

The Rock Cycle

- The earth recycles rock
- **Rock** is defined as:
- Rock is always changing
- The continual process by which new rock forms from old rock material is called:

The Value of Rock

Rock has been an important resource as long as humans have existed

- Early humans used rocks as hammers to make other tools, mostly out of rock
- Fashioned spearheads, knives and scrapers by carefully shaping rocks such as *chert* and *obsidian*

Brainstorm and list as many examples of how rock is used in our lives:

Processes That Shape the Earth

- Certain _____ processes make and destroy rock
- These processes shape the features of our planet and influence the type of rock that is found in certain areas of Earth's surface

Weathering, Erosion and Deposition

-The process in which water, wind, ice and heat break rock down into fragments is called _____

- Important because it _____
to become *sediment*.

- The process by which this sediment is removed from its source is called _____

What are some forces that can cause erosion?

- These forces may also cause the sediments to collect

-The process in which sediment moved by erosion is dropped and comes to rest is called _____

-Sediment is deposited in bodies of water and other low-lying areas, where it may be pressed and cemented together by minerals dissolved in water to form sedimentary rock

Heat and Pressure

- Sedimentary rock can also be forms when buried sediment is squeezed by the weight of overlying layers of sediment
- If temp and pressure are high enough at the bottom, the rock can change into _____ rock
- Sometimes the rock gets hot enough to melt.
- This melting creates **magma** that eventually cools to form _____ rock.

How the Cycle Continues

- Buried rock is exposed at the Earth's surface by a combination of *uplift* and erosion
- Uplift is movement within the Earth that causes rocks inside the earth to be moved to the surface.
- When uplifted rock reaches the Earth's surface, weathering, erosion and deposition begin

Rock Classification

- Scientists divide rock into three main classes:

-Rocks can be divided again based on two important criteria:

1. _____

2. _____

1. Composition

- Describes either the minerals or other materials in the rock

- For example: A rock made mostly of the mineral quartz will have a composition very similar to that of quartz . . .

. . . But a rock made of 50% quartz and 50% feldspar will have a very different composition than quartz does

$$= \quad 95\% \text{ Calcite} \quad + \quad 5\% \text{ Aragonite}$$

2. Texture

- Determined by the **size**, **shape** and **positions** of the grains that make up a rock

- Sedimentary rock can be fine grained, medium grained or coarse grained.

Siltstone

Sandstone

Conglomerate

Fine-Grained

Medium-Grained

Coarse-Grained

- Texture is a very important clue as to how and where the rock formed

The Three Types of Rock

1. Igneous

- forms when
- The type of igneous rock that forms depends on the **composition** of the magma and the amount of **time** it takes to cool

-When magma cools enough, it solidifies to form an igneous rock

- Magma solidifies in much the same way as water freezes.

-Water freezes at 0 degrees (C), Magma freezes at 700 - 1250 degrees (C)

-Magma is a complex mixture containing many melted minerals, all having different melting points.

Composition and Texture of Igneous Rocks

	Coarse-grained	Fine-grained
Felsic		
Mafic		

- In the table above, the **light** colored rocks are **less dense** than the dark-colored ones

- Light igneous rocks are rich in elements such as aluminum, potassium, silicon and sodium.

- These are called _____ rocks

- The dark-colored rocks are rich in the elements calcium, iron, and magnesium, and poor in silicon

- Called _____ rocks

- The slower magma cools, the more time mineral crystals have to grow, the larger they are, **meaning what about their texture?**

-In contrast, what can you say about magma that cools quickly?

Igneous Rock Formations

- 2 types of igneous rocks:

1. Intrusive Igneous Rock

- cools below surface (IN Earth)
- usually large crystals because cools slowly

2. Extrusive Igneous Rock

- Cools above surface (EX=Outside)
- Common around volcanoes
- Cools quickly, therefore small or no crystals
- may flow from an active volcano or **fissures**, cracks in the Earth's crust
- creates new landforms

2. Sedimentary Rock

- Wind, water, ice, sunlight, and gravity all cause rock to physically weather into fragments
- Erosion is responsible for transporting these rock fragments, called _____ from one place to another
- deposited in layers
- newer layers cover older layers, older layers become compacted
- dissolved minerals, such as _____ and _____ separate from water and forms a natural "cement" that binds the rock and mineral fragments together
- this process is called *lithification*
- creates a sedimentary rock
 - forms at or near Earth's surface without heat and pressure
- The most noticeable feature of sedimentary rock is its layers, called **strata**

Composition of Sedimentary Rock

- Sedimentary rock is classified by the way it forms and its composition
- 3 types based on its composition:
 1. **Clastic** sedimentary rock made of fragments of rocks (_____) cemented together
 2. **Chemical** sedimentary rock forms from solutions of dissolved minerals and water
 - some rock can be dissolved by rainwater, eventually ending up in the ocean
 - some of dissolved material crystallizes and forms minerals
 - Example would be _____, made of sodium (Na) Chloride (Cl) forms when these two become so concentrated that _____ crystals form

3. **Organic** sedimentary rock forms from the remains of once-living organisms
- Some limestone made of skeletons of coral.
 - skeletons made of calcium carbonate collect on ocean floor
 - eventually become cemented together to form *fossiliferous limestone*
 - Other animals remains may form limestone
 - Another example would be **coal**
 - forms underground when partially decomposed plant matter is buried beneath sediment and changed into coal by increasing heat and pressure
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- Sedimentary rocks can record the motion of wind and water waves on lakes, oceans, rivers and sand dunes
 - called ripple marks
 - may reveal locations of ancient bodies of water
-
- .
- Preserved in strata

Sedimentary Rock Review

1. Find a picture of strata, or stratification and write a definition
2. Find a picture of the following and label, explaining what makes it the kind of sedimentary rock that it is:
 - Clastic Sedimentary Rock
 - Chemical Sedimentary Rock
 - Organic Sedimentary Rock
3. Explain the process by which sedimentary rock forms

3. Metamorphic Rock

- Rocks may undergo *metamorphism*, meaning change (meta) shape (morphos)
- Actually metamorphic rocks are rocks in which not only the shape, but the **structure**, **composition**, and **texture** have changed
- Changed by heat or pressure or a combination of both
- the temperature at which most metamorphism occurs ranges from 120 degrees F - 1800 degrees F, but may exceed these temps
- Depth and pressure allow metamorphic rock to heat to higher temperature and remain a solid
- Most metamorphic change takes place at depths greater than 1.25 miles
- at depths greater than 10 miles, pressure can be 4,000 times greater than the pressure of the atmosphere at the surface
- Movements within the Earth's crust also exert additional pressure
- This may cause mineral grains in rock to align themselves in certain directions

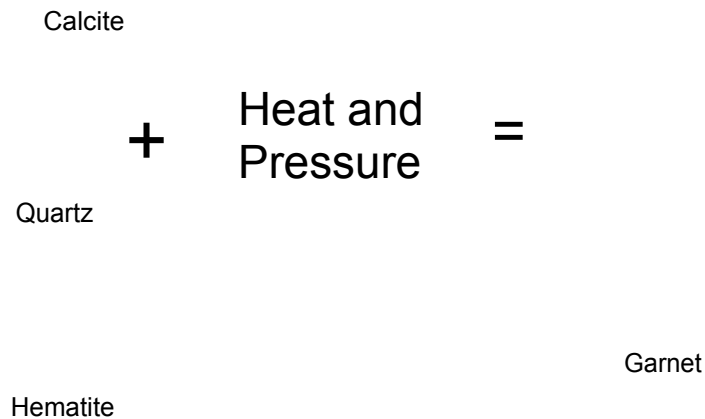
Rock may metamorphism in one of two ways:

1. Rock may be heated by nearby magma
 - called _____ metamorphism
 - some minerals may be changed to other minerals with this increase in temperature
 - occurs near igneous intrusions
2. When pressure builds up in rock buried deep or when large chunks of crust collide
 - called _____ metamorphism

Composition of Metamorphic Rock

- Minerals present in original rock when it was formed may not be stable in new temperature and pressure conditions
- Original minerals change into minerals more stable in the new conditions

Example:



2 Types of Metamorphic Rock (based on Texture)

1. Foliated Metamorphic Rock

- rock in which the mineral grains are arranged in planes or bands
- Usually contains aligned grains of flat minerals, such as biotite mica

2. Nonfoliated Metamorphic Rock

- Texture where mineral grains are NOT arranged in planes or bands
- Commonly made of one or only a few minerals.
- Mineral crystals may change in size or composition
- Called **recrystallization**

Example:



Metamorphic Rock Review

1. Describe the difference between *foliated* and *nonfoliated*
2. Find a picture of both a *foliated* and *nonfoliated* metamorphic rock and briefly explain its texture and composition
3. Explain the difference between *contact metamorphism* and *regional metamorphism*
4. Quartzite is a type of metamorphic rock. Find a picture, state what type of texture it has (*foliated* or *nonfoliated*), and explain how its made (what types of minerals/rocks/sediments its made out of and what forces must act on it)
5. Extra Credit: Find a picture of large metamorphic rock structure and write a brief statement about it