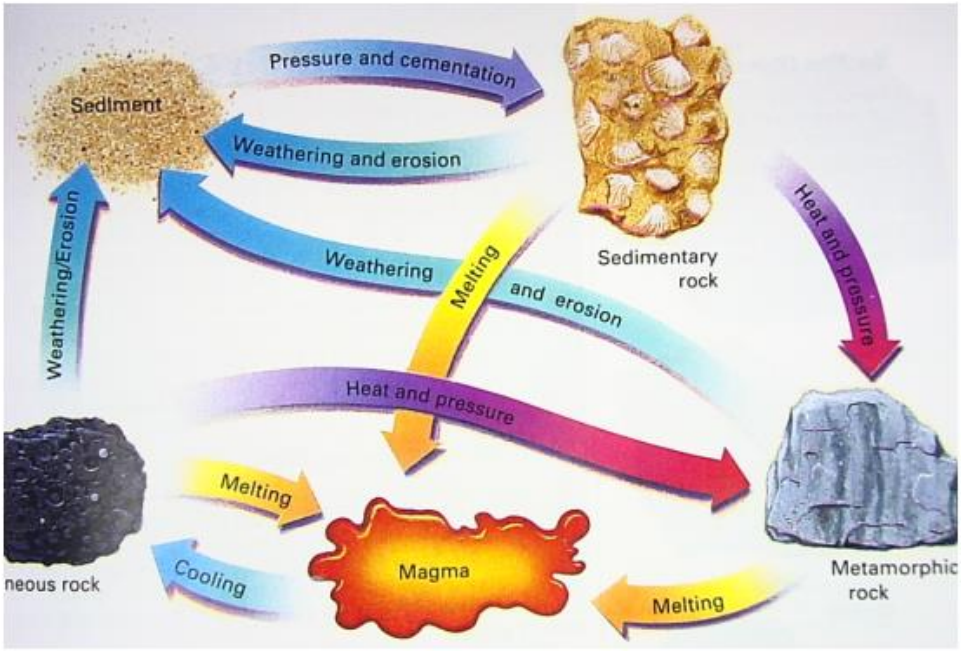
Earth's Crust

Rock Cycle

Three major types of Rock

- Igneous Rock – Rock formed from cooled and hardened magma
- Sedimentary Rock – Rock formed from hardened deposits of sediment
- Metamorphic Rock – Rock formed from other rocks as a result of intense heat, pressure, or chemical processes.

The rock cycle is exactly what it sounds like; it is a cycle that rocks goes through as they change forms. **The rock cycle is a series of processes in which rock changes from one type to another and back again.** Starting with Igneous rock is generally the easiest to use. The volcanic rock cools. At that point several things could happen, either weathering to create sediment, or heat and pressure to create metamorphic rock. Following the rock cycle is like playing a maze on restaurant placemat, you have a starting point then you have to follow the effects that happen to find out where it is going.



Terms

Sediment – material (as stones and sand) carried onto land or into water by water, wind, or a glacier.

Pressure – is a way of determining how much force is applied to an area.

Weathering – is the process where rock is dissolved, worn away or broken down into smaller and smaller pieces.

Erosion – is the wearing away of the land by forces such as water, wind, and ice.

Melting – process of changing something from a solid to a liquid

Cooling – is the removal of heat, usually resulting in a lower temperature. Ex. Lava turns to rock

Heat – an increase in temperature

Magma – molten, or hot liquefied, rock located deep below the Earth's surface

Metamorphism- a change in a type of rock due to pressure, heat and water.

Questions

1. What is the Rock Cycle?

2. What type of rock will be formed from a sedimentary rock that comes under extreme pressure and heat but does not melt? Explain your answer.

3. Explain how metamorphic rock can change into either of the other two types of rocks through the rock cycle.

Task

- Research each of the three different kinds of rock: igneous, sedimentary, and metamorphic.
    1. Igneous rock – Formation, composition, texture
        a. What determines whether an igneous rock will have large crystals or small crystals?
        b. Name the three families of igneous rock.
    2. Sedimentary rock – formation and features
        a. How does clastic sedimentary rock differ from chemical sedimentary rock?
        b. What kind of sedimentary rock forms from the remains of decaying organisms?
        c. What term describes the remains or impressions of plant and animals in sedimentary rock?
    3. Metamorphic rock – formation and classification

a. Explain the difference between a foliated structure and an unfoliated structure?

Minerals

What is a Mineral?

Minerals are the basic materials of Earth's crust. A mineral in a natural, inorganic, crystalline solid. Every mineral has a characteristic chemical composition and can be either an element or a compound. Most rocks that make up the crust are mixtures of various minerals.

There are 4 questions that scientists have to ask to determine if materials are minerals or non-minerals. If the answer to all 4 is YES then the material is considered a mineral.

1. Is the substance inorganic?
2. Does the substance occur naturally?
3. Is the substance a solid in crystalline form?
4. Does the substance have a definite chemical composition?

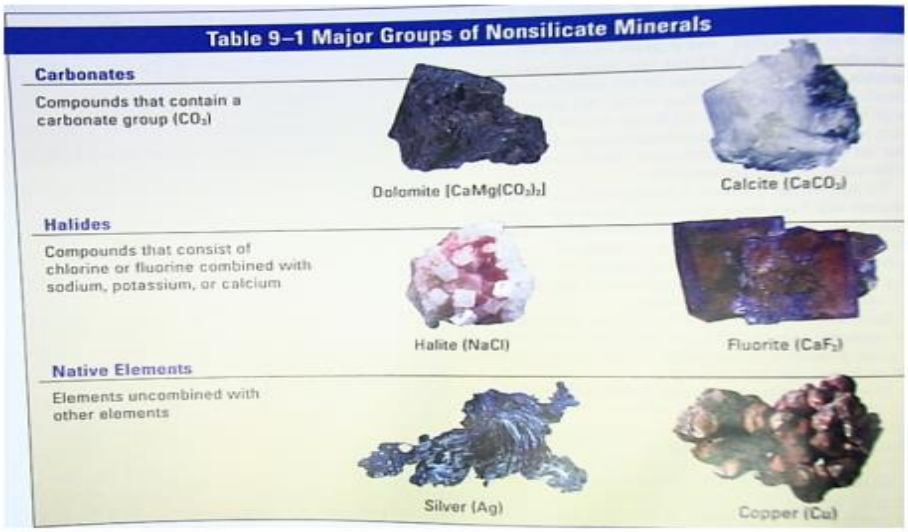
Inorganic – a substance that is not made up of living things or the remains of living things.
Element – Substance that cannot be broken down into a smaller form by ordinary chemical means.
Compound – Two or more atoms that have been chemically combined.

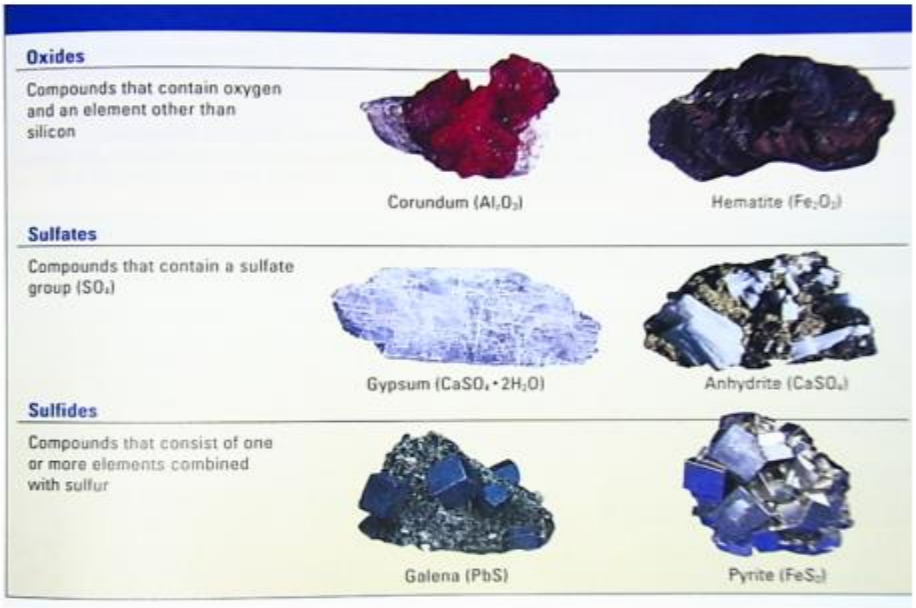
The Earth has 3000 different types of Minerals

- Less than 20 of them are common.

Common Minerals are called **Rock-Forming Minerals.** Rock-forming minerals have 2 main groups.

1. **Silicate Minerals –** contain atoms of silicon and oxygen (Quartz, feldspar, hornblende, olivine, muscovite, and biotite – Silicate minerals make up 96% of Earth's Crust
2. **Non-silicate Minerals –** Minerals that do not contain silicon. Make up only 4% of Earth's Crust





Crystalline Structure

All minerals in the Earth's crust have a crystalline structure. Each type of crystalline material is characterized by a specific geometric arrangement of its atoms or ions. A Crystal is a natural solid with a definite shape.

Questions

1. What are the two main groups of minerals?
2. What two elements are most commonly found in minerals?
3. Silver is a naturally occurring inorganic substance that is formed in the Earth's crust. It is a solid and has a definite chemical composition. Is silver a mineral? Explain your answer.

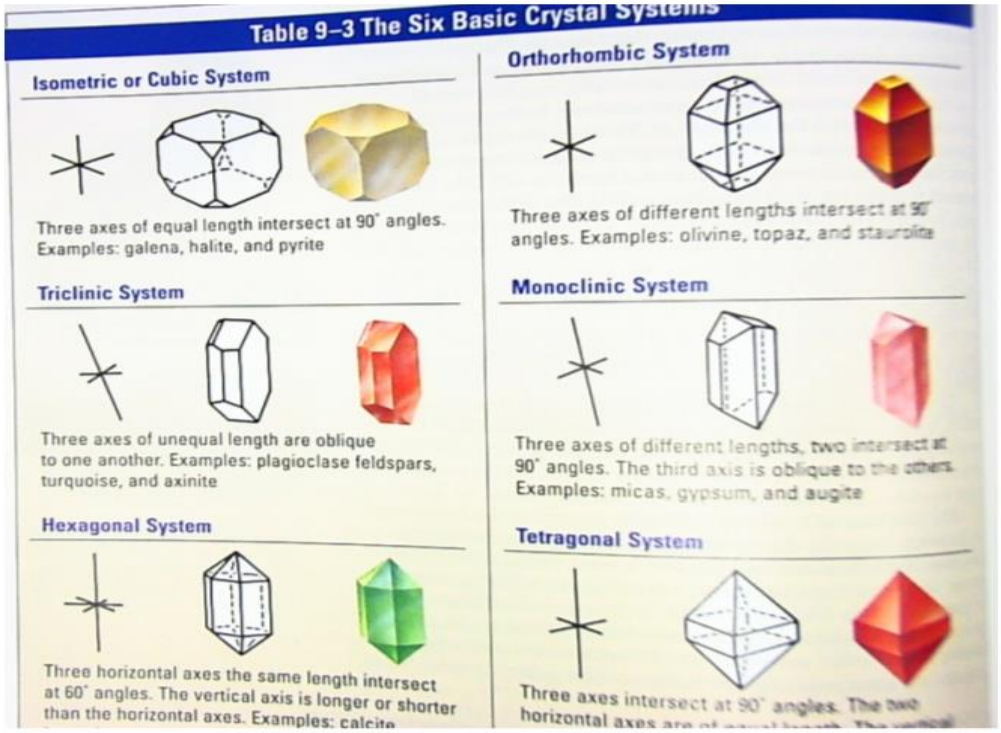
Identifying Minerals

Each mineral has specific properties that as a result of its chemical composition and crystal structure. These properties provide useful clues for identifying minerals

Color
Luster
Streak
Cleavage and Fracture
Hardness
Crystal Shape
Density

Table 9–2 Mohs Hardness Scale

Minerals	Hardness	Common Test
Talc	1	Easily scratched by fingernail
Gypsum	2	Can be scratched by fingernail
Calcite	3	Barely can be scratched by copper penny
Fluorite	4	Easily scratched with steel file or glass
Apatite	5	Can be scratched by steel file or glass
Feldspar	6	Scratches glass with difficulty
Quartz	7	Easily scratches both glass and steel
Topaz	8	Scratches quartz
Corundum	9	No simple tests
Diamond	10	Scratches everything



Task
Research the characteristics of minerals and create a list that explains each of the different types

Layers of Earth and Soil

Terms

Convection current-

Molten rock-

Leaching-

Weathering-

Erosion-

Layers of Earth –

http://www.brainpop.com/science/earthsystem/earthsstructure/

3 layers to the Earth's Crust

1. Crust
2. Mantle
3. Core

Crust - Part of the Earth that we live on. The crust ranges between 35-70km deep on the continents (where we live) and 5-10km of depth in the ocean. At this point you reach the bedrock. The bedrock is the bottom part of the crust.

Mantle – Occupies 2/3 of the Earth. It is made up of a mixture of elements: silicon, iron, magnesium, and oxygen. The mantle starts at the bottom of the crust and is about 2900km deep. The liquid rock inside the mantle churns in convection currents from the upper mantle to the lower mantle. The ***upper mantle*** is made of softer plastics that allow the tectonic plates of the Earth to move around. The ***lower mantle*** is solid and extremely hot.

Core – The ***outer core*** is Earth's only liquid layer it is about 2000km thick and it make made of molten iron and nickel. All the pressure from the outer core creates a solid ball of iron called the ***inner core***.

Soils

http://www.brainpop.com/science/earthsystem/soil/

Soil is a mixture of 4 things:

1. Rock and mineral fragments
2. Water
3. Air
4. Humus – organic material from remains dead plants

The process of soil formation involves the rock cycle. Rocks and minerals from the Earth's crust get weathered and eroded by wind, rain, ice movement, Air (CO_2, O_2) creating sediment. Plants then put their roots down in this sediment. When the plants die humus accumulates in the rock and makes the area more livable for bigger plants and this creates soil. As more and more plants and animals live in the soil it becomes more fertile, this process is very slow and takes thousands of years.

3 Layers (horizons) of Soil

1. Horizon A – Topsoil, has lots of humus that makes it dark. Very fertile
2. Horizon B – Subsoil, is rocks, minerals, and clay. It has less humus so it is less dark and less fertile.
3. Horizon C – bottom layer, lightest color, least amount of humus. Mostly rock.

Below the 3 layers of soil is the bedrock – bottom layer of Earth's crust.

Questions

1. Explain how topsoil could be lost? What process creates this loss?
2. Why do soil profiles contain layers?
3. How would the soil profile in the desert be different from the soil profile in a rain forest? Think about the different plants that would create humus.
4. Why do you think the composition of the Earth is only a theory?
5. With all the advances in modern technology explain one reason why we still have not dug to the inner core of the Earth?

Plate Tectonics

http://www.brainpop.com/science/earthsystem/platetectonics/

Terms

Pangaea

Theory

Fossil

The tectonic plates of the earth make up the top layer of the Earth and it floats along the mantle. The outer layer of Earth, the crust, is not a solid structure. Rather, continents and the ocean floor moves around on these tectonic plates. It moves slowly only a couple of centimeters every year, so you hardly ever notice it. Since the plates of the Earth move there is evidence that supports a theory that at one time all the continents were connected, this is called Pangaea. Scientists believe that Pangaea existed 2 or 3 hundred million years ago. The Theory of continental drift is supported by the evidence that supports Pangaea that Africa and South America appear to fit together like pieces of the puzzle. Also, fossils on each continent indicate similar animals existed there; there is no way that these animals could have crossed the Atlantic Ocean, so continents must have been connected.

The tectonic plates are separated by boundaries, meaning that there is space between tectonic plates. These boundaries are called **fault** lines. Tectonic plates move in 3 ways:

1. Divergent Boundaries – Tectonic Plates pull apart. Molten rock fills the surface. Divergent boundaries pushes the plates further apart, this occurs in the Atlantic Ocean at the Mid-Atlantic Ridge. This effect is called seafloor spreading.
2. Convergent Boundaries – Tectonic plates are crashing into one another, sometimes one plate is forced under the other, and this is called a subduction zone.
3. Transform Boundaries – Tectonic plates are sliding past each other horizontally creating friction. (Earthquakes)

Volcanoes, mountains, earthquakes, and trenches all appear because of moving plates along fault lines.

Questions

1. Give evidence regarding the seafloor that would indicate that continental drift is no longer a theory?
2. Explain how a transform boundary could create an earthquake?
3. Why would people be skeptical to believe in Pangaea?
4. Based on fossil proof, make an argument that supports Pangaea?

Volcanoes

By Chaffin Mitchell, AccuWeather staff writer

Today, about 500 million people live on or close to volcanoes, and while these geological wonders can be a hot spot for tourists, they can pose many hazards to surrounding communities when they erupt.

There are many scientific terms related to volcanic eruptions, and understanding them can help to explain the full spectrum of threats that arise from these fiery features.

A volcano can be a mountain that extends down to a pool of magma between the crust and mantle. It's basically a hole in the Earth from which magma emerges to release pressure inside the Earth.

Here are some common volcanic words and phrases to learn.

Ash

In this photo released by U.S. Geological Survey, a plume of ash rises from the Puu Oo vent on Hawaii's Kilaueaa Volcano. (U.S. Geological Survey via AP)

Volcanic ash is composed of fine particles of fragmented volcanic rock, which are able to irritate lungs, eyes and airways.

People should avoid unnecessary exposure to ash and wear protective clothing, masks and goggles to ensure that ash contact with the body is at a minimum.

The ash is formed during explosive volcanic eruptions when dissolved gases in magma expand and escape into the atmosphere.

Fissures

A fissure in a road in the Leilani Estates subdivision. (Scott Wiggers/Apau Hawaii Tours via AP)

A volcanic fissure, also known as a fissure vent, is a linear vent through which lava erupts, typically without explosive activity.

Hot spots

The Anak Krakatau (Child of Krakatau) volcano sends up powerful clouds of hot gasses, rocks, and lava as a fishing boat is moored offshore. (AP Photo/Ed Wray)

Hot spots are places within the Earth's crust where rocks melt to generate magma.

The Hawaiian hot spot has been active for at least 70 million years, producing a volcanic chain that extends 3,750 miles across the northwestern Pacific Ocean.

Hot spots also develop beneath continents, for example the Yellowstone hot spot, which has been active for at least 15 million years.

Magma

The U.S. Geological Survey shows shows a layer of red ash on top of an active lava flow with surface breakouts in Kilauea Volcano in Hawaii Volcanoes National Park on Hawaii's Big Island. (U.S. Gelological Survey via AP)

Magma is composed of molten rock and is stored in the Earth's crust. Once the magma reaches the Earth's surface, it is called lava.

Lava

Mayon volcano spews molten lava during its sporadic eruption. (AP Photo/Bullit Marquez)

Lava is hot liquid rock that can blast violently out of a volcano.

Lava is magma that reaches the surface of our planet through a volcano vent. It is made up of crystals, volcanic glass and bubbles.

Rift zone

Lava flows on the Pu'u O'o crater on Kilauea Volcano in Hawaii. (AP Photo/Tim Wright)

A rift zone is a linear series of cracks or rifts typically forming into two or three well-defined regions.

Essentially, it is an area where the volcano is splitting apart. The rock is weak and cracked, making it easier for magma to reach the surface.

Rift zones are a feature of some volcanoes, especially shield volcanoes.

Volcanic vents

A volcanic vent is a spot in the Earth’s crust where gases, molten rock, lava and rocks erupt. Volcanic vents can be at the top large volcanoes or they can be openings in the Earth’s crust.

Volcanic bombs

Volcanic bombs. (Hans/pixabay)

Volcanic bombs are masses of molten rock formed when large fragments of lava are ejected from a volcano.

These bombs are shaped while flying through the air and usually take aerodynamic forms. While in the air, after ejection, they cool into solid or semi-solid rock before hitting the ground.

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The three main types of volcanoes:

Stratovolcano (or **composite volcano**)

- A volcano consisting of solid lava and other rocks.

Cinder cone volcano

- A steep hill of volcanic debris.

Shield volcano

- A volcano built entirely or mostly from fluid lava vents.

Sources: ZME Science

Terms:

Magma
Lava
Ash
Fissures
Hot spots
Rift Zones
Stratovolcano
Cinder cone volcano
Shield volcano

Questions:

1. What is the difference between magma and lava?
2. Name and describe the three types of volcanoes.
3. What are fissures?
4. Describe what hotspots are.
5. Describe a volcanic vent and the two places they can be found.
6. How are volcanic bombs created?

http://www.brainpop.com/science/earthsystem/volcanoes/

https://www.youtube.com/playlist?list=PLQlnTldJs0ZQmYcKNCBTiv2Ea64Qg0GJo

https://www.youtube.com/watch?v=zWkNT5A3wIk&list=PLs9Fv6xm7nqfA0cPk_urTc2EZEmOVulOL

The above videos are all about volcanoes. The second link also includes a short clip on how to make a volcano if you care to try.
The third link is the movie Dante's Peak. I would like all students to watch this. Very interesting facts are included in this video. Enjoy.