A-Level Geography Resource Package

[Physical >> Hazards >> Tectonics >> Volcanic Hazards]

Types Of Lava:

Important!
You may be tested on your knowledge of the difference between magma and lava. The former can be found underground, but as soon as it is 'ejected' out of a volcano, it is classed as lava.

There are 2 basic types of magma – more basic **Basaltic or fluid lava**, and acidic lavas such as **Andesite and Rhyolite** which are more viscous. They vary because of their Silica content and gas pressure.

- *Basaltic lava has a relatively low SiO_2 (Silica) content (less than 52%)*
- *Acidic lava come in 2 types - Andesitic Lavas have an intermediate SiO_2 content (between 52 and 63%) whilst Rhyolitic Lava has a relatively high SiO_2 content (above 66%)*

We'll see this term crop up a lot during Hazards. It literally means the 'stickiness' or 'thick, dense state' of types of lava.

Types Of Eruption:

In Plinian Eruptions the magma has high silica content. They are highly explosive and the AD79 eruption that buried Pompeii and Herculaneum was one of these. Plinian eruptions are started by highly viscous magma that has high gas content. As the magma emerges it depressurizes and this allows the gas to expand, propelling pyroclastic material as high as 45 km in the air, at hundreds of feet per second, up and out of the Troposphere. These eruptions can last for days and create a sustained and tall eruption plume, which drops huge amount of **tephra**, fallen volcanic material, on surrounding areas. Additionally, a Plinian eruption can produce extremely fast-moving lava flows that destroy everything in their path.

In Hawaiian Eruptions the lava is more basic and basaltic, with low gas pressures and low silica content. These eruptions are generally not explosive or destructive and **DO NOT** throw huge amounts of Tephra or pyroclastic material in the air. Instead they produce low-viscosity, low-gas-content lava that flows over large areas producing gently sloping shield volcanoes and lava plateaus. Eruptions can form **fire fountains**, Lava thrust up to 50m in the air for many hours. The general 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.

In **Strombolian Eruptions, named after Stromboli in Italy, the effects are impressive but not that dangerous. They put** small amounts of lava 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. There don't tend to be lava flows in Strombolian eruptions but they do produce small amounts of ash.

Summary Table:

Plinian [Trivia: named after the famous Roman writer Pliny the Elder who died rescuing his family during the Vesuvius eruption.]	**Hawaiian**	**Strombolian**
• Highly Explosive	• Basaltic lava with lower pressure and silica	• Not particularly dangerous
• Emerging Magma depressurises allowing gas to expand	• Not so explosive or destructive	• Small quantities of magma forced out and ejected into the air
• Leading to violent pyroclastic flows and tephra emission	• Few pyroclastic flows – rather flowing lava	• High viscosity, so high gas pressure to be able to force this material up
• Possible lava flows, though unlikely	• Fire fountains can be formed, where lava is thrusted high into the air	• Not usually lava flows but excess ash can be a result of explosions.


Fig. 1.1


Fig. 1.2


Fig. 1.3

What exactly is volcanic ash?

Volcanic ash is a mixture of rock, mineral, and glass particles expelled from a volcano during a volcanic eruption. The particles are very small—less than 2 millimeters in diameter. They tend to be pitted and full of holes, which gives them a low density. Along with water vapor and other hot gases, volcanic ash is part of the dark ash column that rises above a volcano when it erupts.

Due to their tiny size and low density, the particles that make up volcanic ash can travel long distances, carried by winds. When an ash column is moved about by wind, it is called an ash plume. Eventually the ash in the sky falls to the ground. It may create a thick layer of dust-like material on surfaces for miles around the original eruption.

Unlike the ash produced by burning wood and other organic materials, volcanic ash can be dangerous. Its particles are very hard and usually have jagged edges.

As a result, it can cause eye, nose, and lung irritation, as well as breathing problems. While in the air, ash can cause problems for jet engines, forcing airlines to cancel flights through the affected area. An ashfall that leaves a thick layer of ash may cause roofs to collapse, clog gutters, and interfere with air conditioning units. Animals in an area coated by volcanic ash may have difficulty finding food, as the plants in the region may be covered in ash. Ash can also contaminate water supplies.

Notes:

Case Study | Eyjafjallajökull [2010]

Fig. 1.4

"There are **two** types of Volcano. **Shields** and **Composites**. The former take place at constructive, the latter at destructive plate margins. Shield volcanoes - low slopes & effusive eruptions. Composite volcanoes - jagged and explosive."

Useful facts & data:

4 "VEI" Value for the Eruptions

VEI = Volcano Explosivity Index. Measures scale of eruptions as a linear value from 0-8.

700+ Residents needed to be evacuated

Temporary Population Displacement

9 Km High Ash Cloud

8 Day EU flight ban

As a result of the thousands of square kilometers Ash Cloud

Valuable External Reading & Viewing:
https://www.youtube.com/watch?v=e-TMtRh8AIs – Great video of the eruption taking place. Allows a sense of scale of the impacts.
https://www.bgs.ac.uk/research/volcanoes/icelandic_ash.html - Article from the British Geological Service with valuable information on exact reasoning and effects of the volcano listed.

Notes:

Examination Questions

Sample 1.

With reference to figures 1.1, 1.2 and 1.3 – identify, and highlight the key differences between three named types of eruption. [6]

Describe the dangers of volcanic ash emission both in a social, safety and health sense. [4]