Rock Cycle

That was easy or not…

What is the rock cycle?

Some may say it is part of the laundry cycle where you add rocks to get the tough stains out…I wouldn't recommend doing this at home.

- ✓ The rock cycle is perhaps the most basic, fundamental principle of geology. All rocks are related to each other and may be transformed from one kind to another. In its simplest form, the rock cycle describes the relationships between the 3 major types of rock.

Three Main Rock Types

- ✓ Igneous
- ✓ Sedimentary
- ✓ Metamorphic

Igneous Rocks

✓Fire-formed

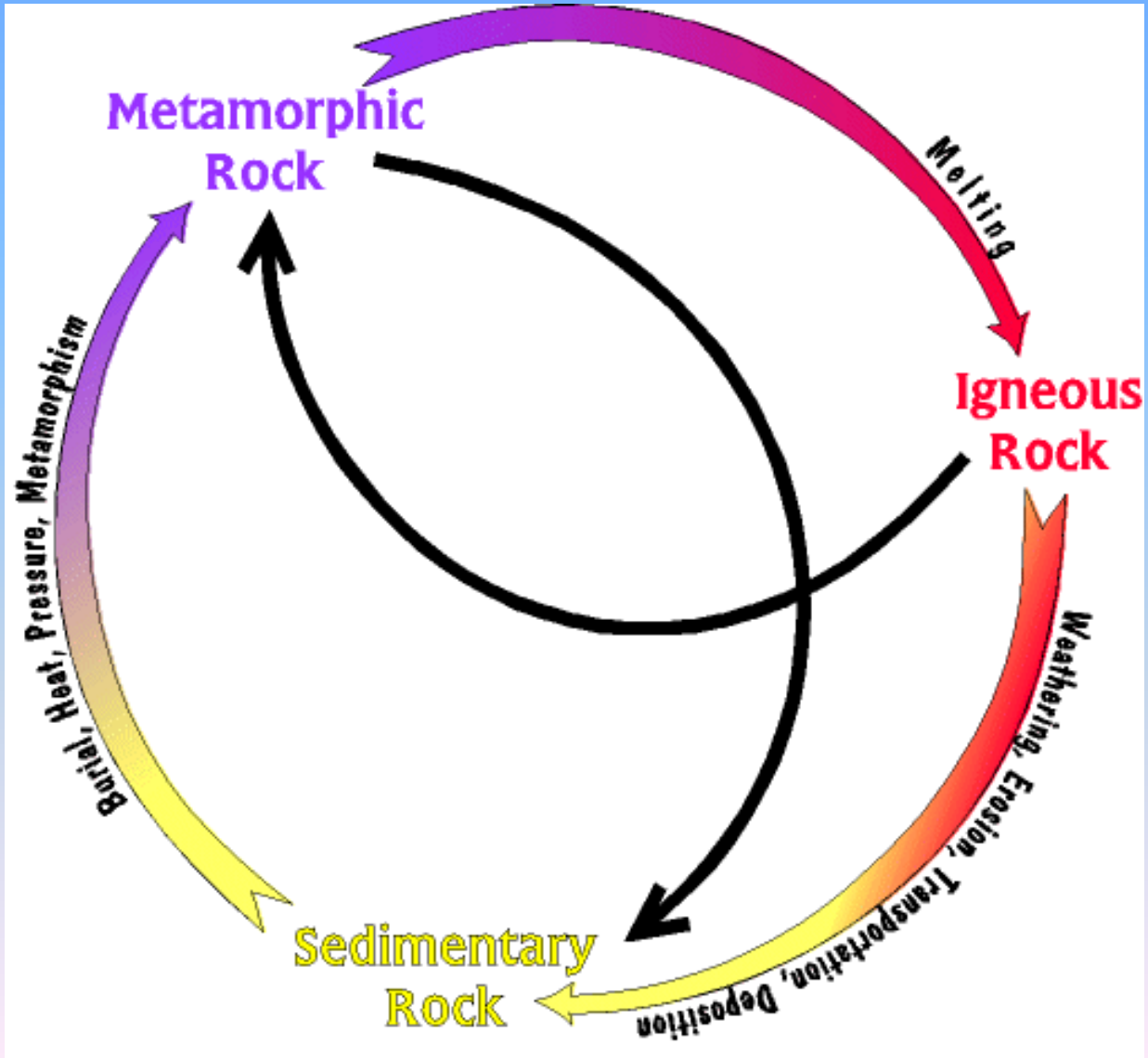
Sedimentary Rocks

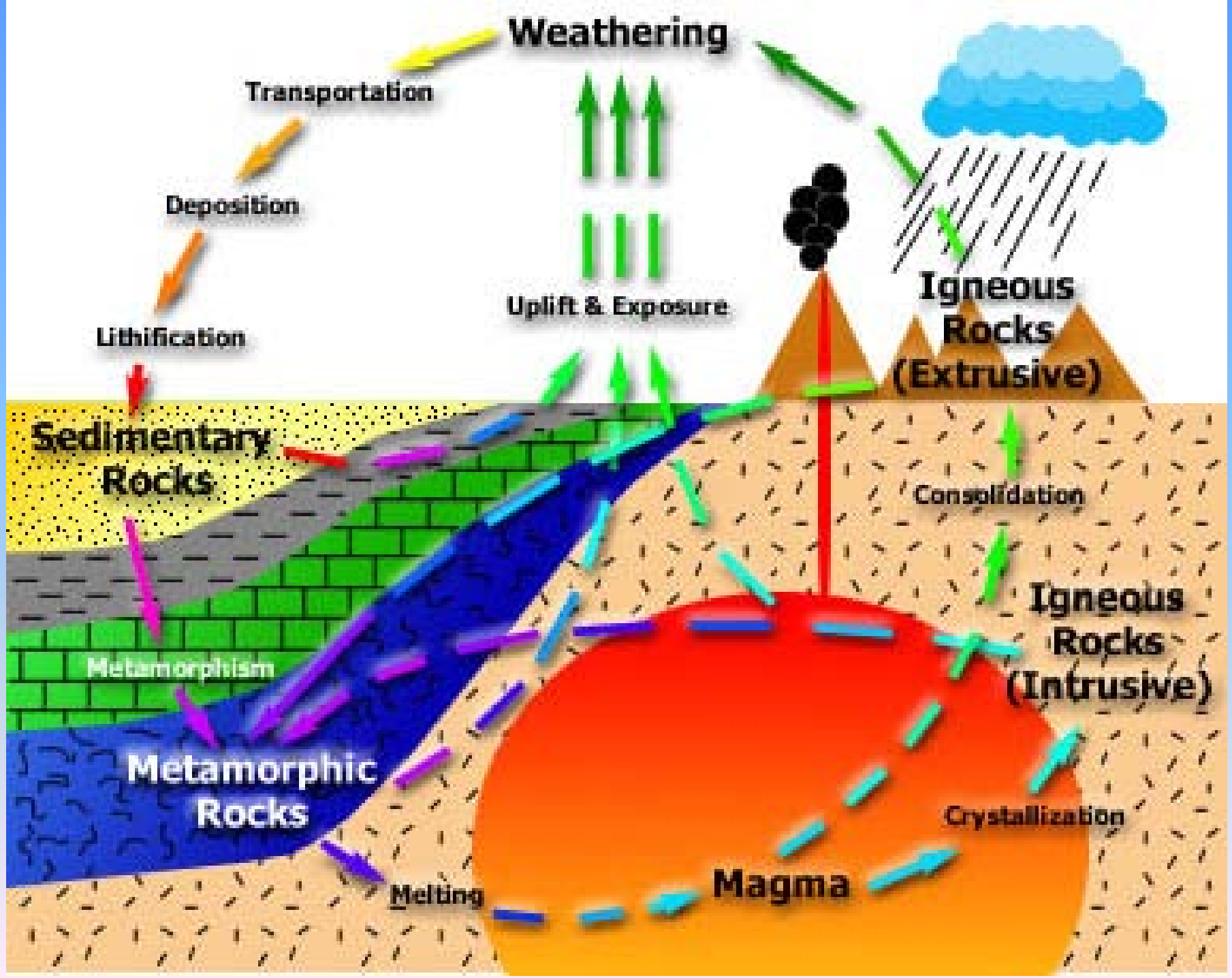
- ✓Compaction and Cementation

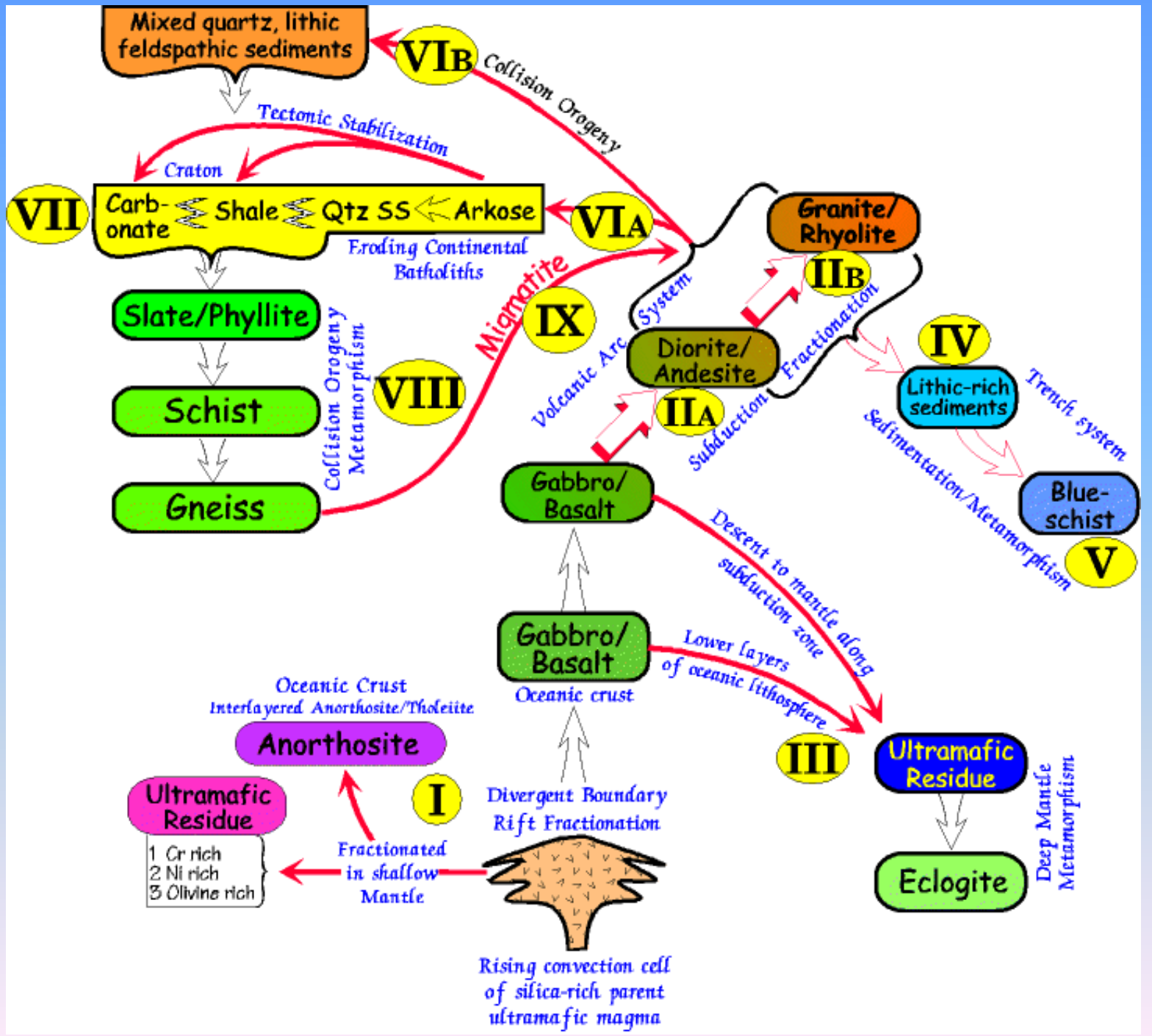
Metamorphic Rocks

- ✓Changed form from heat and pressure

The Wilson Cylcle




Weathering
Transportation
Deposition
Lithification
Uplift & Exposure
Igneous Rocks (Extrusive)
Sedimentary Rocks
Consolidation
Igneous Rocks (Intrusive)
Metamorphism
Metamorphic Rocks
Crystallization
Melting
Magma


Mixed quartz, lithic feldspathic sediments
VIB
Collision Orogeny
Tectonic Stabilization
Craton
VII
Carb-onate
Shale
Qtz SS
Arkose
VIA
Eroding Continental Batholiths
Granite/ Rhyolite
IIB
Slate/Phyllite
Schist
Gneiss
Collision Orogeny Metamorphism
VIII
Migmatite
IX
Volcanic Arc System
Diorite/ Andesite
Fractionation
IV
Lithic-rich sediments
Trench system
Sedimentation/Metamorphism
Blue-schist
V
IIA
Subduction
Gabbro/ Basalt
Descent to mantle along subduction zone
Gabbro/ Basalt
Oceanic crust
Lower layers of oceanic lithosphere
III
Ultramafic Residue
Deep Mantle Metamorphism
Eclogite
Oceanic Crust
Interlayered Anorthosite/Tholeiite
Anorthosite
I
Ultramafic Residue
1 Cr rich
2 Ni rich
3 Olivine rich
Fractionated in shallow Mantle
Divergent Boundary
Rift Fractionation
Rising convection cell of silica-rich parent ultramafic magma

The Crayon Rock Cycle

This activity is an introduction to the rock cycle by using wax crayons.

Crayons have the ability to be ground into small particles (weathered), heated, cooled and compressed just like rocks. However, unlike rocks, all these processes can be done safely and at reasonable temperatures.

Using crayons students can create sedimentary, metamorphic and igneous crayons.

Materials

- Crayons
- Plastic Knife (or Popsicle Stick)
- Aluminum Foil
- Candle with holder
- Lighter
- Ice

Prepartions

1. Cut aluminum foil in ~6 inch squares enough for the same number of groups or individuals.
2. Peel the paper off the crayons to be used and discard the waste properly.

Activity

This activity can be done individually or in groups of two.

To make a Sedimentary Crayon:

1. You need to make small, particles sized sediments out of your crayons. These can be scraped from a new crayons (which can also be considered an igneous crayon), a sedimentary block of crayon, a metamorphic block of crayon or an igneous block of crayon. Scrape crayons with popsicle sticks, plastic knives or other grating tools.

2. Gather a pile of sediments collected from various scraped crayons.

3. Pressing down on this pile will allow the particles to stick together.
    a. Encasing the sediments between sheets of paper, foil, etc will help keep the sediments together.
    b. Using a utensil or stepping on your encase pile will help this process along too.

4. Your coherent bunch of crayon sediments is now equivalent to a sedimentary crayon.

http://www.exo.net/~emuller/activities/Crayon-Rock-Cycle.pdf (Modified to match activity)

To make a Metamorphic Crayon:

1. Place a small pile of sedimentary, metamorphic or igneous crayons into piece of aluminum foil or foil cupcake cup.

2. Heat this foil over the candle flame. Make sure not to be too close. Just heat enough to partially melt the crayon.

3. Watch as the heat from the candle transfers to the foil and to the crayons. The crayons should start to melt.

4. Remove the foil when the crayon wax is soft to the touch (don't use your finger, use a probe such as a popsicle stick).

5. Let your crayons cool.

6. Your partially melted and cooled crayons are now equivalent to metamorphic crayons.

http://www.exo.net/~emuller/activities/Crayon-Rock-Cycle.pdf (Modified to match activity)

To make an Igneous Crayon:

1. Place a small pile of sedimentary, metamorphic or igneous crayons into piece of aluminum foil or foil cupcake cup.

2. Hold this crayon containing foil over the candle flame. Make sure to hold the edges and not to get burned.

3. Watch as the heat from the candle transfers to the foil and to the crayons. The crayons should start to melt.

4. The crayons should be allowed to melt until a smooth liquid forms.

5. Carefully remove molten crayon wax and let cool. Your totally melted and cooled crayons are now equivalent to igneous crayons.

http://www.exo.net/~emuller/activities/Crayon-Rock-Cycle.pdf (Modified to match activity)

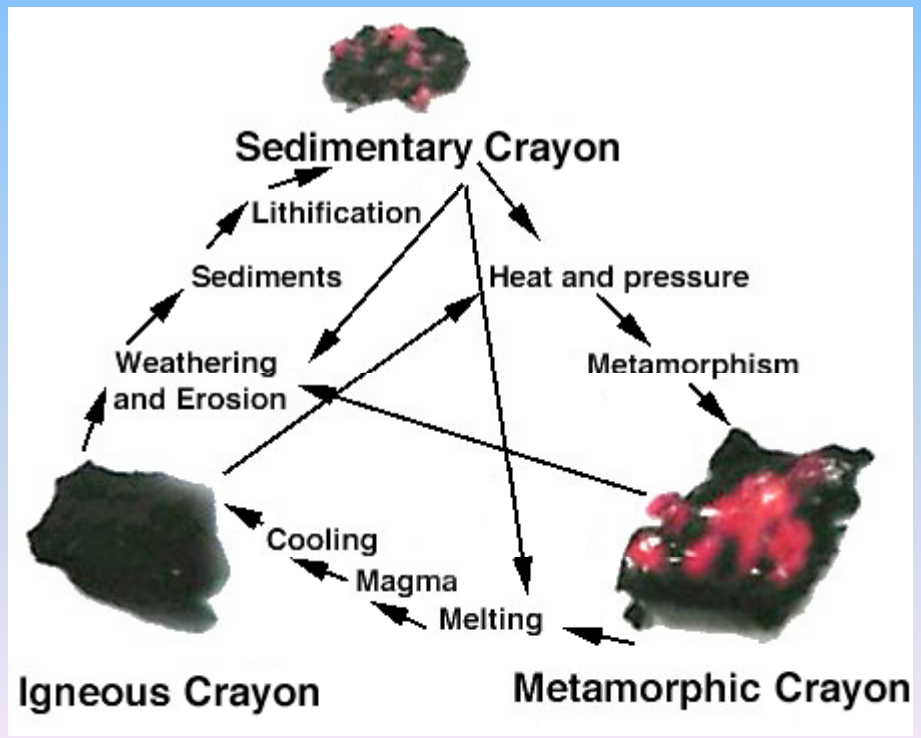
What's going on?

This crayon cycle is designed to model the rock cycle.

The rock cycle is a continuing process that has occurred throughout geologic time.

One type of rock can become another rock type over time.

This process can be thought of as a cycle and can be diagramed (see below).



http://www.exo.net/~emuller/activities/Crayon-Rock-Cycle.pdf (Modified to match activity)

Summary

The particles that constitute an igneous rock held in one's hands today may become part of a sedimentary or metamorphic rock in the distant future.

Very little rock on the surface of the earth has remained fixed in its original rock type.

Most rocks have undergone several iterations of the rock cycle.

http://www.exo.net/~emuller/activities/Crayon-Rock-Cycle.pdf (Modified to match activity)

Fun Websites to Explore

http://csmres.jmu.edu/geollab/fichter/Wilson/PTRC.html

http://www.lessonplanspage.com/printables/PScienceRockCycleFudge58.htm

http://www.cotf.edu/ete/modules/msese/earthsysflr/rock.html

http://www.learner.org/interactives/rockcycle/diagram.html

http://www.rocksandminerals.com/rockcycle.htm

http://library.thinkquest.org/J002289/cycle.html

http://www.classzone.com/books/earth_science/terc/content/investigations/es0602/es0602page02.cfm

Name_____

Rock Cycle Simulation (Crayon Lab)

Objective: To observe the rock cycle through a series of simulations

PART A: WEATHERING

Background

In nature, rocks are broken down by the forces of nature. This process is called weathering. In this simulation, the crayons represent rock material, and the pencil sharpener or
knife represents mechanical **weathering agents** (wind, sun, rain) that cause rocks to break down into smaller pieces.

To do

Weather your rock: use a pencil sharpener, knife or peeler to shave your crayon into small pieces. Collect the shaving on a paper towel. Be as neat as you can.

Questions

1. Are all the crayon shavings (sediments) the same size or shape? _____

   Are the spaces between the sediments the same size and shape? _____

2. Would this be true of rock sediments in nature?_____

3. Name some of nature's weathering agents.

4. Where do rock sediments tend to collect in nature?

PART B: EROSION AND DEPOSITION

Background

Once rock fragments or **sediments** have been created, they are usually moved (**erosion)**by some force of nature like gravity and dropped in a new location (**deposition**). Hereyou will act as the erosion and deposition forces.

To do

In the square of aluminum foil, each lab partner should pile their crayon shavings in a neat pile in the center of the foil. You have just moved and deposited your fragments.

Questions

5. Are the air spaces between the shavings large or small?_____
regular or irregular in shape?_____

6. What are some of the major ways that rock particles are eroded and deposited innature?

PART C: SEDIMENTARY ROCK

Background

To make a new rock out of rock fragments, the rock fragments must be compacted and cemented together. Spaces between the fragments are reduced in size by pressure (**compaction**) and filled in with cementing agents (**cementation**) such as calcite, silica, or iron oxide. This simulation will not add cementing agents, it will only simulate compaction. The compaction process occurs as sediment layers are continually covered by new layers of sediments. The lower layers become compacted by the weight of the new layers above. The rock formed from the sediments that have been compacted and cemented together is called **sedimentary rock.**

To do

Carefully fold the loose layers of crayon shavings inside the aluminum foil.
Place the foil packet between 2 blocks and push down on it as hard as you can.

Questions

7. Describe the layers. Are they thick or thin?

8. Describe the compaction. Are they tightly or loosely compacted?

9. Describe the particles. Are they distinct particles, or are they blurred?

10. Is the surface dull or shiny?

Save one small piece of “sedimentary rock”

PART D: METAMORPHIC ROCK

Background

Deep within the earth, pressure and temperatures increase. The heat and pressure causeminerals and rocks to change in size or shape, or separate into parallel bands. The rockcan even flow like a plastic material, and minerals can change into other minerals. Thechange from one type of rock to another is called metamorphism, and the rocks formedare called **metamorphic** rocks.

To do

Rewrap the sedimentary rocktypecrayons in the aluminum foil. Place between the wood blocks. Put the blocks in the clamp and tighten as much as possible. Let everyone in the group tighten the clamp.

Questions

11. Describe the layers. Are they thin or thick?

12. Describe the compaction. Are they tightly or loosely compacted?

13. Describe the particles. Are they distinct or blurred?

14. Is the surface dull or shiny? What might be the cause of this?

Save one small piece of “metamorphic rock”
PART E: IGNEOUS ROCK

Background
Igneous rocks form deep within the earth. They are formed when magma (called lava if it comes to the surface) cools and hardens. The rocks are called **extrusive** if they come tothe surface during a volcanic eruption. Extrusive rocks cool rapidly from lava into rocks.Igneous rocks are called **intrusive** if they cool slowly beneath the earth’s surface, ofteninside other rocks. Eventually they are exposed by erosion.

To do
Put a piece of foil over the hot plate to protect it. Turn the hot plate to medium. Place the all the rest of your crayon shavings into an aluminum pie pan and place it on the hot plate. Watch the pan and stir occasionally until all of the crayon is melted. Turn off the hot plate.

Using tongs, pour **half** your melted “magma” into the frozen pie plate. Leave the rest in the original pie plate. Observe the samples carefully; feel free to break them into pieces to observe.

IGNEOUS ROCK SIMULATION
Speed of cooling Observations Size of “crystals”
A. Fast (frozen plate)
B. Slow (original plate)

Questions
15. Which group simulates a rock that comes to the surface and cools quickly in the air?

16. Which group represents a rock that cools deep beneath the surface?

17. What general statement can be made about crystal size and the speed of cooling?