

Geology 101

Sample Exam 2 (Dating, 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 below. Note that anyone reading it (e.g., the grader) should be able to tell what **topic** you are doing for your poster.

or

Write the *full* citation of one **non-electronic, non-encyclopedia, non-textbook source** you are going to use.

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

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?

3. (3 points) Still referring to the cross-section above, circle the correct choice within the parentheses:

a. This area was or is undergoing (extensional, compressional, shearing) **stress**.

b. The **orogeny** in this area can be described as (volcanic, fold-and-thrust belt, fault block).

c. These types of mountains will be found near or at a (convergent, divergent, transform) **plate boundary**.

4. a. The boundaries between **periods** on the geologic **time scale** are defined by what type of event?

b. Therefore the periods themselves are defined by its:

i. rocks ii. fossils iii. geographic features iv. attitude

5. Isotope Q has a **half-life** of 5 years. All living things contain the same amount of Q, as long as they continue to breathe. Fluffy the cat has been missing for a while. Sadly, her bones were found and had only **one-sixteenth** (1/16) the amount of Q that the bones of living things have. How many years has Fluffy been “missing”?

7. a. **Earthquake foci** at a convergent boundary will be, on average, (shallower than, deeper than, the same depth as) earthquake foci at a divergent boundary.

b. The number of earthquakes at a convergent boundary will be (greater than, less than, the same as) the number of earthquakes at a divergent boundary.

9. Circle **all** choices that apply. Because S-waves do not travel through liquids, we are able to infer that the:

a. crust b. mantle c. outer core d. inner core

is molten. Because seismic waves:

a. refract b. dissipate c. change speed d. are cool

we know that different layers of the lithosphere and asthenosphere have different densities.

Essay questions — (13 points each); answer **two** of the following.

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 be more likely to 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).

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.

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.