UPSC Preparation

Magma & Lava

The oldest fluid on the earth is referred to as Magma. It is the mixture of silicates, oxides and other volatile constituents. A magnetic chamber below the earth crust contains the magma. When magma is moulted, it erupts as lava.

Salient Points about Magma and Lava for UPSC

1. Magma temperature varies from 700-degree centigrades to 1300 degree centigrade.
2. Lava temperature varies from 700-degree centigrade to 1200 degree centigrade.
3. The igneous rocks are formed when the magma comes out from the interior of the planet and forms a molten rock called lava.
4. The volcanic eruptions originate from magma chambers.
5. Magma contains suspended crystals and gas bubbles.
6. Magma is produced when the interior of the earth (crust or mantle) melts at various tectonic settings:
    - Subduction zones
    - Continental rift zones
    - Mid-ocean ridges
    - Hotspots
7. Magma can erupt out of the interior and give birth to volcanic eruptions or can also solidify within the cracks of the earth to form dykes, sills etc. (Intrusive earth forms.)
8. Silica-rich magmas are more viscous than mafic magmas. Mafic magmas are hotter than silica-rich magmas.
9. Feldspars, feldspathoids, olivine, pyroxenes, amphiboles, micas and quartz are the dominating constituents of lava.
10. Lava creates landforms like:
    - Volcanoes
    - Cinder Cones
    - Kipukas
    - Lava Domes
    - Lava Tubes
    - Lava Lakes
    - Lava Delta

Types of Magmas

Generally, the magmas are considered into four types:

1. Ultramafic
    - The temperature of the ultramafic magma reaches up to 1500 degree Celcius.
    - It has a very low viscosity (Which leads to gentler and less explosive eruptions).
    - It is distributed across divergent plate boundaries, hot spots, convergent plate boundaries.
2. Mafic
    - The temperature of the mafic magma reaches up to 1300 degree Celcius.
    - It also has a low viscosity.

- It has gentle eruptions.
- It is also distributed across divergent plate boundaries, hot spots, convergent plate boundaries.

3. Intermediate
   - The temperature of the intermediate magma reaches up to 1200 degree Celcius.
   - The viscosity is intermediate.
   - It has explosive or effusive eruptions.
   - It is distributed across convergent plate boundaries, island arcs.
4. Felsic
   - The temperature of the felsic magma is less than 900 degrees Celcius.
   - It is highly viscous.
   - The eruptions are explosive.
   - It is common in hot spots in the continental crust and rifts.

Density-wise, the magmas are categorized into three:

1. Basalt Magma
2. Andesite Magma, and
3. Rhyolite Magma

Types of Lava

Silicate lava is usually categorized into five:

1. Felsic Lava -
   - They are also called silicic lava.
   - The silica content in the felsic lava is more than 60 percent.
   - The viscosity of the felsic lava is extreme.
   - On their eruptions, they form pyroclastic deposits.
2. Intermediate Lava
   - They are also called as andesitic lava.
   - The silica content in the intermediate lava varies between 52 percent to 63 percent.
   - They usually occur on steep composite volcanoes.
   - The temperature varies from 850-degree celsius to 1100 degree celsius.
   - The viscosity is less.
   - On their eruptions, they form phenocrysts.
3. Mafic Lava
   - They are also called as basaltic lava.
   - The silica content in the mafic lava is between 45 and 53 percent.
   - Viscosity is relatively low.
   - Shield volcanoes or flood basalts are formed by the mafic lava.
4. Ultramafic Lava
   - The silica content of ultramafic lava is below 45 percent.
   - Komatite, Boninite are ultramfic lava.
5. Alkaline Lava
   - They are a form of silicic lava with an elevated content of alkali metal oxides.
   - The silica content of alkaline lava is that between ferric lava and ultramafic lava.

At what point does Magma become Lava?

When magma erupts from a volcano and reaches the surface of the earth, magma becomes lava.

What is the difference between Magma and Lava?

Both Magma and Lava refer to the molten rock which forms igneous rocks on the surface. The only difference is the molten rock on the surface of the earth is called lava, and the molten rock found below the surface of the earth is called magma.

What is the origin of the words Magma and Lava?

Magma comes from Italian, which means thick, pasty substance. This is the characteristic of magma inside the earth surface.

Lava also comes from Italian which means to slide, and it is the characteristic of lava when it reaches the surface.