

**Vocabulary List** (Number, write and define these words on another sheet of paper, those that have a \* please illustrate, be creative!) (39 total)

intrusion	lava plateau*	dike*	sill*
petrologist	extrusion	petrology	porphyry*
laccolith*	batholith*	stock*	igneous rock
volcanic neck*	volcanic mountain	aa*	caldera
Cinder cone	composite volcano*	crater	felsic lava
Fissure	hot spot*	lapilli	lava
Mafic lava*	magma	pahoehoe*	pillow lava
Pyroclastic material	shield volcano*	stratovolcano*	tephra
Vent*	volcanic ash	volcanic block	volcanic bomb
Volcanic dust	volcanism	volcano	

**Introduction to Rocks**

A. Definition

1. A rock is a consolidated mixture of \_\_\_\_\_, rocks are classified by \_\_\_\_\_.
2. The earth is almost entirely rock to a depth of 2900 kilometers (1800 miles)

B. History

1. Humans have been using rocks for a long time
2. Examples: Stonehenge in \_\_\_\_\_, the Great Pyramids of \_\_\_\_\_, the Great Wall of China

C. Composition

1. Most rocks are composed of a combination of eight elements (oxygen, silicon, aluminum, iron, calcium, sodium, potassium, and magnesium)
2. \_\_\_\_\_ make up 75% of the earth's surface

D. Terminology

1. \_\_\_\_\_ - the study of rocks
2. \_\_\_\_\_ - a scientist who studies rocks
3. \_\_\_\_\_ - solid rock attached to the earth
4. \_\_\_\_\_ - a large, loose rock lying on the surface
5. \_\_\_\_\_ - bedrock visible on the earth's surface
6. \_\_\_\_\_ - an open pit where rock is taken out of the ground for other uses

E. Types of rocks

1. Igneous rocks are rocks formed from the cooling and hardening of molten rock (from the Latin word *ignis*, which means \_\_\_\_\_)
2. Sedimentary rocks are rocks formed from the pressing together and cementing of \_\_\_\_\_
3. Metamorphic rocks are rocks formed when existing rocks are changed by \_\_\_\_\_ (*meta* means change)

F. The Rock Cycle

1. The earth's surface may seem permanent but over time the surface has changed dramatically
2. Rocks don't remain igneous, sedimentary or metamorphic, they change from one kind to another this is called the \_\_\_\_\_

## **Igneous Rocks**

### Types of igneous rocks

1. \_\_\_\_\_ (plutonic)- form from magma deep inside the earth
2. \_\_\_\_\_ (volcanic)- form from lava on the earth's surface

### A. Igneous rocks are classified by their texture (shape, size, arrangement of minerals)

#### 1. Four textures:

- a. \_\_\_\_\_ - resembles glass and is shiny, no crystals form (not enough time, cooled instantly)  
-example: Obsidian
- b. \_\_\_\_\_ - made of interlocking minerals crystals that can only be seen under a microscope (cooled rapidly)  
-example: Basalt
- c. \_\_\_\_\_ - made of interlocking mineral crystals that are visible to the naked eye (cooled slowly)  
-examples: Granite
- d. \_\_\_\_\_ - consists of large crystals and small crystals  
-example: porphyry

### B. Families of igneous rocks

1. \_\_\_\_\_ family - light colored (felsic); rich in quartz, muscovite mica and orthoclase feldspar,
  - a. Granite - coarse-grained; forms Mount Rushmore
  - b. Rhyolite - fine-grained; forms when lava flows harden
  - c. Obsidian - glassy; volcanic glass; conchoidal fracture
  - d. Pumice - glassy; volcanic glass; very light; floats on water
2. \_\_\_\_\_ - dark-colored (mafic), rich in hornblende, biotite mica, plagioclase feldspar and augite
  - a. Gabbro- coarse-grained
  - b. Basalt- fine-grained; forms when lava flows harden

### C. Igneous rock Formations

1. \_\_\_\_\_
  - a. Largest igneous intrusion (covers an area over 100 sq. kil), form core of many mountain ranges
2. \_\_\_\_\_
  - a. Similar to batholith but covers less than 100 sq. kilometers
3. \_\_\_\_\_
  - a. "Lake of rock," magma flows between layers of rock and spreads upward
4. \_\_\_\_\_

a. A \_\_\_\_\_ intrusion that pushes between layers of rock but does not arch them up.

b. example: Palisades of the Hudson River, NY

#### 5. Dike

a. A \_\_\_\_\_ intrusion that cuts across other rock layers

b. example: Spanish Peaks in Colorado

#### 6. Lava Plateau

a. an extrusive formation that forms when lava flows out over a flat area of the earth and cools

b. Example: \_\_\_\_\_, northwestern U.S.

#### 7. Volcanic neck

a. a plug of hardened magma in the \_\_\_\_\_ of an old volcano

b. examples: Ship Rock, NM; Devil's Tower, WY; Kimberly diamond mines of South Africa

### 7.1 Volcanoes and Plate Tectonics

#### 1. What happens when melted rock in the crust?

- \_\_\_\_\_, slowly pushes up due to being less dense than solid crust sometimes rising to the surface in the form of lava

-the opening through which lava flows onto the surface is called the \_\_\_\_\_ and the buildup of material around the surface is called the volcano

#### 2. What causes volcano formation at a subduction zone?

-Heat from the mantle and friction between the moving plates melts the subducted plate into magma, some of it rises to the surface forming either volcanic mountains along a \_\_\_\_\_

#### 3. What causes volcano formation along divergent boundaries?

-Greatest amount of magma comes to the surface along mid-ocean ridges, magma rises to the surface through \_\_\_\_\_

#### 4. What are fissures, and why are they found in Iceland?

-Fissures are cracks through which lava flows, \_\_\_\_\_

- \_\_\_\_\_ has them because it is at the mid-Atlantic ridge, one side of the country is on the N. American plate and one side is on the Eurasian plate

#### 5. What are hot spots?

-Stationary points in the middle of lithospheric plates where magma penetrates to form volcanoes

-Though the hot spot stays in one place, the lithospheric plate moves carrying away a volcano from the hot spot and creating a new one ex: \_\_\_\_\_

### 7.2 Volcanic Eruptions

#### 1. Why are volcanoes considered windows?

-The lava that comes from volcanoes provides an opportunity for scientists to study the material that comes from \_\_\_\_\_

#### 2. What types of lava can come out of a volcano?

- \_\_\_\_\_ - dark colored, rich in magnesium and iron, usually of oceanic crust origin

- \_\_\_\_\_ -a light colored, contains silica, lesser amounts of magnesium and iron, usually from melted continental crust

-Other lavas have a range of compositions that fall between the mafic and felsic lavas

3. How is mafic lava further classified by the Hawaiians?

- \_\_\_\_\_ -lava that cools with a wrinkled harden surface, sometimes ropey

- \_\_\_\_\_ - lava that cools rapidly and breaks into jagged chunks as the liquid below continues to flow, sharp, blocky shapes

-Why do you think they called Aa lava by that name?

- \_\_\_\_\_ -when lava flows out of fissures on the ocean floor, it cools rapidly in rounded shapes, found along mid-ocean ridges

4. What determines if a volcano will have a quiet eruption?

- \_\_\_\_\_ usually produce mafic lava which is very hot and thin, flows almost like water, gas can escape so lava flows like a river

-ex: Hawaiian Islands produce quiet eruptions

5. What determines if a volcano will have an explosive eruption?

-Continental volcanoes usually contain \_\_\_\_\_ that tend to be cooler and thicker, contain large amounts of trapped gas (water vapor and carbon dioxide), the buildup of gases eventually leads to an explosive eruption sending debris high into the air

6. What is tephra and how is it classified?

-Also called \_\_\_\_\_ are rock fragments ejected from a volcano

->0.25 mm- \_\_\_\_\_ - can travel around the world in the upper atmosphere

-0.25mm-2 mm= \_\_\_\_\_

->64mm= \_\_\_\_\_ (Latin for little stones), generally falls near the vent

- \_\_\_\_\_ - lava that is ejected through the air, cools and develops a round spindle shape

- \_\_\_\_\_ -largest tephra formed from solid rock from the fissure can be as large as a house!

7. What are shield cones?

-Volcanoes that are broad at the base and have gentle sloping sides, results of quiet eruptions, layers of mafic lava flow out of the vent and build up to form the cone, sometimes growing to heights of \_\_\_\_\_

- \_\_\_\_\_ are shield volcanoes built up from the ocean floor at a hot spot

8. What are cinder cones?

-Explosive volcanoes that are formed entirely of solid fragments ejected from the volcano, have very steep sides are rarely more than a 1,800 feet tall

-many cinder cones found in \_\_\_\_\_

9. What are composite volcanoes?

-Also called \_\_\_\_\_, have both quiet and explosive eruptions resulting in alternating layers of tephra and lava, reach heights of 5,000-20,000 feet

- \_\_\_\_\_ are examples of composite volcanoes

10. How does a Caldera form?

-When a volcano's magma chamber is emptied, the cone may collapse or a large enough explosion can completely destroy the cone leaving behind a basin shaped depression

-ex: \_\_\_\_\_

11. What tools and hints does a volcanologist use to predict a volcanic eruption?

- \_\_\_\_\_ - predict small earthquakes around the volcano, result of growing pressure on surrounding rocks due to rising magma
- \_\_\_\_\_ in the rocks
- Slight bulging of the surface of a volcano can be detected by sensitive instruments
- The composition \_\_\_\_\_ given off by a volcano
- knowledge of \_\_\_\_\_

Impact on Society: Krakatau (page 125)

In 1883, what effects did this huge eruption have on the surrounding S. Pacific area?

1. Series of eruptions from May-August, last eruption 8/27/1883 was heard all the way in \_\_\_\_\_
2. Thick cloud of ash kept the area in total darkness for 2.5 days, ash buried all remaining life that was left on the island
3. Triggered tsunamis over \_\_\_\_\_ in Java and Sumatra
4. Altered sunsets around the world for \_\_\_\_\_ and lowered global temperatures by 0.27 Celsius, altering climate worldwide for up to 10 years

What would be the advantages and disadvantages of volcanoes?

- Advantages: \_\_\_\_\_, make fertile soil, attract tourists, allow scientists to study earth's interior \_\_\_\_\_ (geothermal)
- Disadvantages: cause loss of \_\_\_\_\_

7.3 Extraterrestrial Volcanism

1. Without convection currents, how could the moon be a site of volcanism?

- A long period of intense meteorite bombardment may have created enough heat in the upper layers of \_\_\_\_\_

2. What is the largest volcano in the solar system?

- \_\_\_\_\_, a shield volcano on Mars rises almost 18 miles above the surface (Everest is almost 6 miles tall)

3. Where is the most volcanically active body in the solar system, how is it different than Earth?

- \_\_\_\_\_, a moon of Jupiter ejects as much material in one month as the Mt. St. Helen's eruption in 1980
- Io's volcanoes erupt material that is primarily sulfur and sulfur dioxide giving the moon a yellow-red color
- Due to the extreme gravity of Jupiter, the surface is under extreme stress probably the reason for volcanism