

Earth Science Chapter 4—Rocks

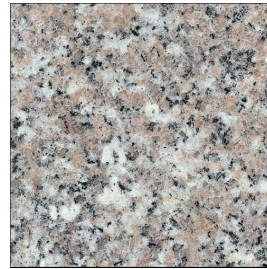
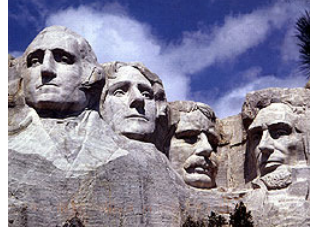
Mr. Aprill

Rocks vs. Minerals

- What is the difference between a rock and a mineral?
- Rock—mixture of minerals, mineraloids, rock fragments, volcanic glass, organic matter, or other natural materials.
- Mineral—a naturally occurring, inorganic solid with a distinct internal structure & chemical composition.

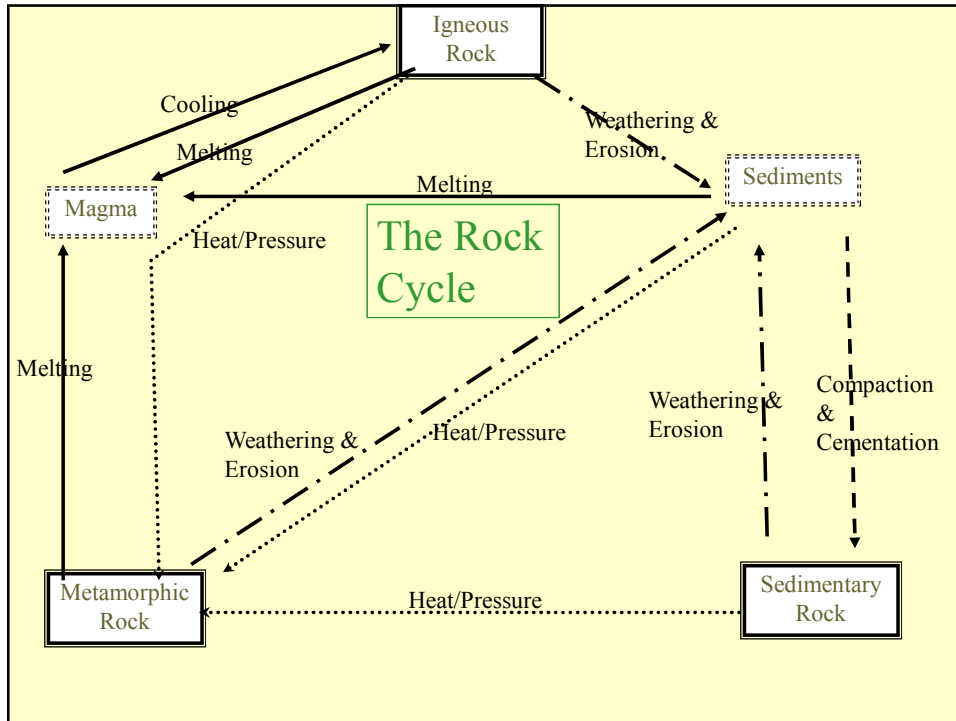
Rock Forming Minerals

- Some minerals are more common in forming rocks.
 - Ex. Granite
 - Quartz
 - Feldspar
 - Hornblende
 - Mica
- Mount Rushmore in South Dakota is made of granite.



How do minerals mix to form Rocks?

- The Rock Cycle—a model showing the 3 types of rocks and how they form. (Pg 91)



Processes of the Rock Cycle

1. Weathering
2. Erosion
3. Compaction
4. Cementation
5. Melting
6. Cooling
7. Heat
8. Pressure

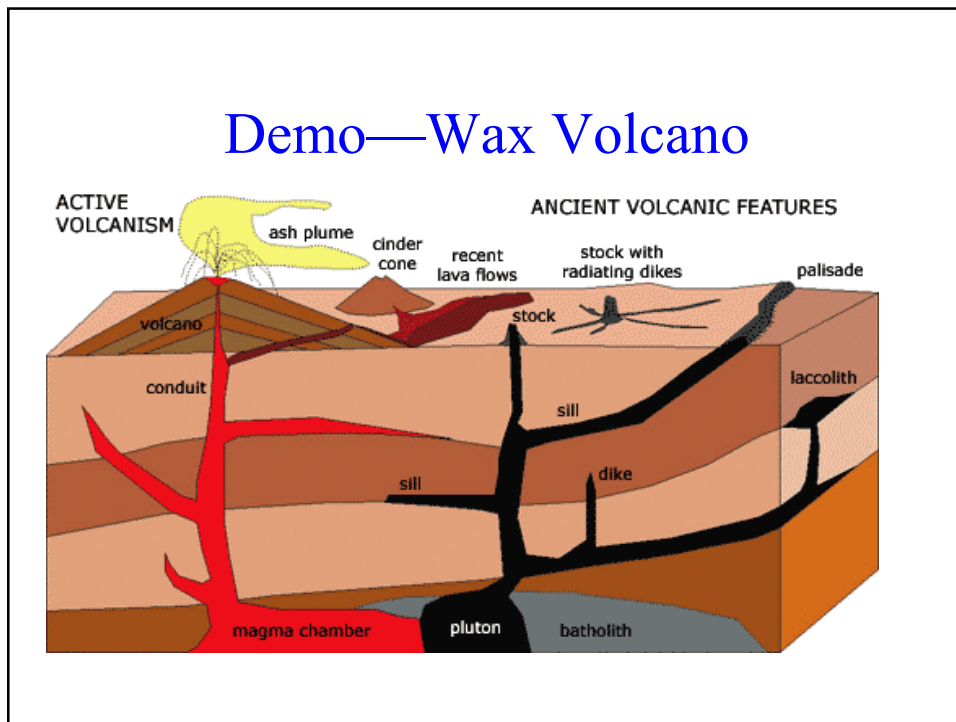
What are the three types of rocks?

- Igneous
- Metamorphic
- Sedimentary

Types of Rocks

- Igneous Rocks: molten material from a volcano or deep inside the earth cools.
- Metamorphic Rocks: rocks changed due to heat and pressure, undergoing changes in composition.
- Sedimentary Rocks: sediments become pressed or cemented together or sediments precipitate out of solution.

Demo—Wax Volcano



Igneous Rocks

- Igneous Rocks: molten material from a volcano or deep inside the earth cools.
- Molten material includes lava & magma.
- Magma—hot, melted rock material beneath Earths surface.
 - Magma is trapped and insulated by surrounding rock.
 - Cools slowly
- Lava—molten material which eventually reaches Earths surface and cools quickly



Where does magma come from?

- 60-200 Km below Earth's surface.
- Temperatures are 1400 degrees Celsius
- Radioactive isotopes in the rock (produces thermal energy)
- Pressure (the deeper you go, the more pressure)
- Since magma is less dense than the surrounding rock, it rises.

How are igneous rocks classified?

- Two ways:
 - By where they form
 - Intrusive
 - Extrusive
 - By the type of molten material (composition)
 - Basaltic
 - Granitic
 - Andesitic

Intrusive Igneous Rocks

- Intrusive Igneous Rocks:
 - Form below Earth's surface
 - Ex. Gabbro
 - Ex. Diorite



Extrusive Igneous Rocks

- Rocks that form when molten material cools on OR near Earth's surface.
 - Cool Quickly
 - Have small mineral grains (or grains absent)
 - Fine grained texture

Igneous Extrusive Rocks

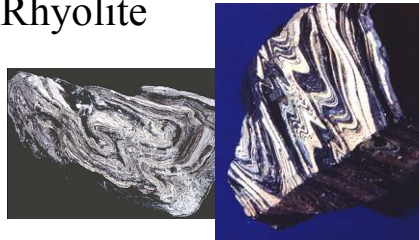
Basalt (Most common
Igneous Extrusive Rock)



Obsidian



Rhyolite



Pumice & Scoria



Volcanic Glass

- Obsidian, Pumice, and Scoria have no visible mineral grains.
- They are considered volcanic glass.
- Obsidian—cooled very quickly, may have cooled underwater
- Pumice and Scoria: air and other gases became trapped in the molten material
- The gases escaped, leaving behind holes.

Can you explain the difference between extrusive and intrusive igneous rocks, and can you give an example of each?

- Intrusive:
 - Examples:

- Extrusive:
 - Examples

Classification of Igneous Rocks by type of molten material

- Basaltic Rocks
 - Dense & dark color
 - Molten material is Rich in Iron & Magnesium
 - Ex. Volcanoes in Hawaii
- Granitic Rocks
 - Light color, lower density than basaltic.
 - Molten material is thick & stiff (contains a lot of silicon & oxygen)—builds violent eruptions
- Andesitic Rocks
 - Composition is between basaltic and granitic
 - Ex. Many volcanoes in the Pacific, these eruptions are violent.

Metamorphic Rocks

- Metamorphic Rocks: rocks changed due to heat and pressure, undergoing changes in composition.
- Formed from changes in Igneous, sedimentary, or other metamorphic rocks.
- To change requires what two factors?
 - Heat (not enough to melt the rock)
 - & Pressure
- Example:
- *Granite* (Igneous) → *Gneiss* (Metamorphic)



Metamorphism

- What a rock changes into depends on the amount of heat and pressure!!!
- Ex.
- *Shale* → *Slate* → *Phyllite* → *Schist*



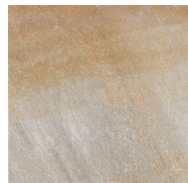
Classifying Metamorphic Rocks

- Metamorphic Rocks are classified by texture.
 - Foliated
 - Mineral grains are flattened and lined up in parallel bands.
 - Ex. Gneiss from Granite
 - Ex. Slate from shale



Classification of Metamorphic Rocks

- Non-Foliated Rocks
 - Grains change, grow, and rearrange, but don't form bands.
 - Example: *Sandstone* (*sedimentary rock*) with heat and pressure is changed to *Quartzite*. Only change is size of mineral grains.



Example: *limestone* into *marble*.



Sedimentary Rocks

- Sedimentary Rocks: sediments become pressed or cemented together or sediments precipitate out of solution.
- Sediments: loose materials such as rock fragments, mineral grains, & bits of plant & animal remains that have been moved by wind, water, ice, or gravity.
- Weathering—process that breaks rocks into smaller pieces.

Sediment Types

Type of Sediment	Size	Example
Clay	<0.004 mm	Shale
Silt	0.004-0.06 mm	Siltstone
Sand	0.06-2 mm	Sandstone
Gravel	>2 mm	Conglomerate

Forming Sedimentary Rocks

- Compaction
 - Occurs in small sediments
 - Layers of sediments build up
 - Pressure from above pushes layers together
- Cementation
 - Occurs in large sediments
 - Pressure alone won't make sediments stick
 - Water soaks through soil and rock
 - Minerals dissolve in water (ie calcite, hematite, limonite) and act as a natural cement.

Ways to classify sedimentary rocks

- Detrital
- Chemical
- Organic

Classifying Sedimentary Rocks



- Detrital
 - Means “to wear away”
 - Made of broken fragments of other rocks which are compacted or cemented together
 - Two types:
 - Conglomerates (well rounded)
 - Breccia (not rounded, sharp edges)

Classifying Sedimentary Rocks

- Chemical Sedimentary Rocks
 - Minerals are precipitated from solution or left behind when solution evaporates
 - Ex. Chemical Limestone
 - Rock Salt



Classifying Sedimentary Rocks

- Organic Sedimentary Rocks

- Form from remains of once living things.

- Ex.** Organic Limestone (contains remains of animals)

- AKA: fossiliferous limestone

- Ex. Coal—Dead plants and animals buried under other sediments in swamps, sediments are compacted over millions of years.

