

GEOLOGY 12
CHAPTER 4 WORKSHEET
VOLCANOES

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Part A

- The rough, jumbled blocky or jagged surface of a lava flow is called
a. pahoehoe b. lahar **(c.) aa** d. phreatic
- The Cascade volcanoes like Mt. St. Helens and Mt. Rainier are examples of
a. cinder cones b. plateau of fissure-type basaltic eruptions
(c.) composite cones d. shield cones
- The volcanic eruptions along the mid-oceanic spreading ridges are examples of
a. cinder cones **(b.) plateau of fissure-type basaltic eruptions**
c. composite cones d. shield cones
- Which of the following terms represents a rock formed predominately from ash-sized pyroclastic fragments?
a. breccia **(b.) tuff** c. cinders d. aa lava
- Where would a caldera likely be found?
a. along a fissure zone b. at the top of a cinder cone
(c.) within a collapsed shield volcano d. along a mid-oceanic ridge
- The Pacific "Ring of Fire" is so named because it has
(b.) many explosive stratovolcanoes (composite cones)
a. many deep-focus earthquakes
c. many shield volcano "hot Spots"
d. many long transform faults like the San Andreas Fault
- Which characteristic best describe volcanoes which form over a hot spot in oceanic lithosphere?
(b.) layer upon layer of plateau basalt's erupted from fissures
a. broad shield cones with a composition of basalt
c. composite cones with an average composition of andesite
d. scattered cinder cones and fissure eruptions of highly viscous lava
- In terms of plate tectonics, where are the most hazardous volcanoes found?
a. at oceanic hot spots **(b.) along convergent plate boundaries**
c. at continental fissure eruptions d. along mid-oceanic spreading
- The most dangerous place to live in the vicinity of a cascade volcano (ie Mt. St. Helens) would be
(a.) in one of the river valleys at the base of the volcano
b. 100 km. to the east, where ash could be deposited
c. on top of a nearby non-volcanic ridge
d. in any town within site of the volcano
- Magma that reaches the earth's surface is called lava.
- Most of the volcanic rock on the earth is produced at seafloor spreading ridges.
- When magma erupts out of long cracks in the lithosphere or crust, as it does along spreading ridges, such eruptions are known as fissure eruptions.
- The contractions of cooling lava may produce polygonal columns know as columnar jointing.
- The volcanoes of the Pacific "Ring of Fire" actually represent subduction zone volcanism.

15. Relatively fluid, basaltic lavas tend to form shield volcanoes when they erupt from central vents.
16. The smooth, ropy-looking surface which forms when especially fluid lava cool is called pahoehoe.
17. Silicic lava of andesitic or rhyolitic composition tends to form volcanic domes when they ooze out at the surface.
18. A volcanic cone formed entirely of pyroclastic material is known as a cinder cone.
19. Stratovolcanoes, or composite cones, are built of layers of alternating lava flows and pyroclastic material.
20. Andesitic and rhyolitic lava tend to be thick, or more viscous than basaltic lava.
21. Composite cones tend to be more felsic in composition, compared to shield cones.
22. Gases escape more easily from mafic magmas than from the more viscous andesitic or rhyolitic magmas.
23. The magma produced at seafloor spreading ridges derives from partial melting of the ultramafic asthenosphere.
24. The type of pyroclastic material that can be carried the farthest distance from an erupting volcano would be ash.
25. A volcano is usually considered active if it has erupted in recent history.
26. A volcano that has not erupted recently and that does not appear to have eroded or worn down is considered dormant.
27. A volcano that has had no recent eruptions and that appears very eroded or worn down is considered extinct.

Match the kind of volcano on the right with the description on the left.

- | | | |
|---|----------|------------------------------------|
| 28. built primarily of lava flows only | <u>a</u> | a. shield volcano |
| 29. likely to produce a nuee ardent | <u>b</u> | b. composite cone or stratovolcano |
| 30. Columbia River plateau basalt | <u>c</u> | c. neither |
| 31. built of pyroclastic and lava flows | <u>b</u> | |
| 32. broad and very low-sloping | <u>a</u> | |
| 33. generally andesitic in composition | <u>b</u> | |
| 34. built entirely of pyroclastics | <u>c</u> | |

Match the kind of volcano on the right with the description on the left.

- | | | |
|--|----------|------------------------------------|
| 35. highly explosive, ash-rich eruptions | <u>b</u> | a. shield volcano |
| 36. associated with oceanic hot-spots | <u>a</u> | b. composite cone or stratovolcano |
| 37. low-viscosity lava | <u>a</u> | c. neither |
| 38. ash fall hazards | <u>b</u> | |
| 39. occurs mostly at convergent plate boundary | <u>b</u> | |
| 40. Mt. Vesuvius | <u>b</u> | |
| 41. Hawaiian Islands | <u>a</u> | |

Part B

- T F 1. The source for the magma that erupts along spreading ridges is partial melting of the asthenosphere.
- T F 2. Magma that cools along divergent boundaries is forming new crust and lithosphere.
- T F 3. Volcanoes that form on continents over subduction zones are generally andesitic in composition.
- T F 4. The source for the magma that erupts over subduction zones is partial melting of the asthenosphere.
- T F 5. Magmas that erupt at an oceanic hot spot will be most similar to magmas erupting on a continent over a subduction zone.
- T F 6. One source for more silicic magma at subduction-related volcanoes may be melting or partial melting of the continental crust itself.
- T F 7. Moving a body of ultra mafic rock to a higher place in the mantle will lower the temperature needed to melt the rock.
- ~~T F 8. Under pressure, wet basalt has a lower melting temperature than does dry granite.~~
- T F 9. Under pressure, wet basalt has a higher melting temperature than does dry basalt.

Refer to Figures 4.2 and ~~4.3~~ ^{5.1} on page ~~59~~ for the questions #10 to 13.

10. If pressure is held constant and water is added, what will happen to the melting temperature of igneous material of any composition?
- nothing; the melting temperature will not change
 - the melting temperature will increase if water is added
 - the melting temperature will decrease if water is added
 - the direction of change in melting temperature varies, depending on the composition of the igneous material
11. If the pressure on dry igneous material decreases, how will the melting temperature change?
- the melting temperature will not change; pressure has no effect
 - the melting temperature will increase
 - the melting temperature will decrease
 - the direction of the effect depends on the composition of the igneous material
12. For wet igneous rocks (the dashed lines in both graphs), are melting temperatures higher or lower at very low pressure compared to high pressure
- melting temperatures are higher at low pressures
 - melting temperatures are lower at low pressures
 - the graphs don't indicate an answer to this question
 - the answer depends on the composition of the igneous rocks
13. ~~Which type of rock requires the lowest temperatures to begin to melt?~~
- ~~ultramafic rock~~
 - ~~granite rock~~
 - ~~basaltic rock~~
 - ~~mantle rock~~
14. The most silicic volcanoes are typically found
- along the mid-oceanic rift zone
 - in continental fissure or rift zones
 - along continental-oceanic convergent plate margins
 - over hot spots in oceanic crust

15. Which term below represents a mudflow that contains volcanic material and is initiated by volcanic eruption?
 a. nueé ardentes **b.** lahar c. ash fall d. aa flow
16. Which term below represents a dense cloud of gas and volcanic ash that races down the slopes of a violently erupting volcano?
a. nueé ardentes b. lahar c. ash fall d. aa flow
17. Why do more viscous lava generally erupt more violently and explosively than do less viscous lavas?
 a. because more viscous lavas erupts less frequently than less viscous lavas
 b. because more viscous lavas tend to be cooler than less viscous lavas
c. because more viscous lavas trap gases so pressure build up in the magma chamber
 d. because more viscous lavas contain very little gas and other volatiles
18. The smooth, ropy-looking surface which forms when especially fluid lavas cool is called paohoe.
19. Silicic lavas of andesitic or rhyolitic composition tend to form volcanic domes when they ooze out at the surface.
20. Magmas that erupt suddenly and violently, releasing built-up gas pressure, tend to produce pyroclastic materials rather than lava flows.
21. Gases escape more easily from mafic magmas than from the more viscous andesitic or rhyolitic magmas.
22. The magma produced at seafloor spreading ridges derives from partial melting of the ultramafic asthenosphere.
23. The release of water from a down going slab of subducted lithosphere is referred to as dewatering of the lithosphere.
24. The characteristic composition of island arc volcanism is basaltic to andesitic, which represents magmas which contain more silica.
25. Hot-spot volcanism is attributed to mantle plumes, which are thought to be relatively stationary features in the mantle.
26. Like all liquids, lava flows down hill.
27. The type of pyroclastic material that can be carried the farthest distance from an erupting volcano would be ash.
28. Carbon monoxide, hydrochloric acid, and hydrofluoric acid are examples of toxic gases that may be emitted during a volcanic eruption.
29. A steam/phreatic explosion occurs when water seeps into the rock surrounding a hot magma chamber and turns to steam, blowing up the overlying volcano.
30. A very explosive volcanic eruptions can throw large amounts of volcanic dust high into the atmosphere, blocking the sun and causing long term climate cooling.

Part C

- Try answering as many of the following questions as possible before referring to your notes or text book.

LEVEL A Testing for Recall

Multiple Choice: Circle the letter of the choice that BEST answers the question.

1. The kind of volcano formed at a hot spot is commonly a
 - a. shield volcano
 - b. volcanic dome
 - c. composite volcano
 - d. stratovolcano
2. Volcanic domes are formed by
 - a. plumes
 - b. abundant eruption of cinders and other pyroclastics
 - c. viscous, rhyolitic lavas
 - d. lahars
3. Pyroclastics such as ash and cinders
 - a. flow downhill in channel, like streams
 - b. can fall like snow, blanketing the surrounding land
 - c. are a nuisance, but pose no threat to humans
 - d. all of the above
4. A volcanic mudflow formed when hot ash melts snow on a volcano is a
 - a. lahar
 - b. nuée ardente
 - c. cinder cone

Fill in the Blank: Listed below are three categories of volcanoes. Indicate an "a" if the volcano is alive, a "s" if the volcano is sleeping, and a "d" if the volcano is dead.

- S 5. dormant
a 6. active
d 7. extinct

True or False: Write a "t" for a true statement and a "f" for a false statement.

- F 8. Fissure eruptions occur only on the ocean floor, at spreading ridges.
- T 9. Cinder cones are built of pyroclastic materials.
- T 10. Calderas often form by the collapse of a volcano's summit into a former magma chamber below.
- T 11. A small amount of partial melting of the upper mantle produces a small quantity of ultramafic melt.
- T 12. Lava is more of a hazard to property than to life, as lava flows paths are predictable, and most lavas move rather slowly. *pg 56*
- F 13. Magmas contain dissolved water, and therefore volcanoes emit water vapor, but they release no other gases.
- T 14. Although their eruptions are local, volcanoes can have global impact, for example in their effect upon climate.

LEVEL B Testing for Understanding

Multiple Choice: Circle the letter of the choice that BEST answers the question.

- Volcanoes that erupt andesitic or rhyolitic lavas
 - produce large shield volcanoes
 - may erupt explosively if gas is trapped in the magma
 - are found primarily over hot spots
 - all of the above
- Precursors to volcanic eruptions may include all of the following EXCEPT
 - increased seismicity ✓
 - change in composition of emitted gases ✓
 - bulge or tilt of the earth's surface ✓
 - increased frequency of lahars
- The "Ring of Fire" is associated with
 - spreading centers
 - subduction zones
 - volcanoes
 - b and c
 - a, b, and c
- Basaltic lavas form what type of volcanoes?
 - shield
 - cinder cones
 - composite
 - no correct answer

5. Which of the following is NOT a hazardous effect of pyroclastics?
- a. volcanic bombs
 - b. falling ash blankets the countryside
 - c. health hazards of ash
 - d. lava flow buries houses
6. Which of the following are thermal features characteristic of volcanic areas?
- a. Hot Springs
 - b. geysers
 - c. fumaroles
 - d. hydrothermal alteration
 - e. all are correct
7. Shield volcanoes form from very fluid, viscous) lavas while domes form from (very fluid, viscous) lavas.

LEVEL C Testing for Application

Multiple Choice: Circle the letter of the choice that BEST answers the question.

1. The volcanic mountains of the Cascade Range
- a. sit above a subduction zone, and are potentially explosive
 - b. are all dormant, and therefore pose no threat in the near future
 - c. characteristically erupt a very fluid, basaltic lava
 - d. all of the above
2. Describe the relationship of magma viscosity to volcanic structure types and lava characteristics.

High viscosity = steep side cones = trapped gasses
(silicic) = explosive + slow moving lavas

Low viscosity = shallow sloped cones = gasses released
(mafic) = gentle explosion
= faster moving lavas