

Geology 101

Sample exam 2 (Dating methods, structural geology, earthquakes, plate tectonics)
Open notes, closed textbook, open labs and handouts, no collaboration. You have 50 minutes to complete the 50-point quiz.

Short answer — (2 points for each, except as stated); answer all questions.

1. Write the **first sentence** of your abstract and one **full citation** of a source that you will use on your poster below. Note that anyone reading it (e.g., the grader) should be able to tell what **topic** you are doing for your poster.

2. (3 points) Referring to the **cross-section** to the right:

a. Give the **letter** of the oldest formation.

b. Is the **fault** older than the **dike**?

c. If the dike is dated **radiometrically** as 70 million years old, is that date **consistent** or **inconsistent** with the fossil information?

6. Referring to the map view to the right, true or false:

a. The structure pictured is an **anticline**.

b. The structure pictured is **plunging**.

7. a. **P-waves** travel (slower than, faster than, the same speed as) **S-waves**.

b. Assuming that the area in the map of question 6 and the area in the cross-section of question 2 are both tectonically active, the **number of quakes** in the

area of question 6 will be (greater than, less than, the same as) the number of quakes in the area of question 2.

11. a. **Continental plate-continental plate collisions** tend not to result in subduction because the colliding rocks are the same:

i. color ii. density iii. age iv. formation

b. However, in **oceanic plate-oceanic plate collisions**, subduction does occur because, even though basalt is colliding with basalt, the two plates' basalts differ in:

i. magma source ii. temperature iii. latitude iv. attitude

Essay questions — (13 points each); answer **two** of the following. Make sure you answer **both** parts of each question chosen.

13. a. You are an anthropologist working on the question of human settlement of the Pacific Northwest. At a coastal village locality, you find two artifacts: a longboat made from a single tree trunk and a water jar made from local sediment. You have enough research funds to numerically date **one** of the artifacts. **Which material of which artifact** would you date? **Why?** And why would the other artifact give you an inaccurate age? (Assume that there will be no errors due to the dating method used — in other words, lab error will be negligible).

b.

14. a. Many students answered question 20 on lab 6 (the one about how you can infer that there is a thrust fault by the pattern of two formations): “Light, dark, light, dark”. I did not think that this answer particularly showed that students understood the question. **Draw a series of cross-sections** that shows how a **thrust fault** will eventually yield a pattern of “**light, dark, light, dark**” on the surface. Make sure you label or shade various formations in your cross-sections so it’s obvious what is happening. Hint: look at the geologic map of Williamsville, VA, again. Further hint: What sort of tectonic force is in the area? What structure must form first?

b

15. a. When the **Nisqually earthquake** struck on February 28, 2001, **surface seismic waves** radiated in all directions from the epicenter near the Nisqually River delta. Seventeen kilometers to the southwest, across the loosely-compacted water-logged mud of the Nisqually Delta and Puget Sound tidal flats, is Olympia. Seventeen kilometers to the northeast, across the tightly-compacted relatively-dry glacial conglomerates and lahar deposits, is Lakewood. **Which town** felt the surface seismic waves **first?** **Explain** your answer using the information given in this question.

b.

16. a. The current major mechanism for **plate tectonics** is **convection** within Earth’s asthenosphere, which drives lithospheric plates to move above. The reason for the convection is the second law of thermodynamics: the heat in the interior of Earth is trying to “escape” to the cold of space. As Earth’s interior cools down, the rate of plate tectonics will clearly slow down. As long as subduction continues, will the **angle of subduction** (that is, the angle at which the denser plate subducts off of horizontal) become (on average) **steeper, shallower** or **stay the same?** Explain your answer. Hint: consider whether the *density difference* between the two colliding plates will be bigger, smaller or the same as the difference today (on average). Also consider what will happen to the *thickness* of plates in general.

b.