Ride the Rock Cycle

Students will travel through the Rock Cycle and learn that like the water cycle, the rock cycle has various stages and does not necessarily move linearly through those stages.

Grade Level: 5th

Phenomena:
Are rocks able to go through stages to change their appearance?

Objectives:
- Students will examine the rock cycle through different stations.
- Students will identify the various stages of the rock cycle.
- Students will interpret the rock cycle and create their own comic strip version of a rock's journey.

Materials:
- Dice (1 per station—See pages 6-8)
- Station cards
- Student worksheets
- Examples of different kinds of rocks if available (sedimentary, igneous and metamorphic)
- Rock Cycle Poster Pieces

Appendixes:
- Student Sheet pg. 6
- The Rock Cycle pg. 7
- Rock Pictures pgs. 8-13
- Dice Templates pgs. 14-16

Time Considerations:
- Preparations: 45-60 minutes
- Introduction: ~15 minutes
- Activity 1: ~20 minutes
- Activity 2: ~15minutes
- Activity 3: 10-15 minutes
- Activity 4: 5-10 minutes
- Conclusion: ~10 minutes

Related Lesson Plans:

Next Generation Science Standards

MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

Science and Engineering Practices (SEP):
Analyzing and interpreting data.

Disciplinary Core Ideas:
Earth's materials and systems.

Crosscutting Concepts:
Scale, proportion, and quantity.

Excellence in Environmental Education Guidelines

Strand 1—*Questioning, Analysis, and Interpretation Skills:* E) Organizing Information—Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.

G) Drawing Conclusions and developing explanations—Learners can develop simple explanations that address their questions about the environment.

Strand 2—*Knowledge of Environmental Processes and Systems*. Strand 2.1– *The Earth as a Physical System:* B) Changes in matter—Learners are able to identify basic characteristics of and changes in matter.

This lesson has been adapted

(based on "Ride the Rock Cycle" lesson from Illinois State Museum Geology Online)

Background

The three major rock types, igneous, metamorphic, and sedimentary, are shown. As you see, each may form at the expense of another if it is forced out of equilibrium with its physical or climatic environment by either internal or surface forces.
Magma is molten rock beneath the earth's surface. *Igneous* rocks form when magma solidifies. If the magma is brought to the surface by a volcanic eruption, it may solidify into an *extrusive* igneous rock. Magma may also solidify very slowly beneath the surface. The resulting *intrusive* igneous rock may be exposed later after uplift and erosion remove the overlying rock.

The igneous rock, being out of equilibrium, may then undergo *weathering* and *erosion,*
Illinois State Museum Geology

Online (http://geologyonline.museum.state.il.us) and the debris produced is transported and ultimately deposited (usually on a sea floor) as *sediment.* If the unconsolidated sediment becomes lithified (cemented or otherwise consolidated into rock), it becomes a *sedimentary rock.*

As the rock is buried the additional layers of sediment and sedimentary rock, heat and pressure increases. Tectonic forces may also increase the temperature and pressure. If the temperature and pressure become high enough, usually at depths greater than several kilometers below the surface, the original sedimentary rock is no longer in equilibrium and recrystallizes. The new rock that forms is called a *metamorphic rock*.

If the temperature gets very high the rock melts and becomes magma again, completing the cycle. The cycle can be repeated, as implied by the arrows. However, there is no reason to expect all rocks to go through each step in the cycle. For instance, sedimentary rocks might be uplifted and exposed to weathering, creating new sediment.

- Make dice for stations (see attachments) and station cards

Preparation

- Collect examples of sedimentary, igneous and metamorphic rocks if possible
- Create a poster/visual aids of the rock cycle
- Set up "Ride the Rock Cycle" activity by hanging signs for the five different stations around the room and place dice at each the station.
- Create a rock cycle comic strip to use as an example in Activity Four.

Doing the Activity

Introduction:

Begin by asking students to look out the classroom windows and describe what they see (mountains, sage, the playground, etc).

Focus their thoughts on the mountains. Ask the class what the mountain is composed of? Rocks!

Explain that there are three types of rocks, all of which moves through a process to which they can change to another from. This continuing process is known as the rock cycle.

The goal for this lesson is to discover how the three types of rocks form and to understand how rocks move through the rock cycle.

Activity 1: Rocky Brainstorm

Ask the class to first name different ways rocks can form (volcanic eruptions, underground, dried mud, etc).

By using their examples introduce the three types of rocks: igneous, metamorphic, and sedimentary.

Describe how the process by which each rock is formed. During this explanation, pass around a rock that represents each of the rock types.

When the rocks are returned, teach students the following body movements that represent each type of rock. These motions will be used in Activity Two.

- **Igneous Rock:** Start with hands at your side and bring your arms upwards as to act out an erupting volcano.
- **Metamorphic Rock:** Form a fist with one hand and a flat surface with the other hand. Bring the two hands together forcefully and say repeatedly "Heat & Pressure).
- **Sedimentary Rock:** Use both hands to model layering, by stacking hands on top of each other.

To ensure students know these motions, quiz students by saying a type of rock and look for the correct motion to be *done.*

Activity 2: Rockin' Game

Explain to the class they will now test each other's knowledge in a Rockin' Game.

The goal of this game is for students to learn the three types of rock and how they are formed.

Demonstrate how the game is played by creating a group at the front of the class (each group will have 5-6 students).

Explain one person will stand in the middle of the circle, to which the remaining students form. The middle person turns in a circle and chooses one person from the circle by pointing and stating one type of rock. The chosen person must quickly respond by doing the correct body motion. If the chosen person responds with the correct motion he or she is safe and remains as part of the circle. If that person takes too long or does the wrong body motion, they switch spots with the person in the middle and continues the game.

Once this is demonstrated, divide the class into groups and begin!

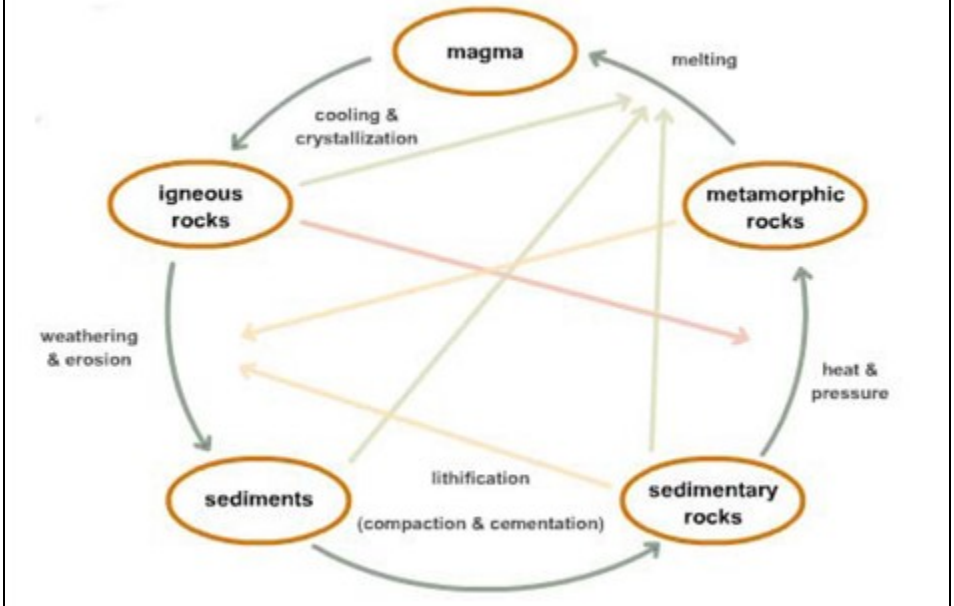
Alternative Game:

Have all students form a circle (preferably outside) and demonstrate actions for the three different rock types:

Sedimentary: 2 people stand across from each other and layer hands over and over saying “layers and layers and layers and layers”.

Igneous: 2 people stand across from each other reaching arms out to form a volcano. A third person crouches down between them saying “magma magma” and then standing up reaching their arms out saying “lava”.

Metamorphic: 4 people stand in a circle with each person rubbing their hands together and saying “heat” and then pushing them on the hands of the people next to them saying “pressure”…”heat and pressure, heat, heat, and pressure…”



http://www.usc.edu/org/cosee-west/Mar192011/Ride_the_Rock_Cycle.pdf

Once these are all demonstrated inform students the instructor will be calling out a rock type and they must find the correct amount of people for each action. If anyone isn’t able to find a group for each round they will be eliminated.

Begin the game with everyone moving around while singing “mineral, mineral, mineral, mineral, mineral, mineral”. Then shout out a rock type.

After each round students should be eliminated and they can help the instructor shout out the rock type for each round.

This may be done any number of rounds depending on time, and can be played until there are two people left standing.

Activity 3:
Riding the Rock Cycle

Gather the class and explain it is time to use their new knowledge of rocks by catching a ride in the rock cycle!

Explain to the class they will investigate how sedimentary, igneous, and metamorphic rocks move through the rock cycle, along with magma and sediments (two other important parts of the rock cycle).

At this point, ask students to predict whether they think the rock cycle moves in a predictable order. Take a class vote and record the results on the board.

Demonstrate the activity before handing out any materials.

Explain to students they will move from one station to another, depending on what the dice rolled. Identify each station around the room and if needed explain what magma and sediments are at this time.

Using the rock records sheet (page 6). demonstrate to students how they should record their journey.

Distribute rock records, and have students move to any station to begin. State to the class students will have fifteen minutes in this activity. Remind students to first record where they are starting, then begin!

Activity 4:
Rock Cycle Comics

When time is finished gather students back into their desks. Students, instead of sharing immediately, will create rock cycle comic strips from their rock records.

Use an already made comic strip to show students your expectations for this activity.

Students are to choose four sequential parts of their record to create a comic strip. Between each box, students need to label how exactly they moved from once station to another.

In addition, instruct students to add a fifth box in their comic strip and add where they could have gone next in the rock cycle.

When students are complete, and if time is permitted, have students share their comic strips with each other.

Use multiple comic strips to fill in the rock cycle on the board. Use arrows and different colored markers to show how complicated the rock cycle is.

Conclusion

Return to the class prediction about the movement of the rock cycle. Does the rock cycle move in a simple manner or is it complicated? Does it happen over a short period of time?

Review the three types of rocks and the five different parts of the rock cycle and how they are connected.

Assessment

Collect comic strips to assess student understanding of the processes that occur as rocks change from one type to another in the rock cycle.

Assess student audibly by listening to how students explain their rock cycle journey to their peers.

Extensions

- Allow students to create a short skit that describes how a rock can move through the rock cycle.
- Use field guides and hand lenses and go for a rock hunt outside.

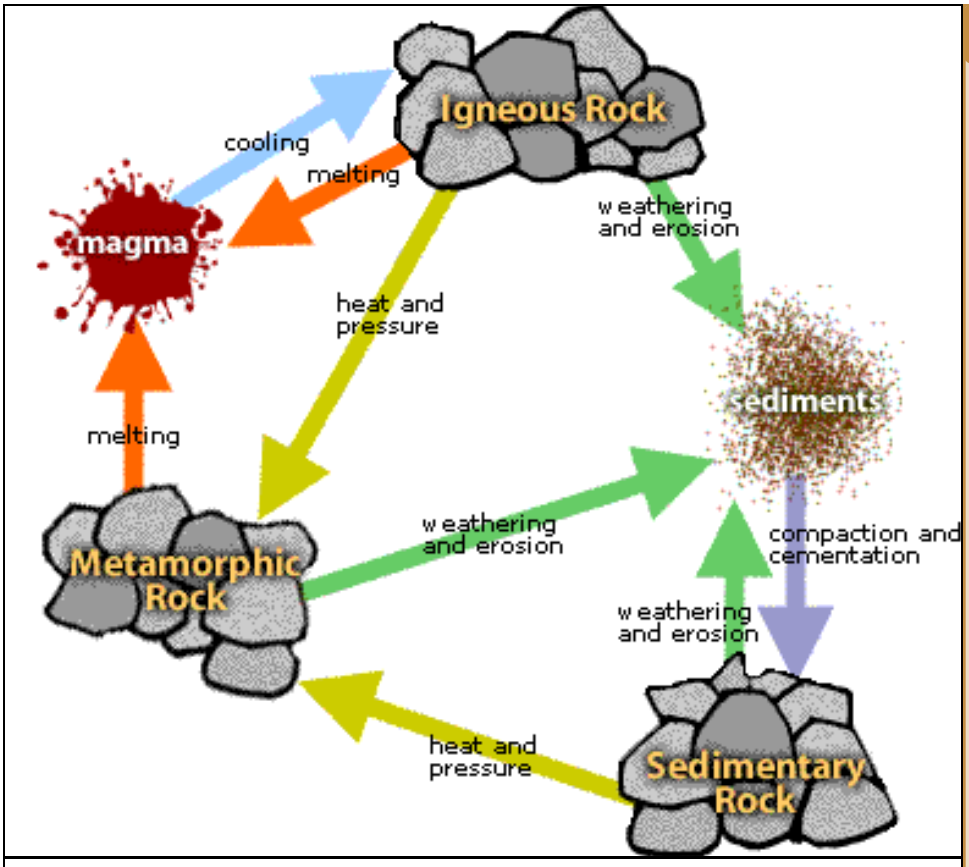


Figure 2
http://www2.needham.k12.ma.us/mitchell/technology/lessons/rocks/rockcyc.htm

Vocabulary

The Rock Cycle: A never-ending process in which rocks change from one kind into another.

Sediment: The solid matter that settles at the bottom of a liquid.

Sedimentary Rock: A rock type that has been created by the deposition and compression of sediment

Magma: molten rock in the earth's crust

Igneous Rock: rock formed by the solidification of magma or lava.

Metamorphic Rock: Any type of rock which changes in texture or composition, after it's original formation, as a result of extreme heat, pressure, or chemically active fluids.

Sources

- *(http://geologyonline.museum.state.il.us)*
- http://www.google.com/search?hl=en&&sa=X&ei=KJNETJvsMIOisQO2mKWJDA&ved=0CAQQBSgA&q=define%3A+The+Rock+cycle%3B&spell=1
- http://idahoptv.org/dialogue4kids/season3/rocks/misclinks.cfm

Images:
Fig. 1. http://www.usc.edu/org/cosee-west/Mar192011/Ride_the_Rock_Cycle.pdf
Fig. 2. http://www2.needham.k12.ma.us/mitchell/technology/lessons/rocks/rockcyc.htm

Riding the Rock Cycle!

I began my ride at _____.

The first thing that happened was _____, then I went to _____.

The next thing that happened was _____ , then I went to_____.

The next thing that happened was _____, then I went to _____.

The next thing that happened was _____ , then I went to_____.

The next thing that happened was _____, then I went to _____.

The next thing that happened was _____ , then I went to_____.

Riding the Rock Cycle!

I began my ride at _____.

The first thing that happened was _____, then I went to _____.

The next thing that happened was _____ , then I went to_____.

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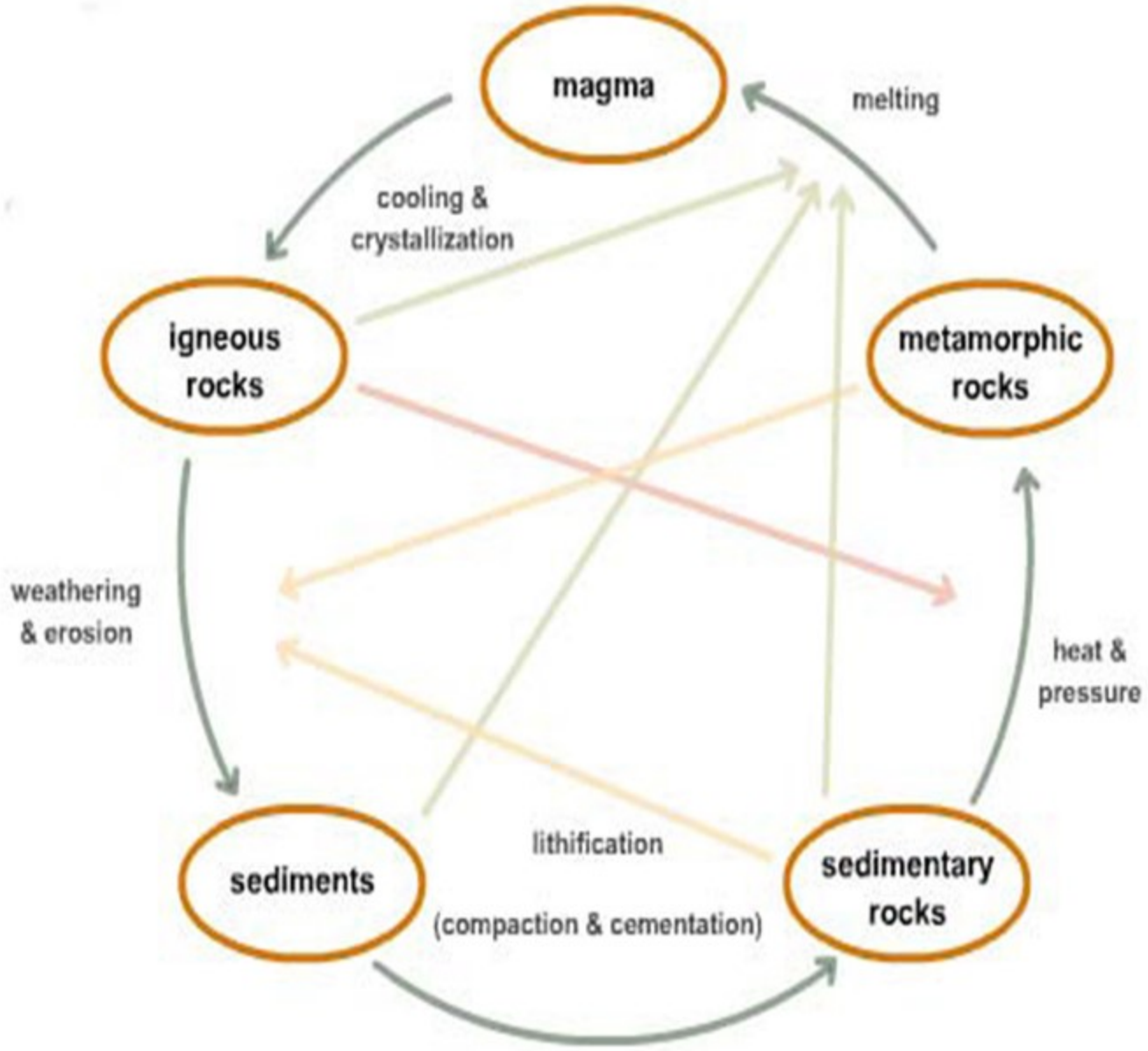
The Rock Cycle



Granite - Igneous Rock

http://www.beg.utexas.edu/mainweb/publications/graphics/granite.htm

Sandstone – Sedimentary Rock

http://www.uwec.edu/runningl/trina's%20web%20stuff/main%20pages/physical%20setting.htm

Limestone - Sedimentary Rock

http://sun-impex.com/limestone-sun-impex.htm

Marble - Metamorphic Rock
Transformed from Limestone
(Jabalpur, India)

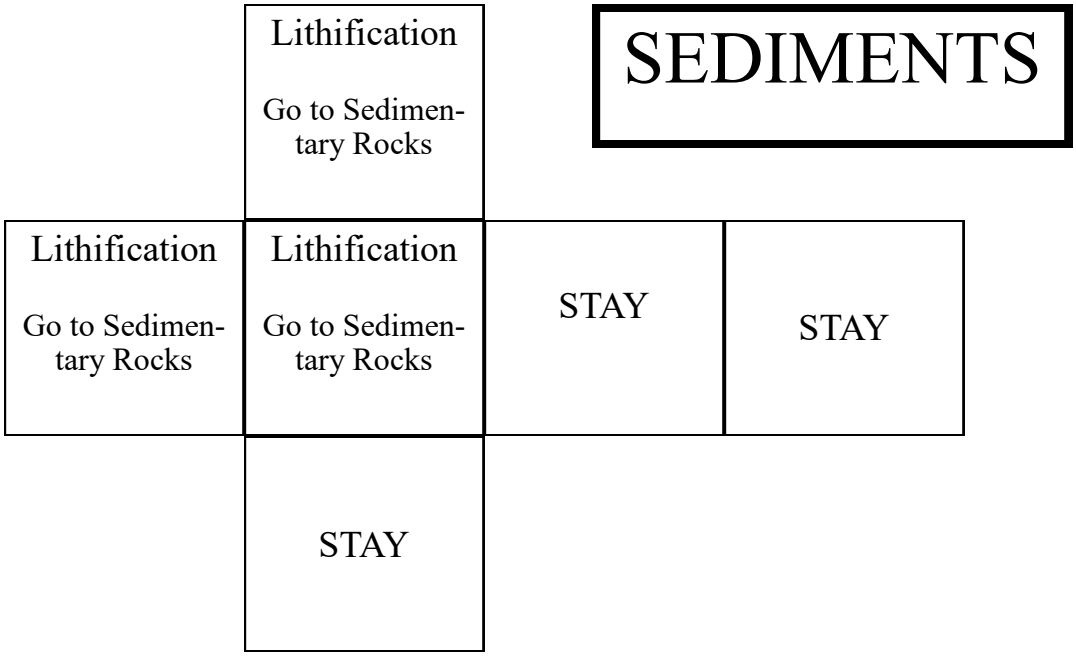
Image From : www.indialine.com/travel/madhyapradesh/jabalpur/

Slate – Metamorphic Rock
Transformed from Shale

http://www.rocksolid-hosting.com/

Obsidian – Igneous Rock

http://www.universetoday.com/60879/obsidian-rock/


SEDIMENTS
Lithification
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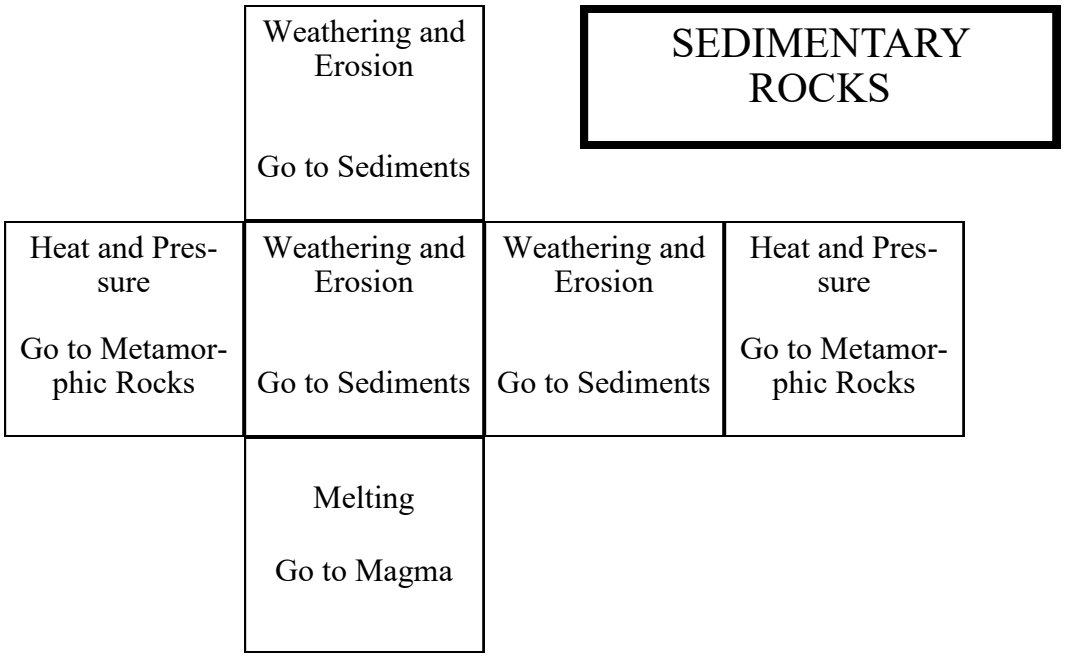
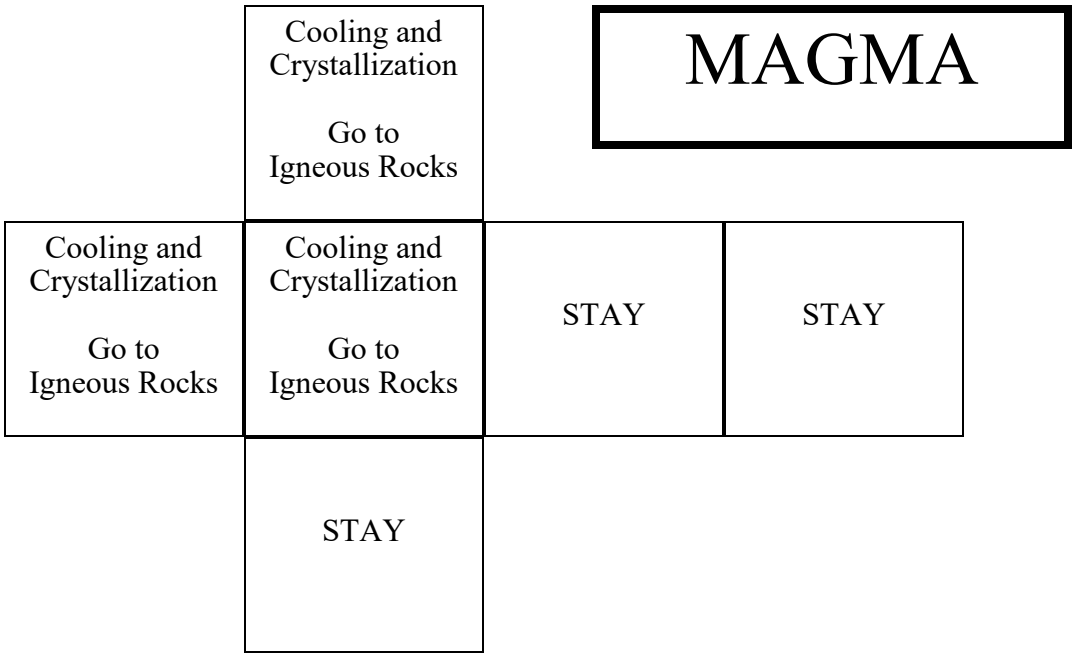

SEDIMENTARY ROCKS
Weathering and Erosion
Go to Sediments
Heat and Pressure
Go to Metamorphic Rocks
Weathering and Erosion
Go to Sediments
Weathering and Erosion
Go to Sediments
Heat and Pressure
Go to Metamorphic Rocks
Melting
Go to Magma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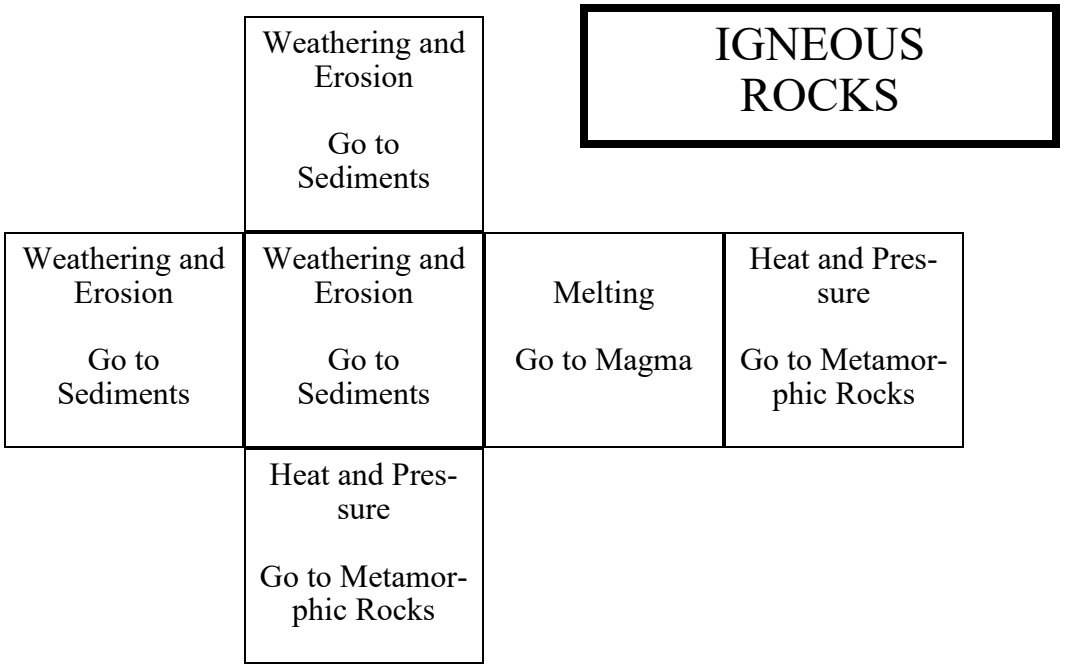
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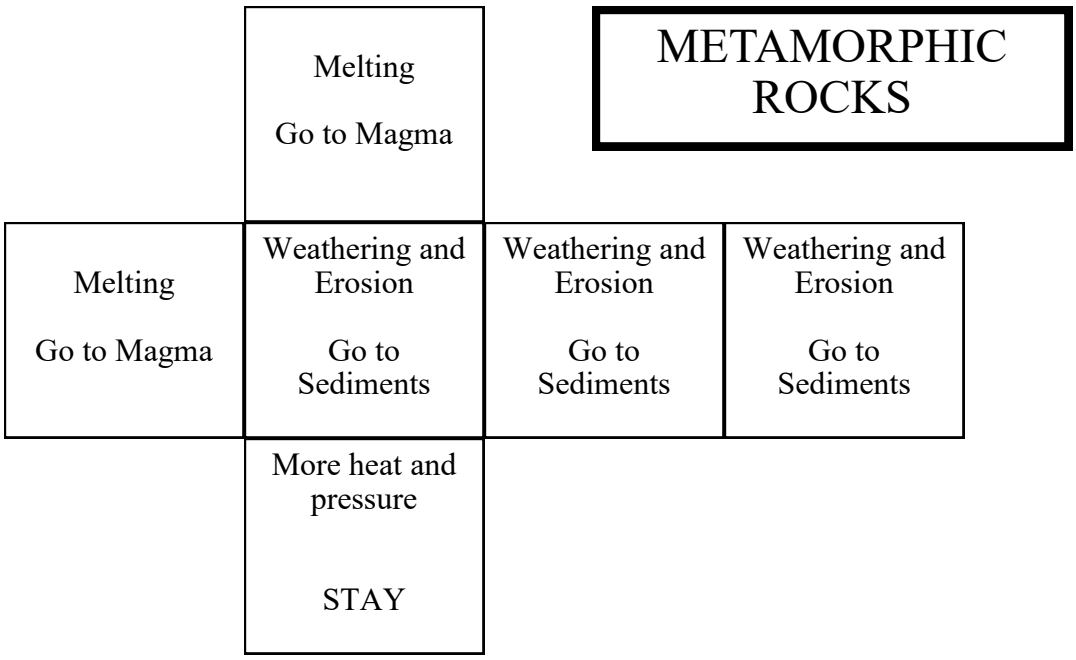
METAMORPHIC ROCKS
Melting
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Melting
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Weathering and Erosion
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Weathering and Erosion
Go to Sediments
More heat and pressure
STAY