Geo 101, Fall 2000

Review Questions for Final Exam

GEOLOGIC TIME AND FOLDING AND FAULTING

THE FINAL EXAM FOR MWF CLASS WILL BE TUESDAY 1400

THE FINAL EXAM FOR TR CLASS WILL BE FRIDAY 930

These questions are to help you study for the exam. They are not to turn in. It will be helpful to work with another student or in small groups try to answer the review questions. If you can't find the answer in your notes or in the book, please come to office hours or email questions to the instructor. Some hints are given at the end of each section.

The exam will be based on the review questions and the lecture notes. Note that some of the review questions are from the material in the text. The actual exam questions will be multiple choice (except for make-up exams).

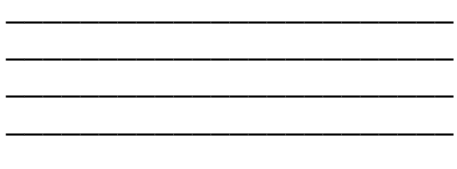
You must take the exam in the lecture section for which you are registered. Any exceptions must be cleared with the instructor in advance.

REVIEW QUESTIONS
GEOLOGIC TIME

Relative Dating

1. How is relative dating different from "calendar" or "absolute" dating?

2. Please state the principle of original horizontality and the principle of superposition. number the beds in the sketch, to illustrate these principles.



3. Add an igneous dike to your sketch to illustrate the principle of cross-cutting relationships. Which is older, the strata or the dike?

   If you add more strata on top (above the dike), how old are they, compared to the age of the dike?

4. Suppose a layer of conglomerate rock contains some granite pebbles. What can you say about the age of the granite pluton from which they came, compared to the age of the conglomerate? [Principle of inclusion]

5. There are three types of unconformity.

   a. What is an unconformity? (General definition)

   b. If there are layers of sedimentary rock below an unconformity that are parallel to sedimentary layers above the unconformity, please list the sequence of events represented in this outcrop. Start with deposition of sediment in the oldest set of layers.

   c. How is a disconformity (as described in "b" above) distinguished from an angular unconformity?

6. To unravel the sequence of events portrayed in the rocks, geologists need to correlate layers from one location to another. What exactly does "correlate" mean in this context? That is, what are they trying to determine?

7. List three ways that geologists are able to correlate sedimentary beds, layers or formations (groups of layers) from one place to another.

8. Please define "key bed." Give an example of something that makes a good "key bed."

9. Please list the Eons of geologic time, from oldest (earliest) to youngest (most recent).

10. Please list the Eras of the Phanerozoic Eon, from oldest (earliest) to youngest (most recent).

Numerical Age ("Absolute") Dating

11. Numerical age dating uses radioactive isotopes. What is an isotope? Are all isotopes radioactive?

12. What kind of rock is most commonly dated using radioactive isotopes?

13. What key fact about decay of radioactive isotopes allows us to use radioactive decay for dating rocks?

14. When a radioactive atom decays, particles are gained by, or lost from, the _____.

15. When a radioactive atom decays, it becomes another isotope of

    a. the same element b. a different element

16. Suppose an igneous rock started with 8 trillion atoms of isotope A (the parent). Now there are 4 trillion atoms of parent isotope A and 4 trillion atoms of daughter isotope B. How many half-lives have passed?

    If there are only 2 trillion atoms of parent A, and 6 trillion of daughter B, how many half-lives must have passed since the rock crystallized?

HINTS AND ANSWERS:

4. The pluton is older than the conglomerate.

6. Correlation means comparing the ages of strata in different locations. They want to find out if there are strata in both locations that are the same age as each other, or if all the strata in one place are older than the strata in the other location.

8. A volcanic ash layer would make a good key bed. Can you explain why?

13. Radioactive decay is a constant rate process. Each isotope has its own characteristic rate of decay. Its rate of decay is described by its half-life. Can you define "half-life"?

FAULTING AND FOLDING

1. Please define and describe strike and dip in relation to the roof of a house.

2. Why do rocks deform (fold or fault)?

3. Where is folding more likely than faulting?

   a. upper crust
   b. lower crust

4. Which makes folding more likely than faulting?

   a. low temperature
   b. high temperature

5. Where is folding more likely than faulting?

   a. weaker rock
   b. stronger rock

6. Which favors folding rather than faulting?

   a. high confining pressure
   b. low confining pressure

7. Which composition is stronger and more likely to fault?

   a. mafic rock
   b. felsic or sedimentary rock

Folds

8. In the photo on page 210, identify the syncline and the anticline. Assume the rocks have not been overturned. Where are the youngest rocks in relation to the syncline? In relation to the anticline?

9. Assuming these are not plunging folds, describe where the fold axis of the syncline would run in the picture on page 210. How about the fold axis of the anticline? How about the axial plane of each fold?

Folds occur under the same stress conditions that produce reverse faults in colder or stronger rock, or under higher strain rate.

The ***fold axis*** is a line inside the rock that goes back into the rock from the cliff or roadcut you might be looking at. Unless the fold is plunging, the fold axis is horizontal. A fold axis has a map location and a direction, but you can't pin the thing down as being at a certain height or depth in the ground. It's an abstraction.

10. Describe a basin, and explain a reason a (structural) basin may form.

    [Note: the word basin also describes a feature of surface topography, but we are dealing with a basin structure in the rock.]

11. Describe a dome, and explain a reason a (structural) dome may form.

    [A dome structure may be eroded, or may be buried inside the rock, just like a basin.]

Faults

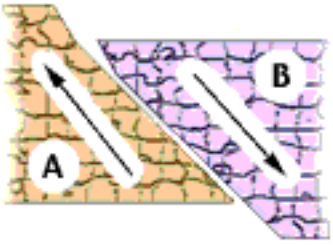
Next 3 Questions: Strike or dip?

12. A ***horizontal*** line drawn on a fault or bedding plane shows the_____ direction of the fault or bedding plane.

13. The direction of _____ is perpendicular to the strike direction.

14. The direction water would run downhill on a fault or bedding plane is called the _____.

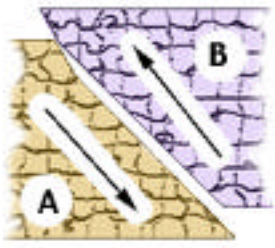
15.



Which is the Hanging Wall?

Is this a normal fault or a reverse fault?

16.



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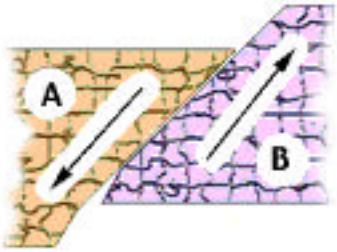

Which is the Hanging Wall?

Is this a normal fault or a reverse fault?

18.

Which is the Hanging Wall?

Is this a normal fault or a reverse fault?

19. Strike-slip faults normally don't have a hanging wall and foot wall. Why?

Next 3 Questions: Normal, Reverse, or Strike-Slip?

20. A fault that results in crustal extension (stretching) is a

_____ fault. The MAXIMUM stress direction is vertical.

21. A fault that results in crustal shortening (pushing together)

is a _____ fault. The MINIMUM stress direction is vertical.

22. A fault that causes one side to slide horizontally next to the

other is a _____ fault. The INTERMEDIATE stress direction is vertical.

Next three questions: subduction zone, transform boundary, or mid-ocean ridge?

23. What kind of plate boundary is a graben, or pair of normal faults (or multiple normal faults) facing each other?

24. What kind of plate boundary is a reverse fault?

25. What kind of plate boundary is a strike-slip fault? Where is a famous example located?

HINT FOR QUESTIONS 15 through 18:

HINTS FOR QUESTIONS 19 through 22:

19. A strike-slip fault is vertical.

20. Remember that stress means pressure. The rock is being squeezed in the "maximum stress direction," and it is able to spread out in the "minimum stress direction."

21. So the rock on one side of the fault is able to move up over the rock on the other side.

22. Both the maximum and minimum pressure directions are horizontal, at right angles to each other. The rock slides horizontally.