

# Natural Resources II

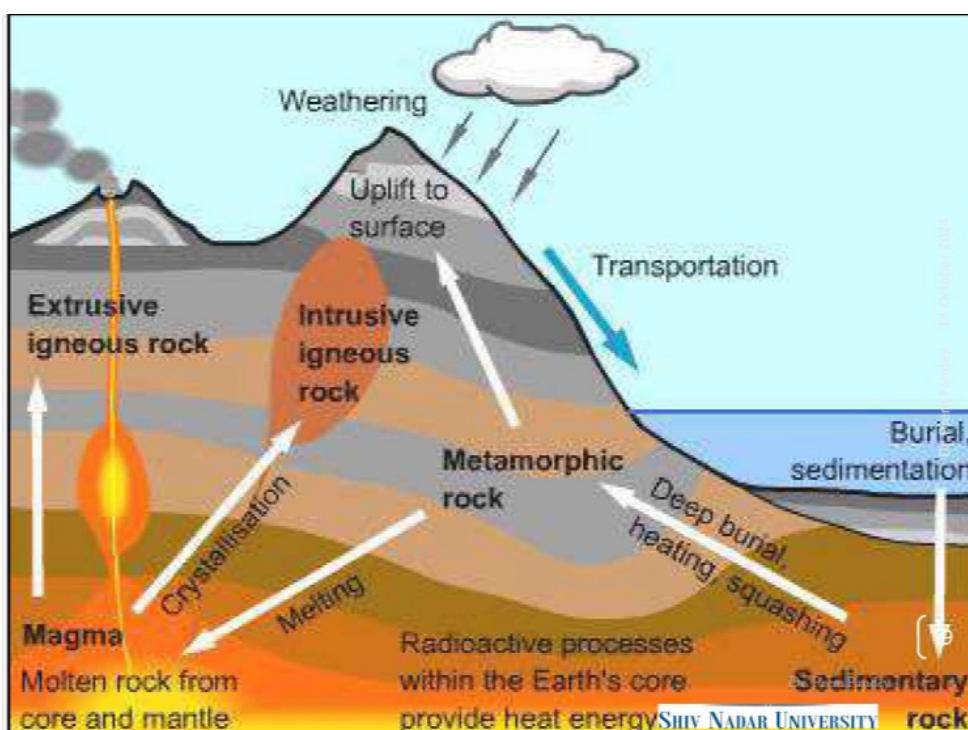
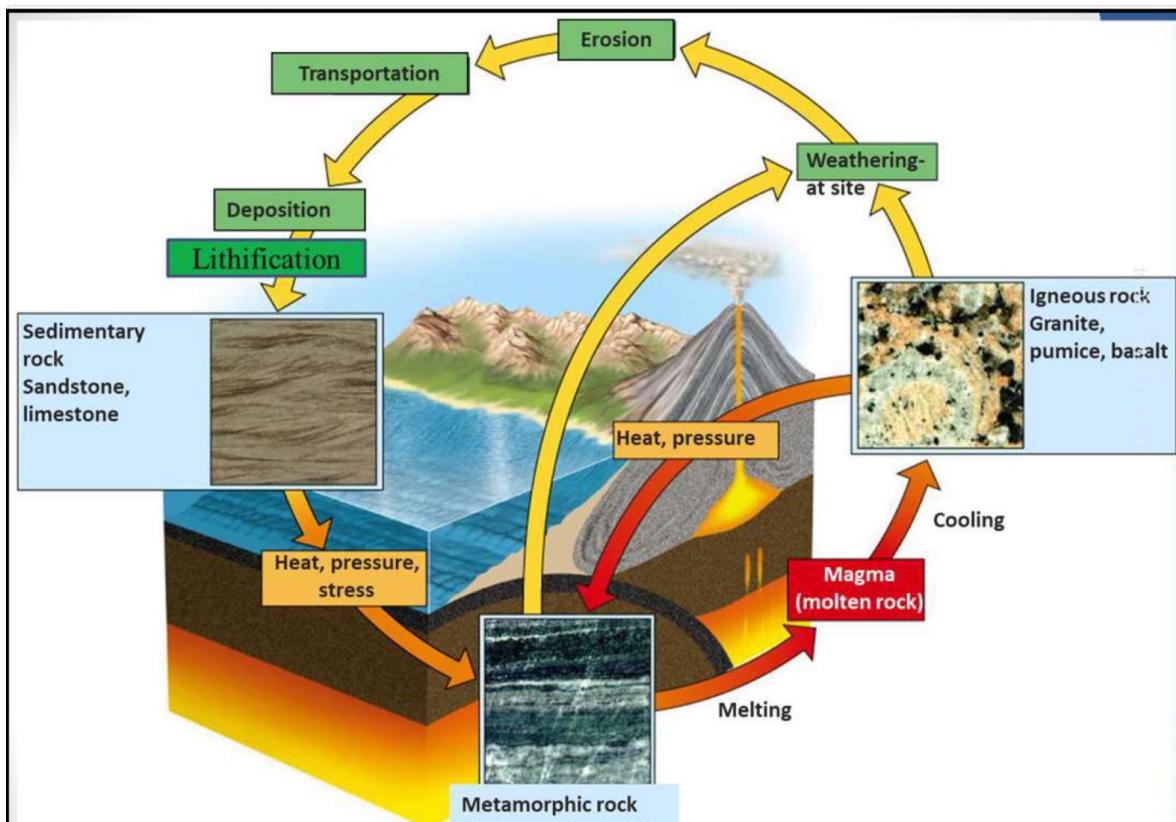
1. Rocks are made of minerals. They are aggregate of one or more minerals.
2. Granite-four minerals-**feldspar, quartz, mica and ampibole**
3. Minerals are made of element

Mineral	Elements
Quartz	Oxygen, silicon
Feldspar	Oxygen, silicon, aluminum, calcium, sodium, potassium
Mica	Oxygen, silicon, aluminum, iron, potassium, magnesium
4. Amphibole	Oxygen, silicon, aluminum, iron, calcium, magnesium

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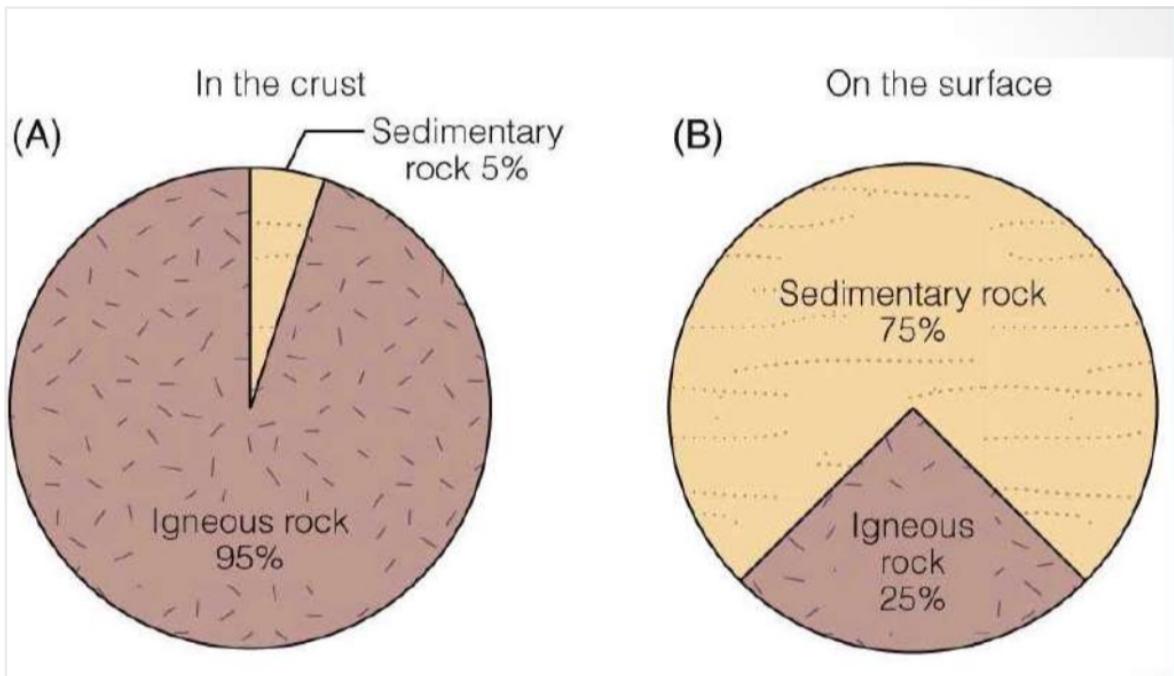
5. 8 common elements compose 98% of continental crust rocks eg **Silicon , Aluminum(most abundant in crust)**
6. Rocks are classifies into three types based on how they were formed.
  1. Igneous:
  2. Sedimentary
  3. Metamorphic:



**7. Quartz:** most common crystalline form of  $\text{SiO}_2$  and the second most abundant mineral in earth crust after feldspar

**8. Earth's crust is mainly Igneous**

rocks and the rock that we see on the surface is sedimentary, especially in Himalayas.



## Sedimentary Rocks

:They are those type of rocks that are formed by the **deposition of material at the arts surface and within the bodies of water**

2. They form horizontal layers(beds) - oldest beds at the bottom and the youngest beds at the top
3. Three types of sedimentary rock:**Clastic,Chemical and Biochemical:** They are identified by the materials that make up the rock or the process by which they are

formed.

### Clastic Sedimentary Rocks:

They are composed of rocks and mineral fragments and the most common type of rock: sedimentary rock.

Three stages of formation: Generation , Transportation and Lithification

### Chemical Sedimentary Rocks:

They form when the mineral precipitate from a solution as a **result of changing physical conditions**

Here, solutions= Fresh water in lakes, groundwater or seawater

Changing physical condition=**increased temeperatures(evaporation)**

They can be readily dissolved in water and transported to oceans

They are indicative of shallow, coastal marine conditions In the geological past

Chemical Sedimentary rocks are **also termed as Evaporates** as they are mostly formed by precipitation due to evaporation.

### Biochemical Sedimentary Rocks

1. They link the biosphere and geosphere

2. From due to actions of living organisms that cause minerals to be extracted from solution. OR from the remains of dead organisms.
3. The mineral calcite is present in the rock limestone formed by coral organisms that build tropical reefs

Ex: Coquina: it is a limestone from broken shell fragments.

Coal: Carbon rich rock formed from compacted plant remains.

## Metamorphic Rocks

It arises from the transformation of existing rock types in a process called metamorphism which means "change in form".

The original rock : protolith is subjected to heat and pressure causing profound physical and / or chemical changes.

Protolith may be sedimentary rock , igneous rock or older metamorphic rock.

Metamorphic rocks make up a large part of earth and are classified by texture and chemical and mineral assemblage(metamorphic facies)

Metamorphism: Changes in the mineral

composition and texture that can occur in solid rock.

These changes may occur due to increasing temperature / pressure / presence of fluids. Here temperatures are high enough to cause chemical changes but not melting of the rock. Approx 200-1100 C. similar conditions are found near magma.

1. Increased pressures and temperatures cause tabular minerals to take on a preferred orientation, **foliation**, perpendicular to direction of pressure.



Un-metamorphosed, non-foliated original rock (granite-igneous rock) with random distribution of minerals



Metamorphic rock (gneiss) with foliation illustrates parallel alignment of minerals

2.

## Igneous Rocks

**Ignis:fire** and these rocks are formed

through the cooling and solidification of magma or lava.

Granite, basalt and obsidian are examples of igneous rocks

Igneous rock may form with or without crystallisation

1. If below the surface - intrusive(plutonic) rocks

2. On the surface-

extrusive(volcanic ) rocks

Melting is caused by one or more of the three processes

1. An increase in temp

2. A decrease in pressure

3. A change in composition

Types of Igneous Rocks:-  
The same magma can form both rock types;

1. **Volcanic Rocks:** forms when

magma rises to earth's surface.

Produces from volcanoes, lava

flows and tephra and molten rock cools rapidly.

2. **Plutonic Rocks:-** Form when

magma solidifies below earths surface. Volcanic eruption

Produces plutons that remain hidden until exposed by erosion—> molten rock cools slowly—> slow cooling

1. Cooling produces large, visible crystals.

Size of crystals of minerals in igneous rocks depends upon the rate of cooling of magma

## **Texture: Igneous Rocks**

1. Rapid cooling produces microscopic crystal
2. Brittleness: Rapid cooling can make crystals more brittle or soft than crystals that cool slowly
3. Slow cooling produces large visible crystals

Crystal size is interpreted to learn where rocks were formed

## **Colour:Igneous Rocks**

Colour varies with silica content  
Silica-rich minerals such as quartz and feldspar are light-coloured  
Silica-poor minerals such as amphibole,

biotite are dark coloured