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Rocks and Volcanism



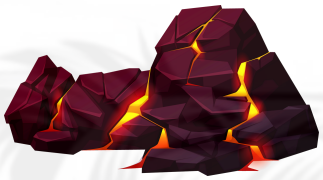
Formation Of Rock

- Study of rocks is called **Petrology**



Age of Rock is calculated using **Radioactive Dating**

Igneous Rock



The word Igneous derived from Latin word **IGNIS** which means "**fire**".

Igneous rocks are formed through the cooling and solidification of molten Rock, known as **Magma or Lava**

Types of Igneous Rocks

Intrusive Igneous Rock / Plutonic Rock

When magma solidifies **within** the earth crust, it forms **intrusive** Igneous rocks
E.g. Granite, Gabbro

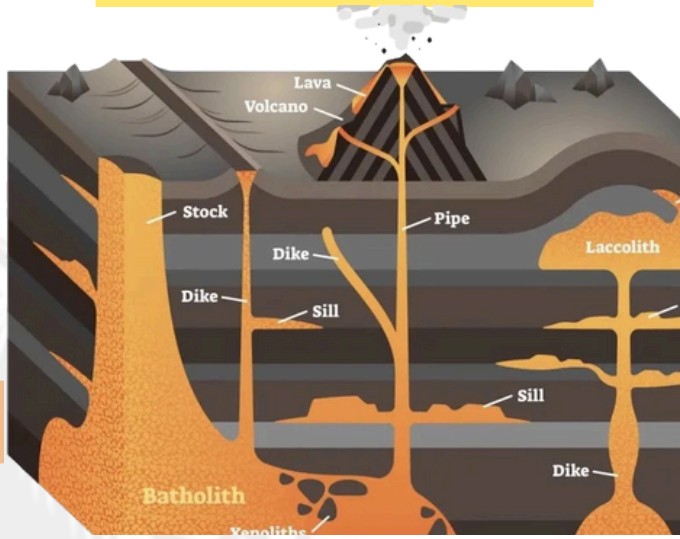
Extrusive Igneous Rock / Volcanic Rock

When magma solidifies on the earth surface as Lava, it cools and Solidifies quickly. This rapid cooling result in the formation of small crystals and glassy texture.
E.g. Basalt, Pumice (It floats in water)

Plutonic Bodies

Plutonic Bodies, Also known as Plutons, are large bodies of intrusive igneous rock, that form beneath the earth's surface.

- **Granite** is found in continental Crust.
- **Basalt** is found in Oceanic Crust .



Types of Plutonic Bodies

Batholiths : A batholith is a large mass of igneous rock that forms deep within the Earth's crust and is exposed at the surface through erosion and uplift.

Dykes : Dykes are vertical or steeply inclined sheets of magma that cut across the layers of surrounding rock.

Sills : Sills are horizontal sheets of magma that intrude between layers of pre-existing rock.

Phacolith : A Phacolith is a lens-shaped igneous rock pluton that forms in folded sedimentary rock found at Anticlines and Synclines.

Laccoliths : Dome-shaped intrusions with a flat base that push overlying layers upward.
It is connected by pipe like structure

Lapoliths: These are saucer shaped instrusions with concave top and bottom.

Sedimentary Rock

- Sedimentary rocks are a type of rock that forms from the accumulation and consolidation of sediments over time.
- Lithification is a process by which loose sediments are transformed into solid sedimentary rocks. This occurs through a combination of compaction and cementation over long periods of time.
- They exist in Layers/Strata.
- Fossils are found in sedimentary rocks.

Types of Sedimentary Rocks

- **Mechanically / Clastically formed** : Sandstone, Limestone, Conglomerate, Shale, Loess, etc.
- **Organically formed** : Chalk, Limestone, Coal, Geyserite, etc.
- **Chemically formed** : Limestone, Halite, Chert, etc.



Metamorphic Rocks

- Metamorphic rocks are rocks that form when existing rocks (igneous, sedimentary, or even other metamorphic rocks) are subjected to intense heat, pressure, or volume change, causing them to undergo physical and chemical changes. this process is also called metamorphism.

- These rocks are formed by recrystallisation and reorganisation of materials within the original rocks.

Types of Metamorphic Rocks

1. Thermal Metamorphism : Metamorphic rocks formed due to sudden temperature change.

2. Dynamic Metamorphism : Metamorphic rocks formed without any chemical change.

- These are generally formed as a result of high pressure.

Types of Thermal Metamorphism

1 . Contact Metamorphism : It Occurs when rocks are altered by intense heat due to their proximity to magma or lava

2. Regional Metamorphism : It occurs when rocks are subjected to High pressure and temperature



Alternate Light and Dark Bands on rock is called Banding



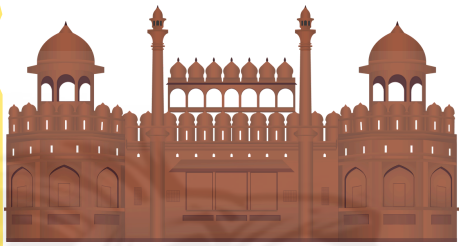
Lines formed in Rock is called Lineation

DID YOU KNOW?

FACTS

- Quartz is not a rock, It is Mineral.
- **Taj mahal** is made of Metamorphic rock
- **Red Fort** is made of Red Sandstone (Sedimentary Rock)
- **India Gate** is made of Red and Yellow sandstone. (Sedimentary Rock)





Granite (Igneous)	Metamorphism →	Gneiss
Shale (Sedimentary)	Metamorphism →	Slate, Schist
Sandstone (Sedimentary)	Metamorphism →	Quartzite
Limestone (Sedimentary)	Metamorphism →	Marble
Basalt/Gabbro (Igneous)	Metamorphism →	Amphibolite
Clay (Sedimentary)	Metamorphism →	Slate

Minerals

Feldspar



Silicon and oxygen are common elements in all types of feldspar and sodium, potassium, calcium, aluminium etc. are found in specific feldspar variety. Half of the earth's crust is composed of feldspar. It has light cream to salmon pink colour. It is used in ceramics and glass making

Quartz



It is one of the most important components of sand and granite. It consists of silica. It is a hard mineral virtually insoluble in water. It is white or colourless and used in radio and radar. It is one of the most important components of granite.

- Quartz is used in making watches due to its Peizoelectric Property.

Amphibole



Aluminium, calcium, silica, iron, magnesium are the major elements of amphiboles. They form 7 per cent of the earth's crust. It is in green or black colour and is used in asbestos industry. Hornblende is another form of amphiboles.

Pyroxene



Pyroxene consists of calcium, aluminum, magnesium, iron and silica. Pyroxene forms 10 per cent of the earth's crust. It is commonly found in meteorites. It is in green or black colour.

Olivine



Magnesium, iron and silica are major elements of olivine. It is used in Jewellery. It is usually a greenish crystal, often found in basaltic rocks. Besides these main minerals, other minerals like chlorite, calcite, magnetite, hematite, bauxite and barite are also present in some quantities in the rocks.

Mica



It comprises of potassium, aluminium, magnesium, iron, silica etc. It forms 4 er cent of the earth's crust. It is commonly und in igneous and metamorphic rocks. It is used in electrical instruments.

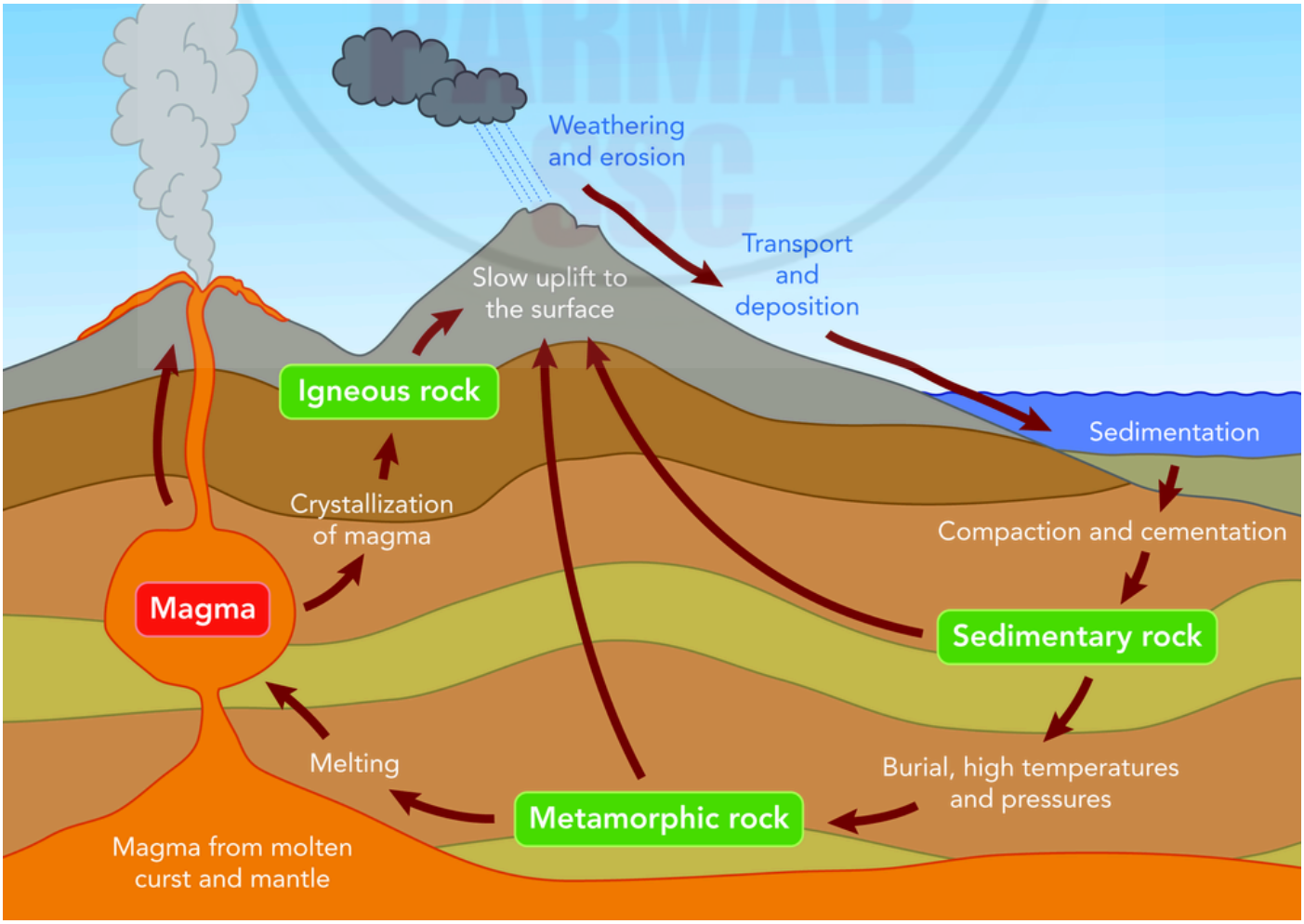
Types Of Rocks :

- Soft Rock : Talc
- Hard Rock : Diamond
- Feldspar consist of 50% of the earth's crust and is widely used in glass and ceramic industries.

- Limestone is one of the key minerals used in cement making.
- Mica is used in electrical industry, constitutes 4 % of Earth's Crust.

Rock Cycle

It is a geological process that describes how the three main types of rocks ; Igneous, Sedimentary and Metamorphic change over time.

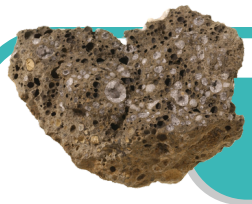


Acidic Rock



- They are high in Silica (mostly feldspar and quartz minerals) upto 80%.
- They are light in colour.
- Due to high Silica content, acidic magma cools faster.
- **Eg. : Granite, Quartz, Feldspar**

Basic Rock



- They are Poor in Silica ;mostly feldspar and quartz minerals upto 40%.
- They are Dark in colour.
- Due to low Silica content, Basic magma cools slowly.
- **Eg. : Basalt, Gabbro, Dolerite**

Volcano



A volcano is a geological feature formed by the eruption of molten rock (magma) from beneath the earth's crust

- **Cinder Cone** — They are small, steep-sided volcanoes formed by moderately explosive eruptions.
- **Flood Basalt Province** — These volcanoes outpour, highly fluid lava that flows for long distances.
  E.g. Deccan Traps (in west central region)
- **Shield** — They are primarily formed by eruption of basaltic lava which is non viscous fluid.
  E.g. Kilauea Volcano in Hawaii, USA
- **Composite** — They are generally cooler and viscous in nature. They are also known as Stratovolcano.
  E.g. Mt. Chimborazo and Mt. Fuzi.
- **Caldera** — It is the most explosive types of volcano, it collapses on itself.

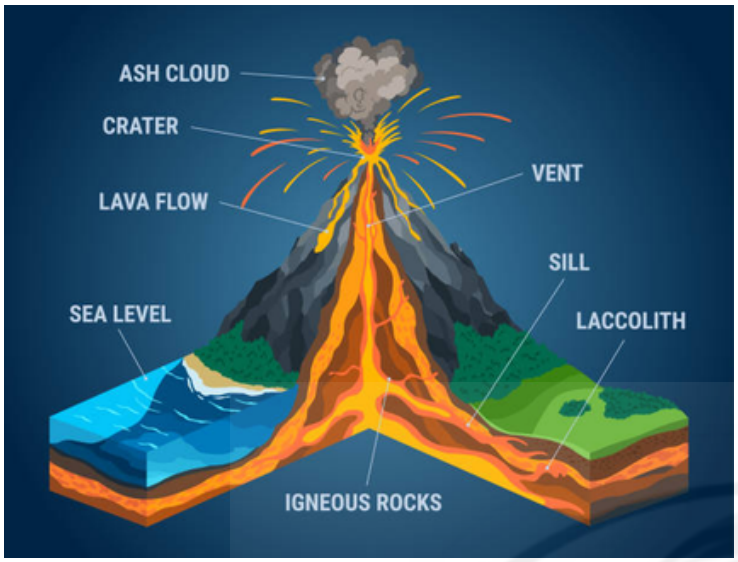


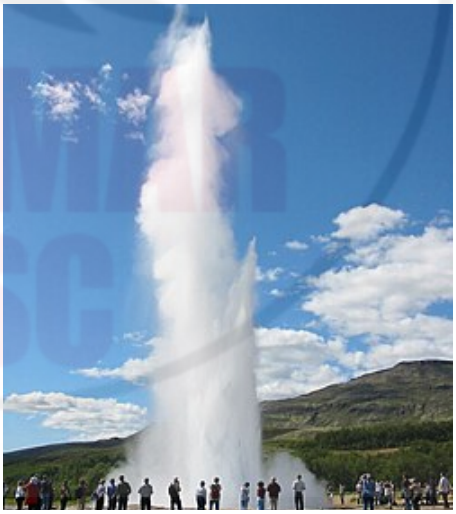


Figure : Volcanic Crater

- Highest Volcano : Ojas del Salado (It is located between Chile and Argentina in Andes Mountain range)
- Lighthouse of Mediterranean : Mount Stromboli

Geyser

- A geyser is a hot spring that intermittently erupts steam and hot water due to geothermal activity beneath the Earth's surface.



- Geysers are commonly found in areas of volcanic activity because the heat from magma or hot rocks below the Earth's surface heats the groundwater, leading to the formation of geysers.



Figure: Hot Spring; Puga Valley, Ladakh