Geology 101

Study Guide #3

Answers to Sample questions for Exam #3

1. In the diagram below, a sequence of sedimentary rocks with descriptions is shown in a cross-sectional view. (This is like looking at the side of a canyon.)

1a. Assume that layer A is the oldest layer in this sequence. Determine the environment of deposition for each of the layers, starting with the oldest layer, layer A, and progressing to the youngest layer, layer G. (Think of each layer as "chapter" in the history of this site. We are "reading" the history of each chapter based on the clues in each layer.)

A= conglomerate, river environment
B= sandstone. Slower river environment
C= coal, swampy environment
D= sandstone, beach
E= limestone, shallow marine environment
F= shale, continental shelf environment
G= turbidite, deep ocean

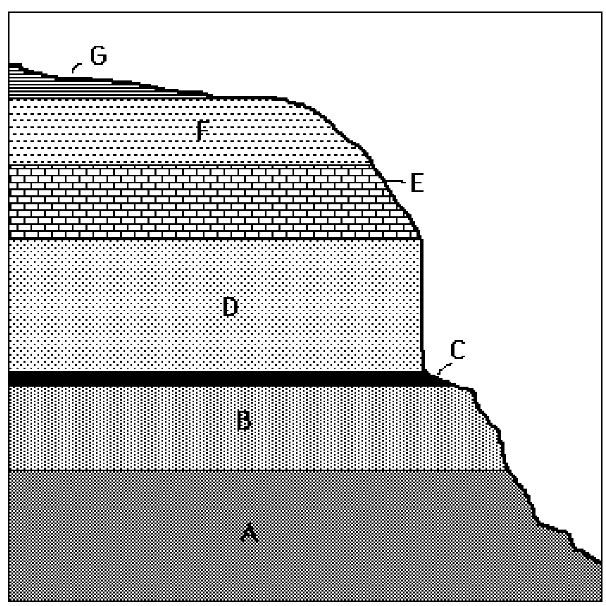
1b. Once you have completed #1 above, look at the overall sequence of layers. What is the pattern represented by the entire sequence? What was happening here through the time from layer A to layer G?
The environment tends to change from a continental stream environment to a deep ocean environment. The most logical explanation is that the land was deformed and uplifted to bring the deep sea sediments to the ground surface.

A= the coarsest of the detrital sedimentary rocks. The grains in the rock are rounded and are larger than 2mm. The rounded grains are cemented by silica. The long dimension of the small pebbles in this rock are oriented roughly parallel to each other.

B= these rocks have grains from 1/16 mm to 2 mm in diameter. It is cemented with silica and is composed of light colored quartz grains. There are a few grains of rounded pebbles in this layer. The grains are well rounded and there is cross-bedding.

C= is a black rock which is an organic sedimentary rock. It is composed largely of plant remains (leaves, bark, wood, and pollen).

Cross-sectional View of a Sedimentary Sequence



D= this layer consists of grains which are 1/16mm to 2 mm in size. The grains are well rounded and cemented with silica. There are some clam fossils in this layer. There are some finer layers in the under part of this unit. Some of these finer grained deposits have mudcracks.

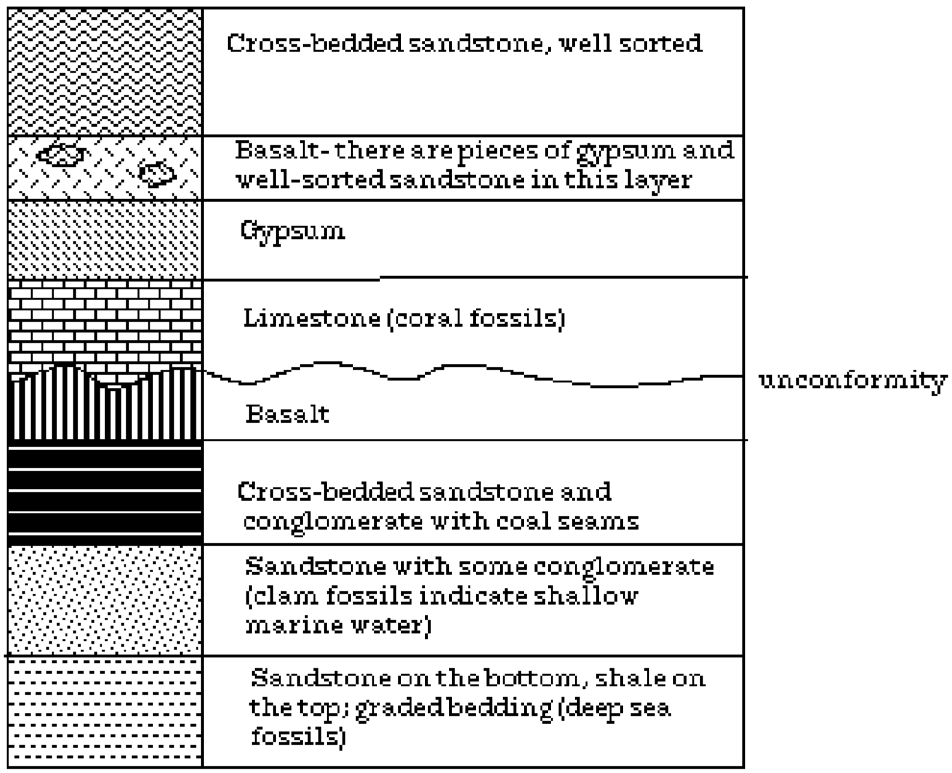
E= composed of $CaCO_3$, many small fragments of fossils. Rock is massive (no apparent bedding)

F= contains particles which are smaller than 0.004 mm in diameter. Horizontal bedding. There are some microscopic marine fossils.

G= this unit has many layers, each exhibiting graded bedding. The particle size of the grains vary from sand and silt on the bottom of the layer to fine silt and clay on the top of each individual layer. (hint: see page 179 in the text!)

2. Why is the C-14 dating methods not used for most geologic applications? Explain.
There are three reasons: (a) the half-life is so short that we can not date old materials, (b) most rock material does not contain carbon, and (c) the daughter product is too abundant in the atmosphere, so we can only use the parent's decay to measure the age—the daughter accumulation of nitrogen is overshadowed by the huge amount of nitrogen in the atmosphere.

3. In the following cross-section discuss the history of the area from the oldest to youngest events.



- ***the sandstone to shale (graded bedding) and deep water fossils indicate a turbidite layer (deposit from turbidity currents)***
- ***sandstone with clam fossils- shoreline—beach***
- ***cross-bedded sandstone—channel deposit from a river floodplain***
- ***basaltic eruption***
- ***erosion***
- ***subsidence of the land or the rise of the sea level***
- ***deposition of a coral reef***
- ***uplift of the land***
- ***evaporation of the ocean (the ocean water continues to flow into the basin, but the evaporation rate was higher)***
- ***sand dune forms the sandstone layer on top***
- ***intrusion of the sill***

4. The half-life of a certain sample of a radioactive element is 3.0 days. At noon on May 10th the amount of the parent isotope was 400 milligrams (mg.).

A. When will the amount of the parent isotope be equal to 100 mg?

May 16

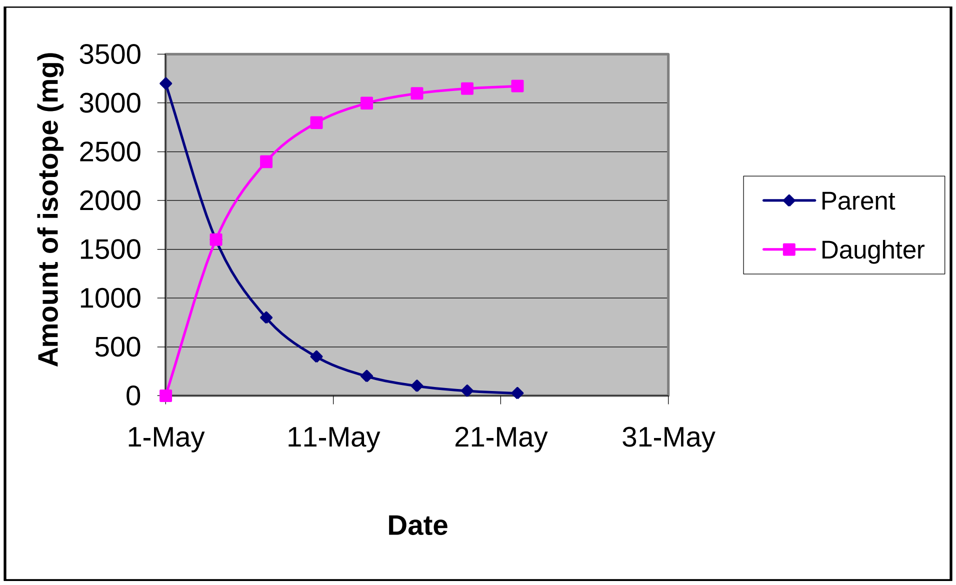
Date	Parent	Daughter
May 1	**3200 mg**	0 mg
May 4	**1600 mg**	**1600 mg**
May 7	**800 mg**	**2400 mg**
May 10	400 mg	**2800 mg**
May 13	**200 mg**	**3000 mg**
May 16	**100 mg**	**3100 mg**
May 19	**50 mg**	**3150 mg**
May 22	**25 mg**	**3175 mg**

B. What was the amount of parent isotope on May 1st?

3200 mg

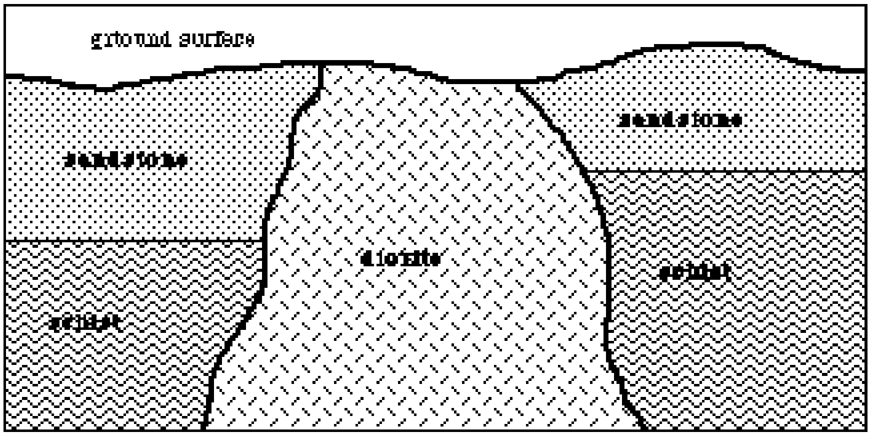
C. Using a solid line on the graph on the next page, show the amount of the parent isotope in the sample as time passes.

D. Use a dashed line to show how the amount of the daughter product changes at the same time.



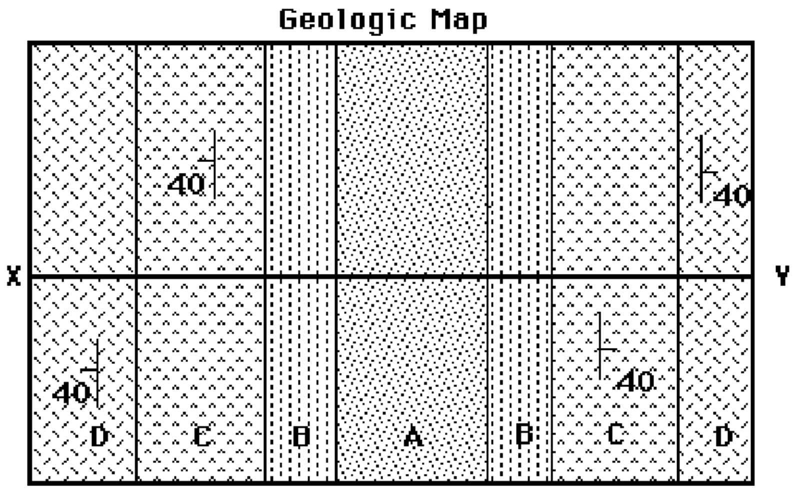
time

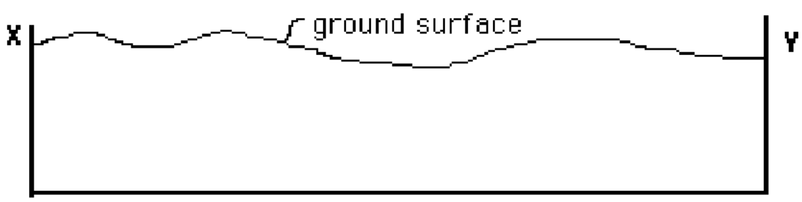
5. Discuss the history of the block below, from the oldest to the youngest. What might you expect to find at the contact of the sandstone and the metamorphic rocks ?



- ***The first part of the history is the deposition of the parent rocks of the schist***
- ***These rocks were buried and metamorphosed to schist***
- ***The rocks were uplifted and eroded***
- ***The sandstone was deposited***
- ***Faulting occurred (the diorite could be first, but this is more logical)***
- ***Diorite was intruded***
- ***Erosion along the top surface.***

6. Complete the cross-section below:





this fold is an anticline—the layers to the left of A dip to the left at an angle of 40 degrees from horizontal while the layers to the right of A are dipping to the right at 40 degrees.

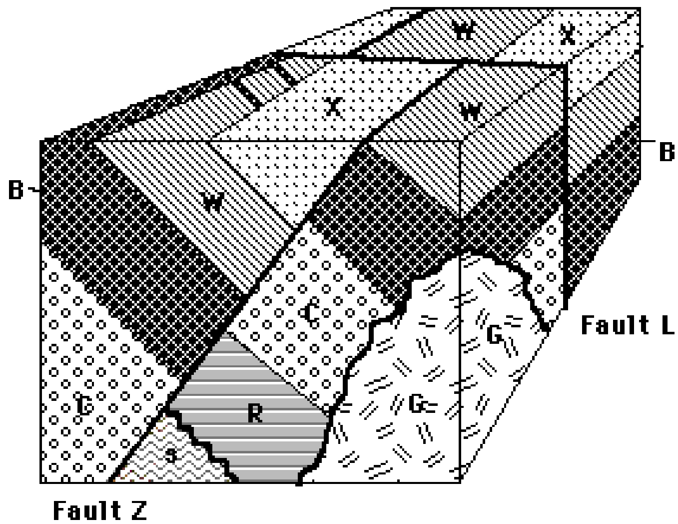
7. From the rock types given below, write the relative age history of the block diagram and the geologic history:

B= basalt	X= shale	W= siltstone	s= schist
G= granite	C= conglomerate	R= rhyolite	

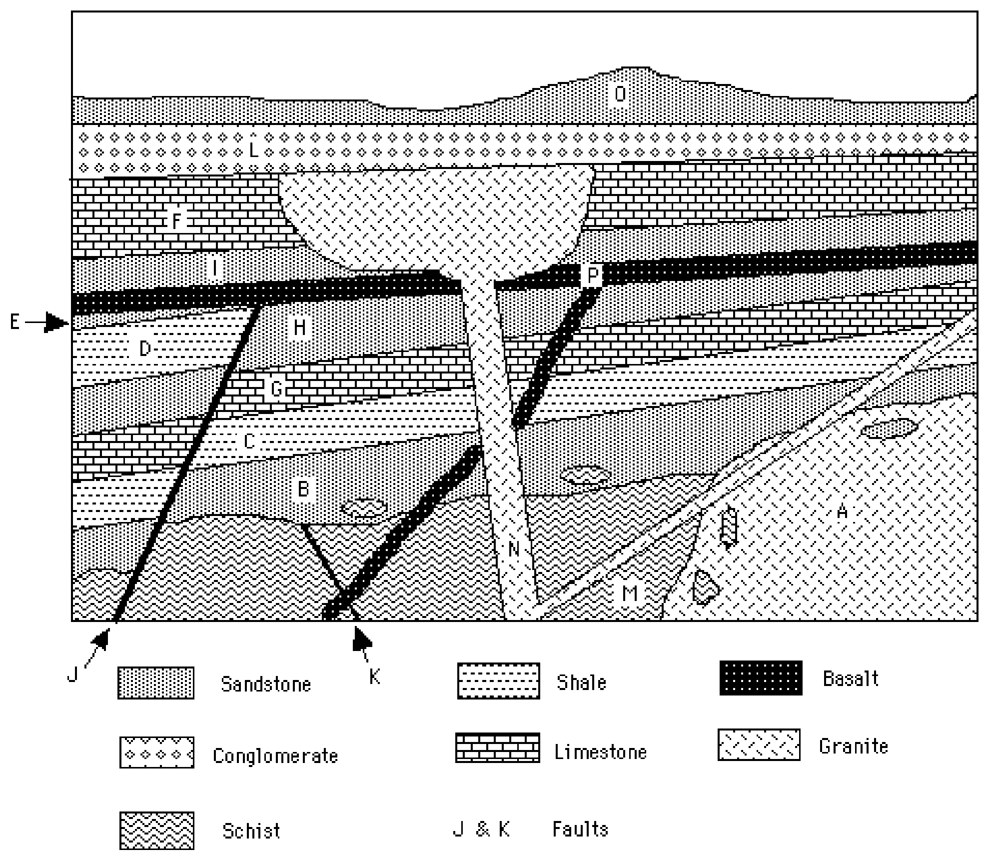
- ***Deposition of parent rock***
- ***Metamorphism to produce s***
- ***Uplift and erosion***
- ***Eruption of rhyolite***
- ***Deposition of conglomerate***
- ***Deposition of siltstone***
- ***Intrusion of basaltic sill***
- ***Deposition of shale***
- ***Intrusion of the granite***
- ***Fault Z occurs***
- ***Fault L occurs***
- ***Erosion***

What types of faults are L and Z ?

Fault Z is a normal fault and Fault L is a strike-slip fault



9. From the cross-sectional diagram below, construct the relative age sequence from oldest to youngest event. Be sure to include all events, such as folding, erosion, metamorphism, etc. There are 23 events.



- ***Deposition of parent material for M***
- ***Burial and metamorphism of M***
- ***Faulting (K)***
- ***Erosion***
- ***Deposition of B***
- ***Deposition of C***
- ***Deposition of G***
- ***Deposition of H***
- ***Deposition of D***
- ***Deposition of E***
- ***Intrusion of A (this could have happened anytime after the deposition of layer B)***
- ***Folding***
- ***Faulting (J)—these last two steps could be reversed***
- ***Erosion***
- ***Intrusion of P***
- ***Deposition of I***
- ***Deposition of F***
- ***folding***
- ***Intrusion of N***
- ***Erosion***
- ***Deposition of L***
- ***Deposition of O***
- ***Erosion along the top surface***