

Chapter 4 – Mt. St. Helens: A Case Study

Practice Exam and Study Guide

1. The Cascades volcanic arc lies along the leading edge of the _____ plate.
2. Is the Cascades volcanic arc intra-oceanic or continental-margin?
3. The Cascades volcanic arc extends from _____ in the south, through _____, and then _____ before terminating in southern _____.
4. List below at least two prominent volcanoes that lie within the Cascades arc from each of the following states: California, Oregon, Washington
5. Most of the present day volcanoes in the Cascades volcanic arc are younger than
 - a. 1,000 years
 - b. 2,000 years
 - c. 1 m.y.
 - d. 2 m.y.
 - e. 10 m.y.
6. The most recent eruption of a volcano within the Cascades arc occurred in
 - a. 1965
 - b. 1975
 - c. 1985
 - d. 1980
 - e. 1987
7. The Mount St. Helens eruption had a VEI of
 - a. 3
 - b. 4
 - c. 5
 - d. 6
 - e. 7

8. The visible cone of Mt. St. Helens prior to May 18, 1980 had formed in the last
- ~1,500 years
 - ~2,000 years
 - ~2,200 years
 - ~2,500 years
 - ~3000 years
9. What were the first signs of a potential eruption at Mount St. Helens?
- Spewing ash and steam
 - Steam-blast eruptions
 - Small pyroclastic flows
 - Earthquake activity
 - Lahars
10. What kind of an event is produced when hot magma encounters ground water?
11. Volcanic tremors are different from the distinct short jolts characteristic of earthquakes along major faults. They are described as a _____ rhythmic shaking of the land surface.
12. The volcanic tremors that occurred On March 31, 1980 were interpreted to signal what?
13. About 10,000 earthquakes were recorded through mid-may with the greatest concentration occurring in a small area less than ~2.57 km beneath a bulge on the north flank of Mt. St. Helens. In fact, the bulge near the summit was more than ~137 meters (~450 feet) higher than it was in the summer of 1979 and was growing horizontally in a northward direction at a rate of ~1.5 meters/day (~5 feet/day). In addition to the growing bulge, new cracks and fractures were also evident along the north flank. How was all of this activity interpreted?
14. On Sunday, May 18, 1980, Mt. St. Helens erupted explosively. What triggered the eruption?
- Rate of bulge movement
 - SO₂ gas emissions
 - Change in ground temperature
 - A magnitude 5.1 earthquake with a focus located about 1 mile beneath the volcano
 - We don't know

15. The collapse of the north flank of the volcano produced a landslide-debris avalanche. How is this avalanche ranked in history?
16. The landslide-debris avalanche traveled at speeds of
- 177 to 189 km/hour
 - 157 to 169 km/hour
 - 177 to 249 km/hour
 - 377 to 349 km/hour
 - 277 to 269 km/hour
17. Did the landslide-debris avalanche have enough momentum to travel up and over a ridge ~350 meters (1,150 feet) high? Yes or No
18. The landslide-debris avalanche traveled down the North Fork of the Toutle River and filled it to a depth of
- ~35.7 m
 - ~40.7 m
 - ~45.7 m
 - ~65.7 m
 - 10.7 m
19. The collapse of the north flank of Mt. St. Helens unloaded the summit and triggered the expansion of high temperature-high pressure steam trapped in voids and cracks, and gases dissolved in the dacitic magma that had produced the northward bulge. The result of this sudden and catastrophic expansion of steam and magmatic gases was a northward-directed _____.
20. The northward directed lateral blast formed a _____ that devastated a fan-shaped sector some 597.7 square kilometers in area.
21. Though the pyroclastic flow created by the lateral blast occurred seconds after the landslide-debris avalanche did it have enough speed to overtake the avalanche?
22. What is the maximum estimated speed of the pyroclastic flow created by the lateral blast?
- ~578 km/hour
 - ~778 km/hour
 - ~780 km/hour
 - ~1078 km/hour
 - ~2078 km/hour

23. The devastation from the lateral blast reached as far as _____ kilometers from the volcano.
24. The area affected by the lateral blast can be subdivided into three roughly concentric areas. What are these three concentric areas called?
25. Was there anything left standing within the direct blast zone?
26. What happened to trees within the channelized blast zone?
27. What happened to trees within the seared zone?
28. The eruption column following the lateral blast climbed to what height?
 - a. ~10.3 km
 - b. ~12.3 km
 - c. ~15.3 km
 - d. ~19.3 km
 - e. ~25.0 km
29. Was lightning produced during the eruption? If so, then what were its effects?
30. Following the lateral blast, what process produced pyroclastic flows as the eruption column climbed to ~19.3 km?
31. Minutes after the May 18 eruption destructive lahars were produced. What specific events initiated the development of these lahars?
32. The early lahars likely were the products of wet or dry rock avalanches?
33. The lahar with the greatest volume entered and flowed down the North or South Fork Toutle River?
34. In the two weeks following the May 18 eruption, how far had ash spread?

35. The eruption that began on May 18, 1980 was over by
- May 22, 1980
 - May 20, 1980
 - May 19, 1980
 - May 21, 1980
 - May 23, 1980
36. The May 18 eruption lowered the highest point on the summit of Mt. St. Helens by
- 100 meters
 - 200 meters
 - 300 meters
 - 400 meters
 - 500 meters
37. How many lives were lost due to the May 18, 1980 eruption at Mt. St. Helens?
38. What was the total cost of the damage produced by the May 18 eruption?
- \$1.74 billion
 - \$2.47 billion
 - \$2.74 billion
 - \$3.74 billion
 - \$3.47 billion

Answers

- North American
- Continental-margin
- northern California, Oregon, Washington, Canada
- California: Mt Shasta and Lassen Peak, Oregon: Mt. Hood and Crater Lake, Washington: Mt. St. Helens and Mt. Rainier
- d. 2 m.y.
- d. 1980
- d. 6
- c. ~2,200 years
- d. earthquake activity
- steam-blast explosions
- continuous

12. The movement of magma or gases beneath the volcano
13. It was interpreted to signify that magma was being forced into a sub-volcanic magma chamber located beneath the growing bulge.
14. d. A magnitude 5.2 earthquake with a focus located about 1 mile beneath the volcano
15. It is the largest ever recorded.
16. c. 177 to 249 km/hour
17. yes
18. c. ~45.7 m
19. lateral blast
20. pyroclastic flow
21. yes, it overtook the landslide-debris avalanche
22. d. ~1078 km/hour
23. ~30.6 km (~31 km)
24. The three concentric zones are the direct blast, channelized blast, and seared zones.
25. No, everything that was standing was carried away or vaporized by the pyroclastic flow.
26. They were all knocked down.
27. They were singed brown by the hot gases of the pyroclastic flow.
28. d. ~19.3 km
29. Yes, vegetation and trees were set afire.
30. Parts of the eruption column collapsed, generating several pyroclastic flows that moved down the flanks of the volcano.
31. Pyroclastic flows traveling over the glacier and snowfields near the summit of Mt. St. Helens.
32. The early lahars were all produced by wet rock avalanches.
33. It flowed down the North Fork Toutle River.
34. It had drifted around the globe.
35. c. May 19, 1980
36. d. 400 meters
37. 57
38. c. \$2.74 billion