Mr. Standifer

**Volcanoes**

**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**How Magma forms**

* The ash that spews from some volcanoes can form billowy clouds that travel around the world before raining back down to Earth.
* In the last 10 000 years, more than 1500 different volcanoes have erupted, providing evidence that Earth is indeed geologically active.
* Magma is a mixture of molten rock, suspended mineral grains, and dissolved gases that fuels all volcanoes.
* Magma forms when temperatures are high enough to melt the rocks involved, usually between 800°C and 1200°C.
* Such temperatures exist at the base of the lithosphere and in the asthenosphere.

**Pressure**

* Pressure, which increases with depth, is one factor that determines whether rocks will melt to form magma.
* As pressure increases, the temperature at which a substance melts also increases.
* Due to the effects of pressure, most of the rocks in Earth’s lower crust and upper mantle do not melt to from magma.

**Water**

* The presence of water also influences whether a rock will melt.
* At any given pressure, a wet mineral or rock will melt at a lower temperature than the same mineral or rock under dry conditions.

**Types of Magma**

* The three major types of magma are: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Magma Composition**

* A number of factors determine the composition of magma.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the internal resistance to flow; the higher the viscosity, the thicker the magma.

**Basaltic Magma**

* Basaltic magma typically forms when rocks in the upper mantle melt.
* Most basaltic magma rises relatively rapidly to Earth’s surface and reacts very little with crustal rocks because of its low viscosity.
* The volcanoes fueled by basaltic magma erupt relatively quietly.

**Andesitic Magma**

* Andesitic magma is found along continental margins, where oceanic crust is subducted into Earth’s mantle, and is formed from oceanic crust or oceanic sediments.
* Andesitic magma contains about 60 percent silica, resulting in an intermediate viscosity.
* The volcanoes it fuels are said to have intermediate eruptions.

**Rhyolitic Magma**

* Rhyolitic magma forms when molten material rises and mixes with the overlying silica and water rich continental crust.
* Rhyolitic magma has high viscosity and fuels very explosive volcanoes.

**Viscosity**

* The viscosity of magma and lava depends on both temperature and composition.
* The hotter the magma or lava, the lower the viscosity.
* Magmas and lavas high in silica have higher viscosities than magmas and lavas low in silica.

**Anatomy of a Volcano**

* When magma reaches Earth’s surface it is called lava.
* A \_\_\_\_\_\_\_\_\_\_\_\_\_ is where lava erupts through an opening in the crust.
* As lava flows out onto the surface, it cools and solidifies around the vent, eventually accumulating to form a mountain known as a volcano.
* A crater is a bowl-shaped depression at the top of a volcano that is connected to the magma chamber by a vent.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are usually less than 1 km in diameter.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are large depressions up to 50 km in diameter that can form when the summit or the side of a volcano collapses into the magma chamber that once fueled the volcano.
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**Types of Volcanoes**

* The appearance of a volcano depends on two factors:
	+ The type of material that forms the volcano
	+ The type of eruptions that occur
* Based on these two criteria, three major types of volcanoes have been identified:
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Shield Volcanoes**

* A shield volcano is a mountain with broad, gently sloping sides and a nearly circular base that forms when layer upon layer of basaltic lava accumulates during non-explosive eruptions.
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**Cinder-Cone Volcanoes**

* A cinder-cone volcano is a generally small, steep-sided volcano that forms when material ejected high into the air falls back to Earth and piles up around the vent.
* The magma that fuels these volcanoes contains more water and silica than shield volcanoes, which makes them more explosive in nature.
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**Composite Volcanoes**

* Composite volcanoes are large volcanoes that form when layers of volcanic fragments alternate with lava.
* The magma that forms composite volcanoes commonly contains large amounts of silica, water, and gases, making these volcanoes violently explosive.
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**Sizes and Shape**

* Shield volcanoes are by far the largest, and cinder-cone volcanoes are the smallest.
* Cinder-cone volcanoes have the steepest slopes, while shield volcanoes have the gentlest slopes.
* The slopes of cinder-cone and composite volcanoes are concave, and the slopes of shield volcanoes are straight.

**Volcanic Material**

* Tephra are rock fragments thrown into the air during a volcanic eruption.
* Tephra are classified by size, the smallest being dust (less than 0.25 mm) and ash (0.25–2 mm).
* Somewhat larger fragments are called lapilli, or “little stones” (2–64 mm in diameter).
* The largest tephra thrown from a volcano include angular volcanic blocks and rounded or streamlined volcanic bombs, both of which can be the size of a house or larger.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* Some tephra cause tremendous damage and kill thousands of people.
* A pyroclastic flow is a cloud of volcanic gas, dust, and other tephra traveling at speeds of nearly 200 km/h.
* The temperature at the center of a pyroclastic flow can exceed 700°C.

**Where do volcanoes occur?**

* Most volcanoes form at plate boundaries.
* About 80 percent of all volcanoes are found along convergent boundaries.
* About 15 percent are found along divergent boundaries.
* Only about 5 percent of extrusive igneous activity occurs far from plate boundaries.



**Convergent Volcanism**

* Convergence involving oceanic plates creates subduction zones, and the magma generated is forced upward through the overlying plate and forms volcanoes when it reaches the surface.
* The volcanoes associated with convergent plate boundaries form two major belts:
* The larger belt, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, is also called the Pacific Ring of Fire.
* The smaller belt is called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Divergent Volcanism**

* At \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, magma is forced upward into the fractures and faults that form as the plates separate.
* These areas of major faults and fractures are called rift zones.
* Most of the world’s rift volcanism occurs under water along ocean ridges.

**Hot Spots**

* Some volcanoes are located far from plate boundaries and form as the result of hot spots.
* Hot spots are unusually hot regions of Earth’s mantle where high-temperature plumes of mantle material rise toward the surface.
* A plume does not move laterally, which results in a trail of progressively older volcanoes that formed as a plate moved over a hot spot.
* The Hawaiian Islands continue to rise above the ocean floor as the Pacific Plate moves slowly over a hot spot.
* The rate and direction of plate motion can be calculated from the positions of volcanoes in a chain that has formed over a hot spot.

