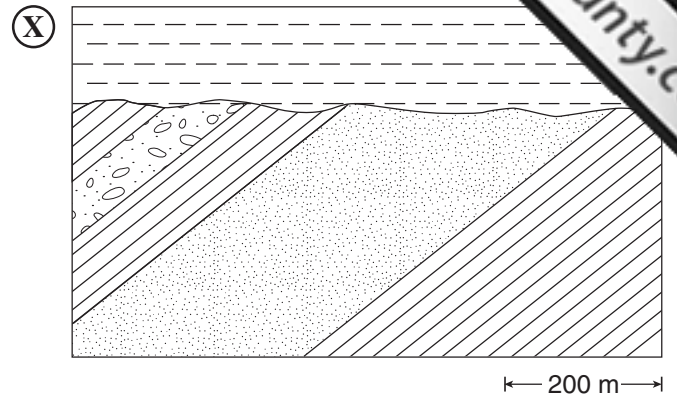
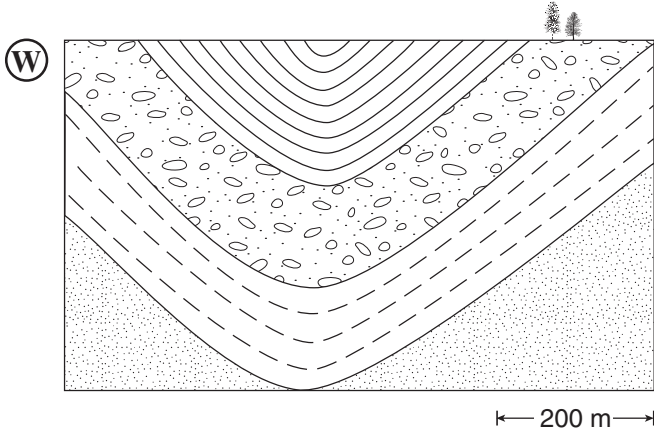
52. The basalt layer has many vesicles (gas bubbles). A well drilled into the layer does not produce a strong, steady stream of water. Which of the following would be the **best** explanation for this?
- A. The soil is permeable.
 - B. The basalt is fractured.
 - C. The basalt has a low porosity.
 - D. The basalt has a low permeability.
-
53. What is the difference between the zone of saturation and the zone of aeration of groundwater?
- A. The zone of saturation has a lower porosity than the zone of aeration.
 - B. The zone of saturation has a higher porosity than the zone of aeration.
 - C. The pore spaces in the zone of saturation are full of water whereas the pore spaces in the zone of aeration are not full of water.
 - D. The pore spaces in the zone of saturation are not full of water whereas the pore spaces in the zone of aeration are full of water.
54. All of the following are related to glacial processes except
- A. till.
 - B. oxbows.
 - C. eskers.
 - D. drumlins.

55. What is the most likely reason that Mercury and the Earth's moon have a similar surface appearance?
- A. They both have a large iron core.
 - B. They have never had an atmosphere.
 - C. They have high surface temperatures.
 - D. They rotate very slowly on their axes.
56. Which of the following processes is most likely to preserve land plants as a large coal deposit?
- A. Dead plants are heated and dried by the tropical sun.
 - B. Eruption of lava flows cover and heat the plant matter.
 - C. Sea level rises and plant matter is buried by sediments.
 - D. Chemical and biological weathering occurs, causing organic decay.

Use the following statements about processes involved in the formation of energy resources to answer question 57.

- 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 more dense than water.
 - V. Trees die in a swamp.
 - VI. Hydrocarbons rise through permeable rock because they are less dense than water.
57. 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

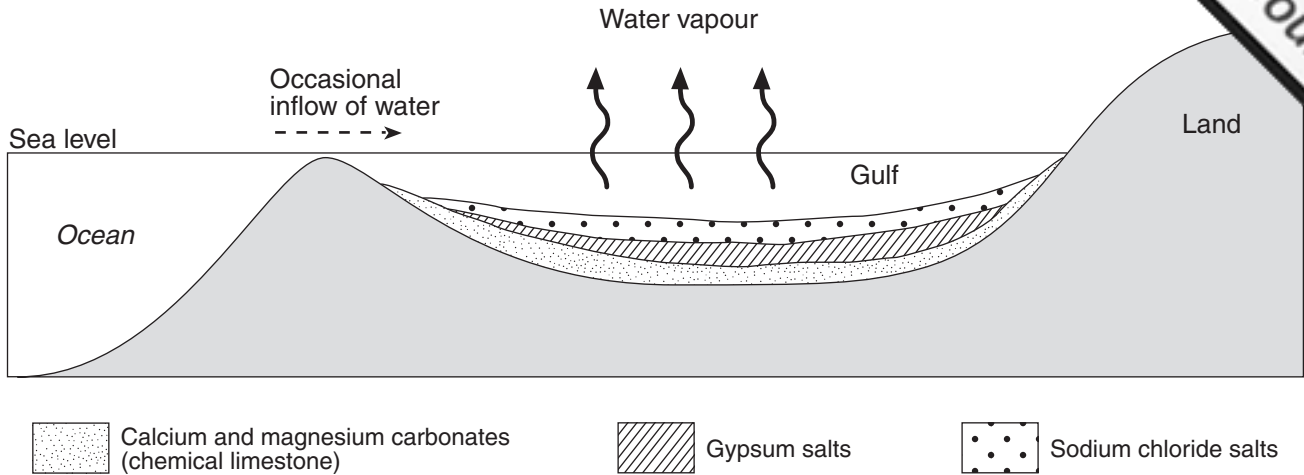
Use the following geological cross sections to answer question 58.



58. Which two cross sections show possible oil traps?

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

Use the following diagram showing the formation of a resource deposit to answer q



59. What type of resource deposit is shown in the diagram?

- A. placer
- B. evaporite
- C. magmatic
- D. hydrothermal

60. A geophysical survey was conducted to locate an ore body. Which of the following minerals is most likely responsible for a higher gravity reading in a particular area?

- A. quartz
- B. calcite
- C. feldspar
- D. magnetite

Data
Page 9

61. Which of the following statements about a particular sedimentary deposit would be true?

- A. It must be a glacial moraine because the sediments are well sorted and angular.
- B. It must be a stream deposit because the sediments are well sorted and well rounded.
- C. It must be a talus deposit because the sediments are poorly sorted and well rounded.
- D. It must be a wind deposit because the sediments are poorly sorted and well rounded.

Use the following table of ore deposit properties to answer question 62.

| | |
|----|-------------------------------|
| 1. | Size of deposit |
| 2. | Age of formation |
| 3. | Geographic location |
| 4. | Concentration of metal in ore |
| 5. | Shape of deposit |
| 6. | Type of bedrock |

62. Which three factors would be of **greatest** importance in determining whether or not an ore deposit is economical?
- A. 1, 3 and 4
 - B. 1, 5 and 6
 - C. 2, 3 and 5
 - D. 2, 4 and 6

Use Photograph 8 to answer questions 63 and 64.

63. Name the feature shown in Photograph 8.

- A. mud cracks
- B. ripple marks
- C. cross bedding
- D. graded bedding

64. Which of the following processes is **least** likely to be responsible for the feature shown in Photograph 8?

- A. a river
- B. moving ice
- C. beach waves
- D. blowing wind

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

