Name:_____ Geosphere Time Allotted: 25 minutes

Key: (*) = none, one, or more than one answer possible (e.g. Answer: A, D, and E)

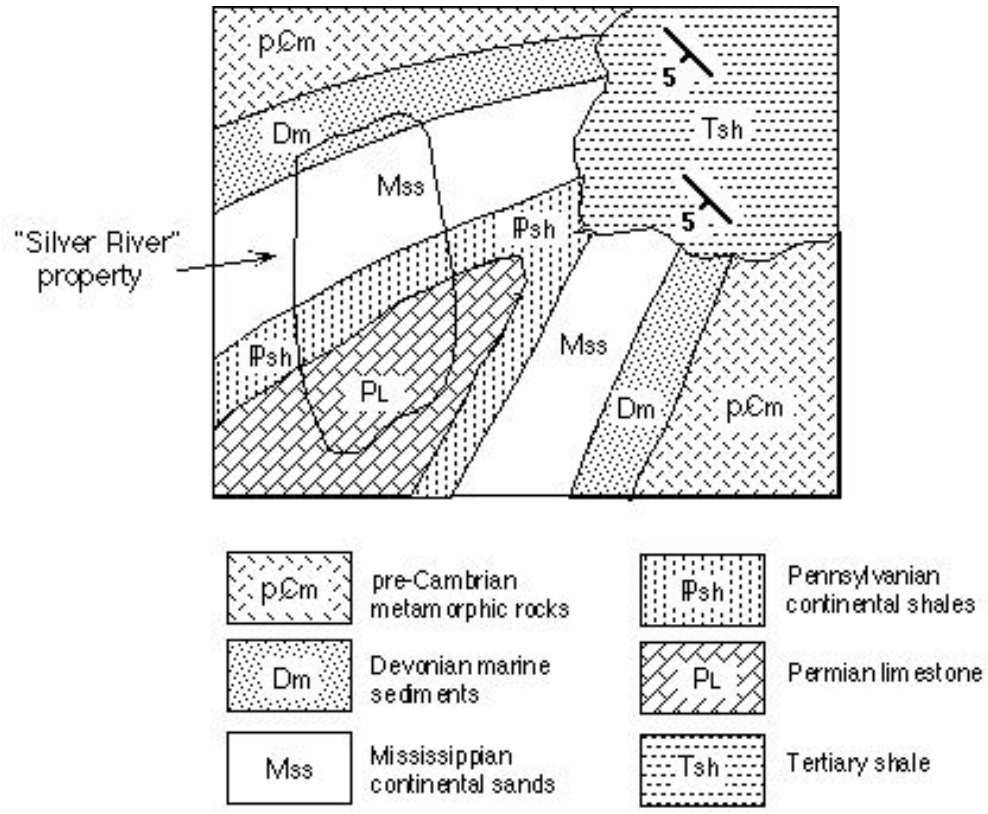
1. Which of the following are characteristics of the E soil horizon? (*)

a) An abundance of decaying organic material
b) Dominance of leaching
c) Light coloration
d) The accumulation of fine material

2. Greenschist facies are characterized by (*)

a) Being associated with subduction zones
b) Having mafic protoliths
c) High olivine content
d) High chlorite content

Use the diagram below to answer the following two questions.



3. Which of the following correctly identifies the oldest and youngest layers in the figure, respectively?

a) pCm, Tsh
b) PL, Tsh
c) Tsh, PL
d) PL, pCm

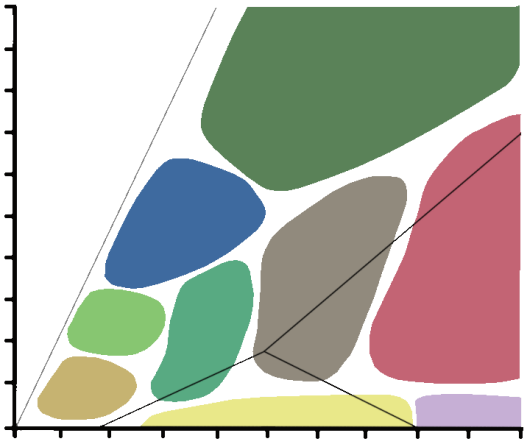
4. What sort of geologic structure do the Paleozoic beds form?

a) Monocline
b) Syncline plunging SW
c) Syncline plunging NE
d) Anticline plunging NE
e) Anticline plunging SW

5. Scientists use X-ray crystallography to reveal the chemical formula of a newly discovered mineral. They find that it is a member of a solid solution series with a 5:1 abundance of $CaAl_2Si_2O_8$ to $NaAl_3Si_3O_8$. The mineral was most likely extracted from which of the following environments?

a) On a riverbed upstream of a clay-rich alluvium deposit.
b) A field of pillow lava at the bottom of the ocean.
c) Half Dome, an exposed granite batholith in Yosemite.
d) On the surface of a highly catastrophic stratovolcano.

The figure below depicts common mineral assemblages in metamorphic rocks. Answer the following three questions related to the figure.



6. Increasing x-axis and y-axis indicate, respectively:

a) Increasing pressure and increasing temperature
b) Increasing temperature and increasing pressure
c) Decreasing pressure and decreasing temperature
d) Decreasing temperature and decreasing pressure
e) Increasing pressure and decreasing temperature
f) Increasing temperature and decreasing pressure
g) Decreasing pressure and increasing temperature
h) Decreasing temperature and increasing pressure

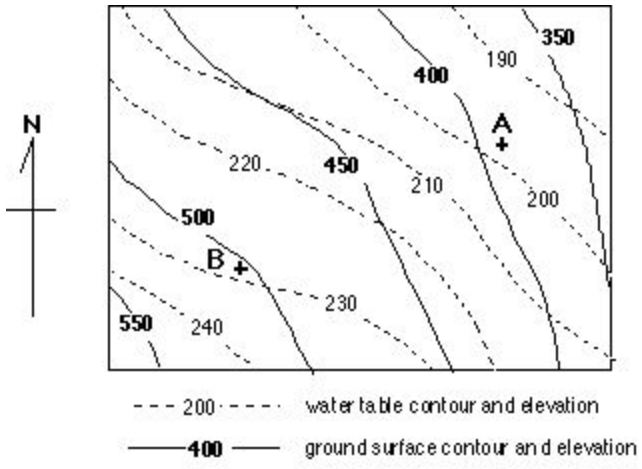
7. Which of the following statements related to the diagram are correct? (*)

a) Lines with lower slope values would indicate a lower geothermal gradient
b) Hornfels is likely found towards the bottom of the diagram
c) The trisecting lines divide the diagram into minerals with different molecular formulas
d) The trisecting lines divide the diagram into minerals with different molecular structures

8. Which of the following best explains the empty region towards the upper left of the diagram?

a) These conditions are not found in nature
b) Rocks in this region are igneous rocks
c) Rocks in this region are sedimentary rocks
d) Materials melt into magma in this region, and so minerals are thus destroyed.

Consider the figure below. Answer the following two questions using the figure.



9. Which direction is the groundwater flowing?

a) NW to SE
b) SW to NE
c) NE to SW
d) SE to NW
e) Impossible to tell

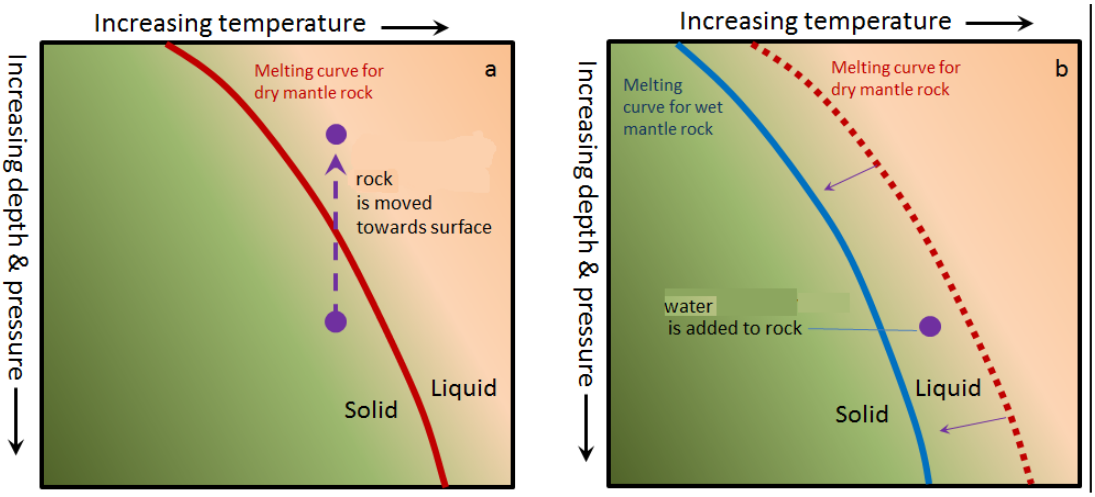
10. If you were drilling a well at point B, about how many feet down would you have to drill before you hit water?

a) 230 feet
b) 270 feet
c) 500 feet
d) 730 feet
e) Impossible to tell

11. You are looking for some property where you can drill a well and get a good, reliable water supply. Which materials below would probably provide the poorest supply?

a) Very highly jointed and fractured volcanic rock
b) Outwash gravels from a continental glacier
c) Lake sediments
d) Fine-grained, compact glacial till
e) Greywacke sandstone

Using the figure below, answer the following three questions.



12. The diagram at the left is most useful for understanding which of the following?

a) The formation of metamorphic rocks
b) The formation of hotspots
c) The formation of volcanic arcs
d) The formation of mantle convection cells

13. The diagram at the right is most useful for understanding which of the following?

a) The formation of metamorphic rock
b) The formation of hotspots
c) The formation of volcanic arcs
d) The formation of mantle convection cells

14. The diagram at the right depicts which of the following?

a) Heating of the mantle by added material
b) Cooling of the mantle by added material
c) Increase in melting point by added material
d) Decrease in melting point by added material

15. Hampton Roads, Virginia has the highest predicted sea level rise on the East Coast of the United States over the next 100 years. This predicted large sea level increase is most likely due to: (*)

a) Massive glacial melting from Greenland
b) Isostatic rebound due to glacial melting
c) Melting sea ice in the Arctic Ocean
d) Thermal expansion of seawater