Eruption Primer

Where Volcanoes Occur:

Occurrence (Where)	Divergent Plates	Converging Ocean-Ocean Plates	Converging Ocean – Continent Plates	Hot Spots
Description	Earth opens and magma comes out. Piles up through cooling.	Subduction of one ocean plate under another creates **Island Arc** Partial melting	Subduction of oceanic crust under continental crust creates a **Volcanic Arc**	**Hot Spot** - hot magma deep within mantle leaves trail as plate moves across magma chamber
Composition	peridotite and basaltic	basaltic and andesitic	andesitic and rhyolitic	basaltic
Examples	Mid-Atlantic Ridge, East Pacific Rise	Aleutians, Japan, Philippines	Andes, Cascade Range	Emperor Seamounts, Hawaiian Islands, Iceland, Yellowstone Caldera

Violent vs. Effusive Eruptions:

What determines whether a volcano erupts magma violently or effusively (gently)?

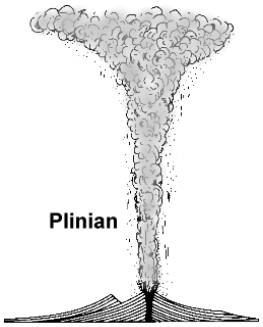
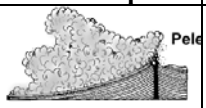
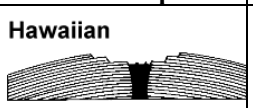
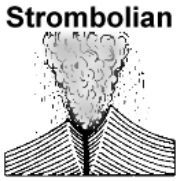
3 Factors affecting **Viscosity** (- a measure of a fluid's resistance to flow):
1. Chemical Composition - more silica in magma, increases viscosity

Magma Composition	**Silica Content**	**Viscosity**	**Lava Flows**
Basaltic	50%	least viscous	long, thin flows
Andesitic	60%	intermediate viscosity	
Rhyolitic	70%	most viscous	short, thick flows

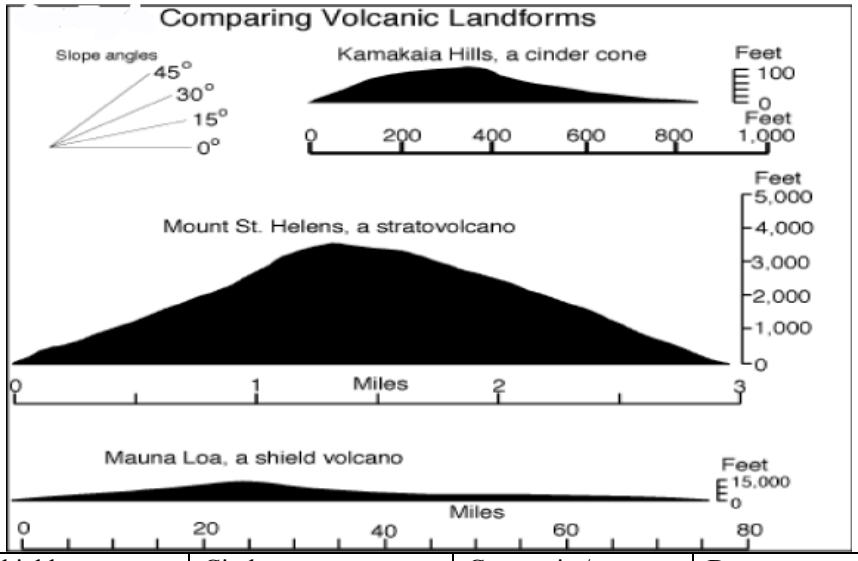
2. Temperature - as lava cools, viscosity increases, therefore mobility decreases

3. Dissolved Gases - dissolved gases increase fluidity, expansiveness of gas adds buoyancy, helps molten lava propel from a vent, highly viscous magmas block the upward migration of gases, pressure increases until violent eruption occurs

Types of Eruptions:

Plinian Eruption	Pelean Eruption	Hawaiian Eruption	Strombolian Eruption	Vulcanian Eruption
				
These awesome eruptions can inflict serious damage on nearby areas -- the eruption that buried Pompeii and Herculaneam was a Plinian eruption. They are initiated by magma with very high viscosity and gas content. The powerful upward thrust of the expanding gases propels pyroclastic material as high as 30 miles (48 km) in the air, at hundreds of feet per second. The eruption, which can last hours or even days, produces a towering, sustained **eruption plume**. This dumps a huge amount of **tephra**, fallen volcanic material, on surrounding areas (usually more to one side, depending on how the wind blows). Additionally, a Plinian eruption can produce extremely fast moving rhyolite lava flows from the eruption column collapse that destroy everything in their path.	This eruption style occurs when a deep plug of cooled, intermediate to high silica magma is violently forced out of the volcanic vent. A massive ash eruption and explosion may occur as gasses expand violently. Often a collapse (explosive or gravitational) of a lava dome occurs. Nuee ardente (French for glowing cloud) are common in this style. This eruptive style builds a large stratovolcano. Examples of this type volcano are Mt. Pelee on Martinique in the Caribbean, and Mt. Mazama in California.	Gentle eruption of low silica (low-viscosity, low-gas-content) basalt lava. Gas release may produce a **fire fountain**, a fountain of bright orange lava pouring hundreds of feet in the air, for a few minutes or sometimes several hours. The more typical eruption style is a steady lava flow from a central vent, which can produce wide **lava lakes**, ponds of lava forming in craters or other depressions. Lava flows and spatter from fire fountains can certainly destroy surrounding vegetation or trees, but the flow is usually slow enough that people have plenty of time to make it to safety. So named because they are common to Hawaii's volcanoes. *Lava flow* (aa, pahoehoe); *scoria cone* from fountaining.	These eruptions are fairly impressive but not particularly dangerous. They thrust small amounts of lava 50 to a few hundred feet (15 to 90 meters) in the air, in very short bursts. The lava has a fairly high viscosity, so gas pressure has to build to a high level before it will thrust the material upward. These regular explosions can produce impressive booming sounds, but the eruptions are relatively small. Strombolian eruptions generally don't produce lava flows, but some lava flow may follow the eruption. These eruptions produce a small amount of ashy tephra and build scoria cones.	Like Strombolian eruptions, these eruptions are characterized by many short, moderately violent gas explosions. Vulcanian eruptive columns are typically larger than Strombolian columns, however; and they are mostly made up of ashy pyroclastic material (pumice). The explosions are initiated by high-viscosity, high-gas-content andesitic magma in which small amounts of gas pressure build up and thrust material into the air. In addition to ashy tephra, Vulcanian eruptions will also launch football-sized **pyroclastic bombs** into the air. Vulcanian eruptions generally aren't associated with lava flow.

Comparing Volcanoes:



Type of Volcano	Shield	Cinder (Scoria/Tephra) Cone	Composite/ Stratovolcano	Dome
Description	▪ broad, gently sloping landform ▪ small percentage of pyroclastic material ▪ greater width than height, slope angles less than 12 degrees	▪ conical hill composed of pyroclastic debris, cinders ▪ low height, ~ 400 meters ▪ gas-charged magma ▪ after gas is expelled from magma, lava pours from vent, generally flows under the cinder cone	▪ steep-sides, symmetrical landform ▪ built of alternating layers of pyroclastic debris capped by high viscosity lava flows ▪ Nuee Ardente and ignimbrites associated	▪ The lava, even though emitted at high temperature, is extremely viscous. ▪ Eruptions are separated by long intervals. They begin with a preliminary phase characterized by emissions of smoke and cinders, followed by an enormous explosion.
Type of Lava	Basaltic	Basaltic scoria	andesitic and rhyolitic	rhyolitic
Type of Eruption	Hawaiian eruptions	Strombolian eruptions	Plinian eruptions	Pelean eruptions
Location			Subduction zones	near composite volcanoes
Slope / Height, etc.	Base diameter up to 100 km, height up to 5 km; slope <10°	Base diameter ~1 km, height a few 100 m; slope 30° to 33°	Base diameter up to 10s of km, height up to 4-5 km; slope 15° to 33°	Usually fairly flat (slope < 7°) with knobs or spines where the lava slowly bubbles out
Eruption Frequency	Typically active for 100,000 to 1,000,000 years.	Active for 1 to 100 years	Typically active for 10,000 to 100,000 years	Typically active for 10,000 to 100,000 years
Examples	Mauna Loa, Kilaeau	Sunset Crater, Arizona	Mt. St. Helens, Mt. Fuji, Vesuvius	Kelut, Indonesia