Geology 101 Name(s):

Lab 1: Reading different kinds of maps used in geology

Note: On all labs, you may work in small groups. You may turn in one lab for all of the group members; make sure that everyone who should get credit is listed! For exams, you may use the labs as a reference, but you may not share labs during the exam — please keep a copy of the answers for your own use.

Mt. St. Helens and vicinity topographic map

Topographic maps (or "topo sheets") show a representation of an area, and use **contour lines** to depict elevations.

1. What is the **year of publication** of the map? Which **organization**(s) produced it (they are typical of the maps we will look at this quarter)?

2. What is the *highest* **elevation** on the map? What is the *lowest* elevation on the map? Include **units**.

3. What is the straight-line **distance** between the two points in question 2? Include **units**.

4. What is the **latitude** and **longitude** of the Mt. St. Helens crater? Include **units** and **compass directions**.

5. What does the *green* shading indicate? (Traditionally, green meant forested land) So how can you tell where the deforested "blast" zone (from the eruption on May 18, 1980) is?

6. What does the gray *non-speckled* area represent? What does the gray *speckled* area represent? Which is the more far-reaching hazard?

7. What is the slope of the inner wall of the **caldera**? What is the slope of the **southern flank** of the mountain? Which is *steeper*? Report slopes as a **percent slope** (calculate this by picking two contour lines on the slope, then find the

difference in elevation between the two lines, divide by the lateral distance between the two lines and multiply the result by 100).

Plan a hike from Woodland (near the lower left corner of the map) to Randle (near the upper right corner of the map). Remember you want to *minimize* elevation gains and losses.

8. List *three* geographic features, towns or roads you will pass by or on:

Raised relief map of Mt. Rainier

These maps make the idea of **contours** more tangible — follow any of the brown-line contours; they should form a level path.

9. On your hike, were you to continue upstream along the banks of the Cowlitz River, all the way to its **headwaters**, where would you end up?

10. What is the **vertical exaggeration** on this map? Does this mean that the mountains are **taller** than they ought to be for the scale of the map, or **shorter**?

11. Why didn't the Mt. St. Helens blast of 1980 affect the upper Cowlitz River valley (where State Route 12 runs)?

Geologic Map of Washington

Geological maps have a different emphasis than topographical maps. Though the topography might lurk in the background of a geological map, it may be hard to figure out exactly where you are on a geological map!

12. Note the column headed “Geologic Units” to the right of the map. By what **two** characteristics are the geologic units divided into different colors (page 224 of the text may be helpful in determining one of these characteristics)?

13. Locate north Seattle. Write the **two-letter** designation of the local geologic unit. What is the apparent dominant **geologic force** that has shaped this area (hint: read the unit description and guess what the second letter of the designation stands for)?

14. Note the large portion of the colored areas on the map that have a “Q” as the first letter of that geologic unit. Give a **reason** that there is so much “Q” area (page 224 may be helpful again).

15. Note the “Explanation” of symbols at the bottom of the map. A “**contact**” is a line along which two geologic units meet. A “**fault**” is a breakage in the rocks along which movement has occurred. Choose the correct entry from within the terms in the parentheses:

a. (All Some No) faults are contacts.

b. (All Some No) contacts are faults.

16. Are all the faults shown on the map **active**? Explain your answer; **sketch** a portion of the map that illustrates your answer. Hint: Do some of the faults seem to terminate abruptly when the color of the geologic unit changes? What does this indicate about the “brokenness” of the color without the fault and what does this imply about the fault?

The Plate Tectonic Map of the Circum-Pacific Basin Region

Some geologic maps dispense with showing rocks altogether; clearly, they are used for a different purpose.

17. Find the **Pacific Plate**. Later in this exercise, you will want to find out the rate at which the Pacific Plate is moving. Do you use the **red** arrows or **clear** arrows? What's the **difference** between them?

18. What is the **current** rate of Pacific Plate motion near Hawaii? Don't forget to include the **units** of motion!

19. Measure the **distance** from the big island of Hawaii to Kammu Seamount, off to the west (remember to measure this distance as kilometers).

20. Using the conversion factor 1 km = 100,000 cm, calculate the **length of time** in years represented by the seafloor between Kammu Seamount and Hawaii, assuming the Pacific Plate has moved at a constant rate.