Analysis

1. Describe the figures that resulted from the joined Qs and the joined Vs.

2. What relationship exists between earthquake zones and volcano zones on your map?

3. How do the earthquake and volcano zones compare with plate boundaries shown on the map in Chapter 2?

4. At which of the three types of plate boundaries are all of the volcanoes and earthquakes located?

5. What other surface feature is likely to be near the volcanoes on your map?

6. Why do you think the area around the Pacific is called "The Ring of Fire"?

a)

Areas of Frequent Earthquakes	Volcanoes
Acapulco, Mexico	Tacora, Chile
Aleutian Islands	Misti, Peru
Anchorage, Alaska	Mt.St. Helens, U.S.A
Concepcion, Chile	Osorno, Chile
Costa Rica	Paricutin, Mexico
Ecuador	Pogromni, Aleutian 1
Fiji Islands	Sangay,Ecuador
Los Angeles, California, USA.	Sta.Maria, Guatemala
New Guinea	Ruapehu, New Zealand
Nicaragua	Taal, Philippines
New Zealand	Wrangell, Alaska
Portland, Oregon, USA.	Koryakskaya, Pacific
San Francisco, California, USA.	Coast of Russia
Santiago, Chile	Yokohama, Japan

A) REPORT

ERUPTIONS AND THEIR PRODUCTS

Extracted from "FACING GEOLOGIC AND HYDROLOGIC HAZARDS", U.S. Geological Survey, Professional Paper 1240-B

Volcanic eruptions can be broadly classed as non-explosive or explosive. Nonexplosive eruptions are generally caused by an iron and magnesium-rich magma (molten rock) that is relatively fluid and allows gas to escape readily. Lava flows that are common on the island of Hawaii are the characteristics product of nonexplosive eruptions. Explosive eruptions, in contrast, are violent and are derived from a silica-magma that is not very fluid; these eruptions are common at volcanoes in the volcanic chain of Alaska. Explosive eruptions produce large amounts of fragmental debris in the form of airfall ash, pyroclastic flows, and mudflows on and beyond the flanks of the volcanoes.

Tephra is one of the products of an eruption. Tephra is a term used to describe rock fragments of all sizes erupted into the air above a volcano, often in a vertical column that reaches into the outer layer of the stratosphere. Large rock fragments generally fall back onto, or near, the volcano. Small fragments are carried away by wind and fall to the ground at a distance determined by the grain size and density, the height to which the fragments are erupted, and the velocity of the wind. Eruption of a large volume of tephra will cause a distinct layer of ash to accumulate. The spatial distribution of ash accumulation is generally in the form of a lobe which is thickest directly downwind from the volcano and thinnest the boundaries; the thickness decreases as distance from the volcano increases. Tephra can endanger lives and damage property at considerable distances from a volcano by forming a blanket at the groundsurface and by contaminating the air with abrasive particles and corrosive acids. Close to a volcano, people can be injured or killed by breathing tephra-laden air; damage to property is caused by the weight of tephra and its smothering and abrasive effects.

Hot fragments and gases can be ejected laterally at high speed from explosive volcanoes and can be extremely dangerous. Lateral blasts, the term for the phenomenon, commonly leaves deposits that are no more than 3 to 6 feet thick near source vent, theses deposits thin rapidly as distance from the vent increases. They generally do not extend more than several kilometers from the vent, but ocasionally a blast can reach as far as about 25 kilometers. Lateral blasts endanger people chiefly because of their heat, rock fragments carried, and high speed which may not allow sufficient time for them to escape or to find adequate cover. Damage to structures results chiefly from impact and high-speed "wind". Lateral blast phenomenon can grade outward to pyroclastic flows that move down from slopes. The effects of the two events are similar.

Pyroclastic flows are masses of hot dry rock debris that move like a fluid. They owe their mobility to hot air and other gases mixed with the debris. They often form when large masses of hot rock fragments are suddenly erupted onto a volcano's flanks. Pyroclastic flows can move downslope at speeds of as much as 160 kilometers per hour and tend to follow and bury valley floors. Clouds of hot dust generally rise from the basal coarse part of the flow and may blanket adjacent areas, especially downwind. Because of their great mobility, pyroclastic flows can afect areas 25 kilometers or more from a volcano. The principal losses from a pyroclastic flow are caused by the swiftly moving basal flow of hotrock debris, which can bury and incinerate everything in its path, and the accompanying cloud of hot dust and gases, which can extend beyond the basal flow and cause asphyxiation and burning of the lungs and skin.

Mudflows are masses of water-saturated rock debris that move down slopes in a manner resembling the flowage of wet concrete. The debris is commonly derived from masses of loose unstable rock deposited on the flanks of a volcano by explosive eruptions; the water may be provided by rain, melting snow, a crater lake, or a lake or reservoir adjacent to the volcano. The speed of mudflows depends mostly on their fluidity and the slope of the terrane; they sometimes move 80 kilometers or more down valley floors at speeds exceeding 35 kilometers per hour. Mudflows may reach even greater distances than pyroclastic flows, about 90 kilometers from their sources. The Chief threat to man is burial. Structures can be buried or swepts away by the vast carrying power of the mudflow.

Lava flows are generally erupted quietly, although they are often preceded by explosive volcanic activity. Lava flows typically appear only after an eruption has been in progress for hours, days, or a few weeks, rather than at the outset of the eruption. The fronts of lava flows usually advance at speeds ranging from barely perceptible to about as fast as a person can walk. Lava flows typically cause no direct danger to human life, but they generally cause total destruction in the areas they cover. Lava flows that extend into areas of snow may melt it and cause floods and mudflows; lava flows that extend into vegetated areas can start fires. On large central-vent volcanoes lava flows generally are short; therefore, lava-flow hazard zones include only the flanks of the volcano and the nearest 2 to 3 kilometers of adjacent valleys and basins.

Flow-hazard zones extend considerable distances down some valleys. Losses from a volcanic eruption can be reduced in several ways. These include (1) use of knowledge of the past eruptive activity of a volcano to define the potential kinds, scales, locations, extents, effects, and severity of future eruptions and to define hazard zones, (2) establishment of monitoring system to forecast an impending eruption and to provide warning, (3) disaster preparedness and emergency evacuation, (4) protective measures, (5) risk assessment and land-use planning, (6) insurance, and (7) relief and rehabilitation.

B) CHAPTER SUMMARY

- Most earthquakes are a result of the movement of rocks along a fault.
- Most earthquakes occur near plate boundaries.
- Numbers on the Richter scale indicate the strength of an earthquake.
- P-waves, S-waves, and L-waves carry energy away from the focus of an earthquake.
- Seismographs detect and record seismic waves.
- Rocks form inside the earth and on the surface of the earth because of volcanic activity.
- Most volcanic activity on the earth's surface is near plate boundaries.
- A volcano is called active, dormant, or extinct depending upon its history of eruptive behavior.
- Cinder cones, shield cones, composite cones,.and volcanic domes are different types of volcanoes.

C) QUESTION/PROBLEMS

1. What causes earthquakes in the middle of a plate?
2. Explain what is meant by a deep focus earthquake.
3. Why do scientists think that the outer core of the earth is liquid?
4. What causes volcanoes to occur on island arcs?
5. List four signs that might help scientists predict an earthquake.
6. How can you tell that a fault releases energy?
7. Where do most deep focus earthquakes occur?
8. What increase in energy is an increase of one number on the Richter scale?
9. Where did the strongest recorded earthquakes occur?
10. Which two seismic waves move through the earth?
11. Why do scientists need three seismograph readings to find an earthquake?
12. What might the slowing of P-waves indicate?
13. What is a batholith?
14. What is a fissure in the earth?
15. How does an island arc form?
16. What is an extinct volcano?
17. Which of the types of cones is not steep-sided?

D) CHAPTER TEST

A. Vocabulary. Match the definition in Column I with the term it defines in Column II, on the left margin between the brackets.

Column I	Column II
( ) 1. a volcano that has not erupted recently	a. aftershock
( ) 2. a series of small earthquakes that follow a large one	b. batholith
( ) 3. a volcano that is not expected to erupt again	c. dormant
( ) 4. the way in which energy travels through the earth	d. epicenter
( ) 5. the point on the earth's surface which is above,the focus of an earthquake	e. extinct
( ) 6. an instrument that detects seismic waves from distant earthquakes	f. extrusive
( ) 7. volcanic activity that takes place at the surface of the earth	g. seismic wave
	h. focus
	i. laccolith
	j. seismograph

B. Multiple Choice. Choose the letter that best completes the statement or answers the question, and write it on the column at the left margin between the brackets.

( ) 1. To locate the epicenter of an earthquake, scientists need at least

a) one seismograph report
b) two seismograph reports
c) three seismograph reports
d) four seismograph reports

( ) 2. A mushroomed-shaped intrusive rock mass is a

a) laccolith
b) stock
c) sill
d) volcanic dome

( ) 3. Most magma reaches the surface at

a) trenches
b) mid-oceanic ridges
c) faults
d) island arcs

( ) 4. When old ocean crust moves under younger ocean crust, the resulting volcanoes are

a) flood basalts
b) continental volcano chains
c) new ocean floors
d) on island arcs

( ) 5. Volcanoes composed of alternating layers of volcanic ash and lava are

a) composite cones
b) cinder cones
c) shield volcanoes
d) volcanic domes

( ) 6. A crack in the ground through which lava oozes is a

a) trench
b) fissure
c) stock
d) sill