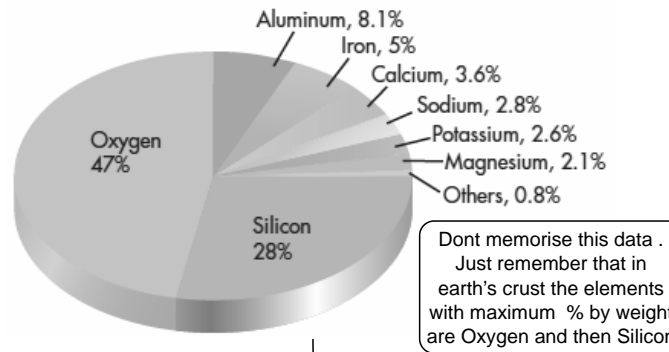


Types of Rocks and the Rock Cycle

Introduction to Rocks and Minerals in Earth's Crust

The earth is composed of various elements . The elements in earth's **crust** by their % weight are :



These elements combine in various ways to make **minerals**

It is these minerals which become a **rock** when they are bonded in a solid state

The three broad classes these rocks are divided into are

Igneous

Sedimentary

Metamorphic

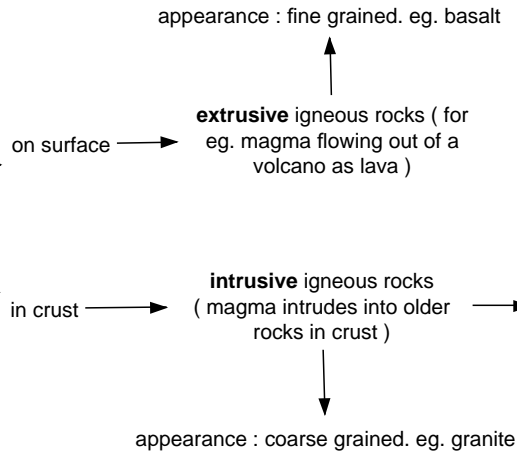
Geomastery

Magma (liquid rock) in the mantle → moves upward into crust or surface

When it cools and solidifies → becomes **igneous rocks**

consist of

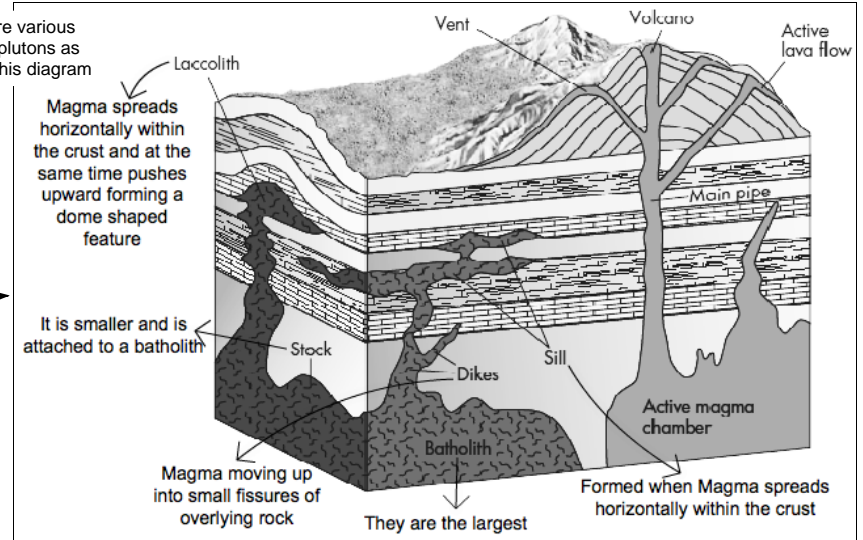
largely silicate minerals as shown in table below . Many of these minerals combine to form different kinds of igneous rocks



Igneous Rocks

The places beneath surface where magma cools are called **plutons**

There are various types of plutons as shown in this diagram



Some major minerals with important features

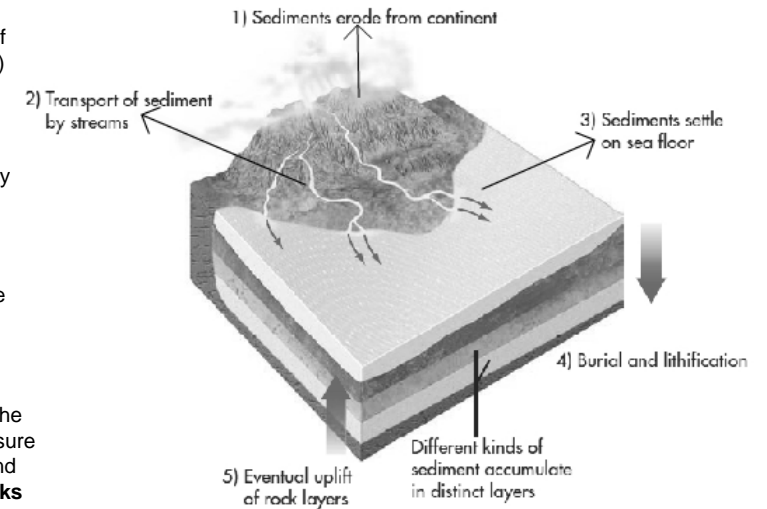
| | |
|---|--|
| Feldspar (silicate + other elements) | <ul style="list-style-type: none"> • forms half of the crust |
| Quartz (silicon dioxide) | <ul style="list-style-type: none"> • present in sand and granite • used in radio and radar |
| Pyroxene group (silicates with aluminum, etc) | <ul style="list-style-type: none"> • found in meteorites |
| Amphibole group (silicates with sodium, etc) | <ul style="list-style-type: none"> • used in asbestos |
| Mica (silicate of aluminum + others) | <ul style="list-style-type: none"> • used in electrical instruments |
| Olivine (silicate of iron and magnesium) | <ul style="list-style-type: none"> • used in jewellery |

There is no need to remember their composition as such . Just remember that the common feature is silicon and oxygen.

Sedimentary Rocks : The Broad picture

Lets first understand what is the fundamental process of sedimentary rocks formation with an example , then we can cover more details in next page

- 1) Many denudational agents drive the process of weathering of existing rocks (igneous , metamorphic as well as sedimentary) → This results in fragments of various sizes
- 2) These smaller fragments/sediments are easier to transport by different exogenous agencies like wind and water
- 3) They are deposited in a new place (in this figure , they have been deposited in the ocean)
- 4) **Lithification** : multiple layers of sediments deposit one over the other → water is squeezed out of the lower layers under the pressure of upper layers → and the grains start accumulating together and crystallise to foem new rocks whcih we call as **sedimentary rocks**



Geomastery

3 major classes of sedimentary rocks

Chemically formed

source : when dissolved minerals like calcium carbonate in solution → precipitate out as sediments → and then lithify to form rocks

Eg. dolomite , limestone , evaporite , chert

Mechanically formed

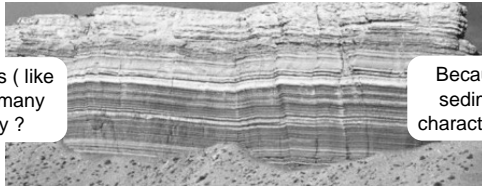
source : mechanical transportation of fragments of older rock (as in diagram in last page)

Eg. Sandstone , Shale , Conglomerate , Limestone

Organically formed

source : Carbon based Materials
for eg. accumulation of plant and organic matter which gets converted to coal

Eg. geyselite , chalk

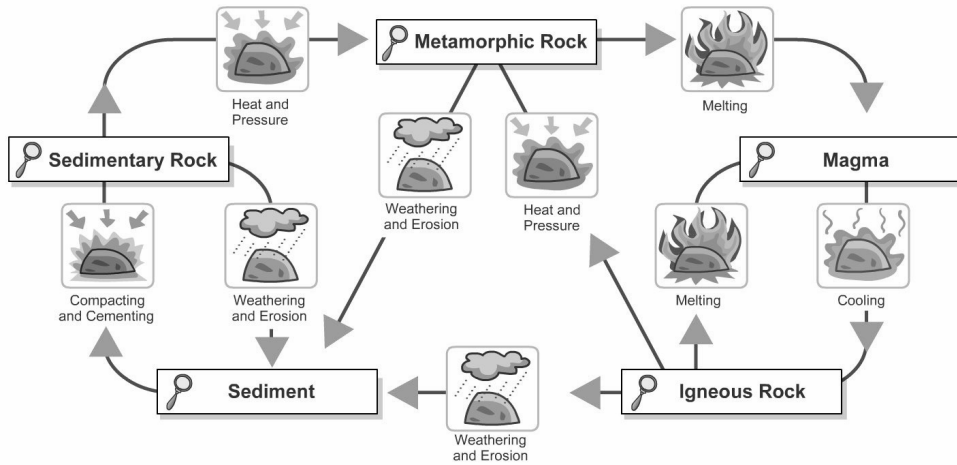


In most sedimentary rocks (like sandstone and shale) , many layers are visible . Why ?

Because the various layers of the sedimentary deposits retain their characteristics even after lithification .

Over time, minerals move from one rock phase to another through a variety of processes, such as heating, melting, weathering, and recrystallization. The rock cycle summarises this process.

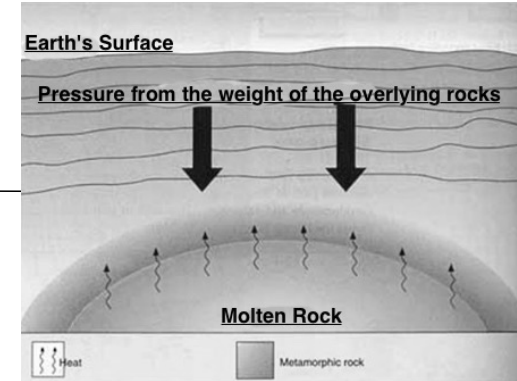
The Rock Cycle



Rocks and Rock Cycle

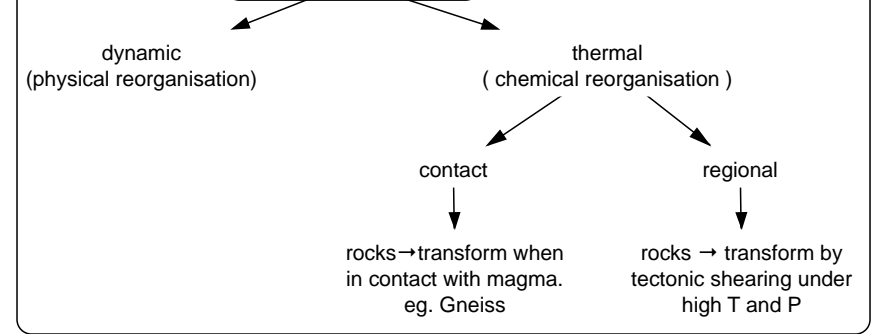
Existing rocks → recrystallisation and reorganisation of material under intense T and P → **Metamorphic Rocks**

way 1 : existing rocks are buried by crustal processes and overlying pressure transforms them



way 2 : rising magma transforms the underlying rocks by heat

Types of metamorphism



In many metamorphic rocks → particles get arranged in layers → this is called as foliation/banding (Eg. Gneiss)



Some important metamorphic transformations

| original rock | metamorphic form |
|---------------|------------------|
| Shale | → Slate |
| Slate | → Schist |
| Limestone | → Marble |