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FOR EXCELLENCE IN MIAMI-DADE PUBLIC SCHOOLS
2019-2020

Ideas with IMPACT

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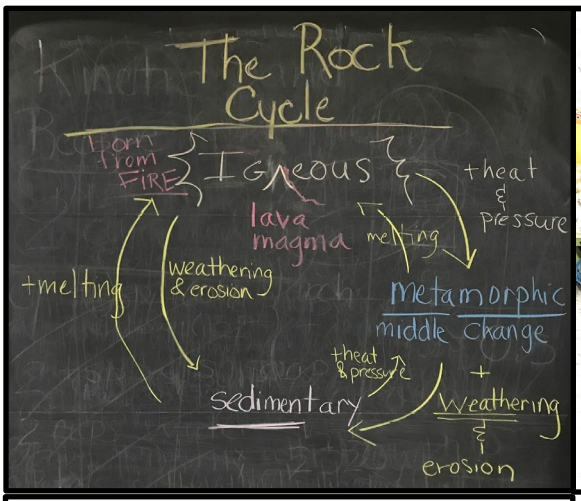
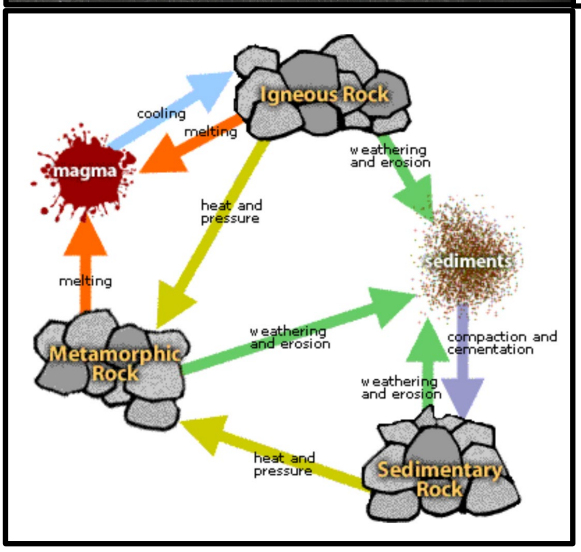
Weathering Through the cRock Cycle

Weathering through the Rock Cycle

Using broken crayons to teach science, sustainability, and art.





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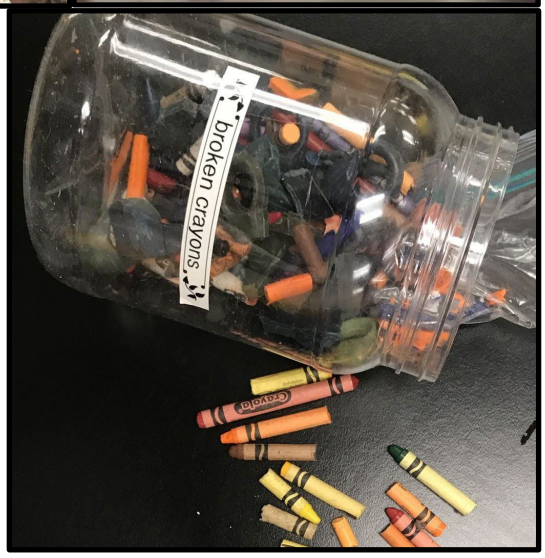

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Goals

To describe and use a model to create the rock cycle.

Lesson Objectives

By the end of this activity, the learners will be able to

- Justify why models are used in the study of science by giving three examples of different models and explaining how they are useful.
- Outline and describe the steps of the rock cycle using 10 key vocabulary terms.
- Use a dual-pan balance to accurately measure 20 grams.
- Compare three processes in the lab with Earth processes.

Florida Standards Covered

Rock Cycle

SC.2.E.6.1 Recognize that Earth is made up of rocks. Rocks come in many sizes and shapes.

SC.4.E.6.1 Identify the three categories of rocks: igneous, (formed from molten rock); sedimentary (pieces of other rocks and fossilized organisms); and metamorphic (formed from heat and pressure).

Recycling/Sustainability

CTE-AFNR.68.ENVIRO.02.04 Demonstrate how to recycle or conserve a natural resource.

CTE-TECED.68.CONTEC.06.03 Analyze recycling opportunities for building construction and materials.

SP.PK12.US.9.2a Select and engage in volunteer activities in school or community, such as recycling, litter patrol, or collecting money for a charity.

Measuring Mass

SC.3.P.8.2 Measure and compare the mass and volume of solids and liquids.

SC.4.P.8.1 Measure and compare objects and materials based on their physical properties including: mass, shape, volume, color, hardness, texture, odor, taste, attraction to magnets.

SC.4.P.8.3 Explore the Law of Conservation of Mass by demonstrating that the mass of a whole object is always the same as the sum of the masses of its parts.

SC.5.P.8.1 Compare and contrast the basic properties of solids, liquids, and gases, such as mass, volume, color, texture, and temperature.

Science Lab Skills

SC.2.N.1.1 Raise questions about the natural world, investigate them in teams through free exploration and systematic observations, and generate appropriate explanations based on those explorations.

SC.2.N.1.2 Compare the observations made by different groups using the same tools.

SC.3.N.1.6 Infer based on observation.

SC.3.N.3.2 Recognize that scientists use models to help understand and explain how things work.

SC.3.N.3.3 Recognize that all models are approximations of natural phenomena; as such, they do not perfectly account for all observations.

SC.4.N.3.1 Explain that models can be three dimensional, two dimensional, an explanation in your mind, or a computer model.

Curriculum Integration Standards

Language Arts

LAFS.4.RI.1.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

Math

MAFS.3.MD.1.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units.

Visual Arts

VA.3.S.2.2 Development of skills, techniques, and processes in the arts strengthens our ability to remember, focus on, process, and sequence information. Follow procedures, focusing on the art-making process.

Lesson Plan

STEM Lesson Plan for The Rock Cycle	
Dates:	**Subject: Science**
Standards: SC.2.E.6.1, SC.4.E.6.1,CTE-AFNR.68.ENVIRO.02.04, CTE-TECED.68.CONTEC.06.03, SP.PK12.US.9.2a, SC.3.P.8.2, SC.4.P.8., SC.4.P.8.3, SC.5.P.8.1, SC.2.N.1.1, SC.2.N.1.2, SC.3.N.1.6, SC.3.N.3.2, SC.3.N.3.3, SC.4.N.3.1, LAFS.4.RI.1.3, MAFS.3.MD.1.2, VA.3.S.2.2	

Lesson objectives:

By the end of this activity, the learners will be able to

- Justify why models are used in the study of science by giving three examples of different models and explaining how they are useful.
- Use a dual-pan balance to accurately measure 20 grams.
- Outline and describe the steps of the rock cycle using 10 key vocabulary terms.
- Compare three processes in the lab with Earth processes.

Students & Teachers Engaging Minds (STEM) Activities

Collaboration	Communication	Creativity	Critical Thinking
Students will work in groups of three	Students will write a story depicting their rock's journey through the rock cycle	Students will sing about the rock cycle, draw the cycle, and write a story about the rock cycle	Students will compare the crayons and the model of the rock cycle with Earth's processes.

Activity Overview & Procedures	**Assessments**
☐☐ Lecture ☐☐ Demo ☑Lab/Report the Rock Cycle Diagram/Story ☐☐ Discussion ☐☐ Activity ☑Classwork Science Journal ☑Video Khan Academy – Rock Cycle ☑Reading worksheet – see resources ☑Other The Rock Cycle Song	☐☐ Book report ☑Classwork Rock Cycle Journal entry ☑Cooperative skills Lab activity ☑Discussion/questioning RC Questions ☑Group Lab activity ☐☐ Homework ☑Individual Rock Cycle Diagram/Story ☐☐ Oral presentation ☐☐ Peer evaluation ☐☐ Quiz ☐☐ Report ☐☐ Teacher observation ☐☐ Test

Inter/Trans-disciplinary Inquiry	Real-World Connections	STEM Career Connections	Target Vocabulary
Art Writing	Geology Gemology	Volcanologist Geologist	Rock Cycle, igneous rock, metamorphic rock, sedimentary rock, sediments, weathering, erosion, melting, cooling, lava, magma, heat, pressure

Notes:

Step-by-Step Guide in Implementing

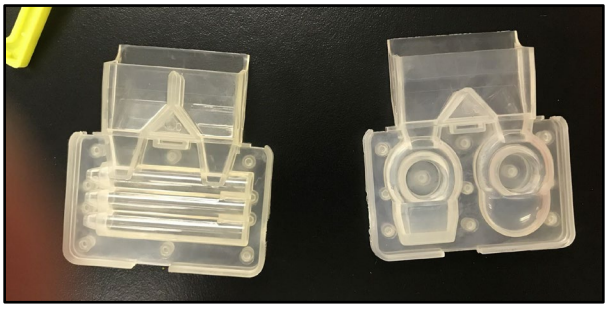
1. Make copies of the Rock Cycle Diagram and Jam Campus Rock Cycle Lyrics and distribute to each student. Make copies of the Rock Cycle reading activities for the students and have them read about the rock cycle prior to the lab.
    - Types of Rocks - from Education.com - A reading activity for 2nd graders on types of rocks.
    - What is the Rock Cycle? - from Education.com A reading activity for 3rd graders on the rock cycle.
    - Science with Mrs. Barton A reading activity on the rock cycle for upper levels
2. Write the vocabulary terms (rock cycle, igneous rock, metamorphic rock, sediment, sedimentary rock, magma, lava, weathering, erosion, melting, heat, pressure) on the board. Set up the lab stations next to outlets with a crayola maker, a dual pan balance, crayon pieces with wrappers removed, sock, mallet, and safety goggles
3. Play the Rock Cycle Song - Jam Campus to start the class. Have students sing along a couple of times.
4. Introduce the concept of the Rock Cycle. Ask students to define what a cycle means. (c*ycles repeat)*
5. Play the Khan Academy - The Rock Cycle video. Ask the students to draw the cycle in their science journal as the video plays.
6. Tell the class that they will create a model of the rock cycle using crayons. Have them explain what is a model and why are models used in science. *(Models make learning easier, takes a concept that is large or long process and makes it observable for scientists/students to study and learn).*
7. Have students go to their lab stations and put on their goggles. Go through the steps provided in the lab outline.
8. Have students complete the rock cycle diagram in their science journals as they are experiencing it in the lab. Ask students to compare the crayola rocks and the crayola rock cycle model to the real rocks and the rock cycle in their lab journals using 2-column notes.

9. Have students complete lab worksheets (Rock Cycle Diagram and Story)
10. For review or enrichment, have students complete the Annenberg Rock Cycle interactive or Rock Cycle Gizmos.

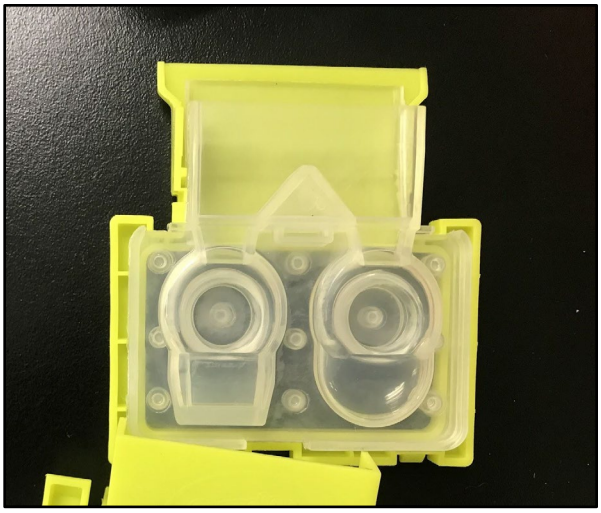
Lab Set-Up

Setting up the Crayola Melt ‘n Mold

Important! Do this prior to the lab.

1. Collect broken crayons from around the school and from student donations. Remove crayon labels by soaking crayons in warm water for 5-7 minutes. Dry the **igneous rock** crayon pieces.	
2. Plug machine into outlet. Open the lid and place the metal tray on the heating element. Make sure the plate is correctly placed, note the green clip on the left and the metal dowels are in the grooves.	
3. Select the mold to use for the activity. The ring mold will make 2 rings. The crayon mold will make 3 crayons. Snap the pieces together until they are secure and tightly bound together.	

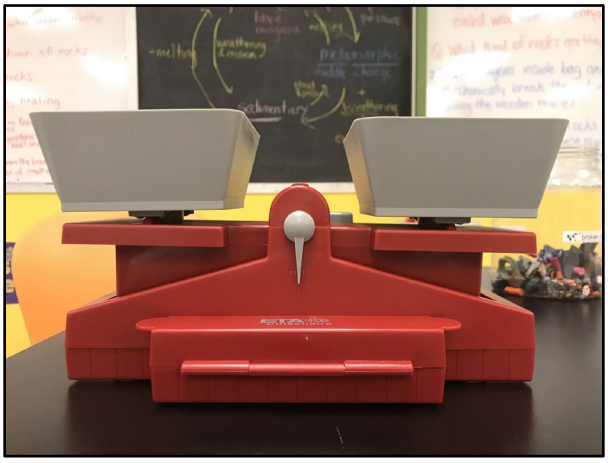
4. Place the mold in the green holder. There is only one way to put the mold in the holder. Pay attention to the depth of the box at the top. Snap both green pieces together. Make sure they click and are se



5. Place the holder in the front of the crayola maker. Make sure that the metal tray and green holder are correctly placed. Turn the small knob on the right to test the tilt of the metal tray. It should pour into the opening of the mold.

6. Flip the on switch. Repeat the setup on all stations.

7. Place dual pan balance at each station. Ensure that the balance is in operational condition and that there is a 20 gram mass (or a combination thereof) for each balance.



Lesson Outline

1. Have students select crayon pieces for their crayon rock cycle. Allow students to describe and record the characteristics of their igneous crayon pieces. (one solid color per piece, waxy, cylindrical shape). They can draw their igneous crayon pieces in their lab report.	
2. Once the balance is set to zero, have the students place a 20 gram mass on the right pan.	
3. Each group needs to measure 20 grams of crayon pieces. Students can take turns adding crayon pieces to the left pan until both sides are balanced.	
4. Place the igneous crayon pieces in the **weathering** bag (sock).	

5. Ask the students what they think the mallet is for. Introduce the concept of **weathering** once they mention that it is to break the crayons into smaller pieces. "Weathering wears things down."
Have students wear safety goggles.

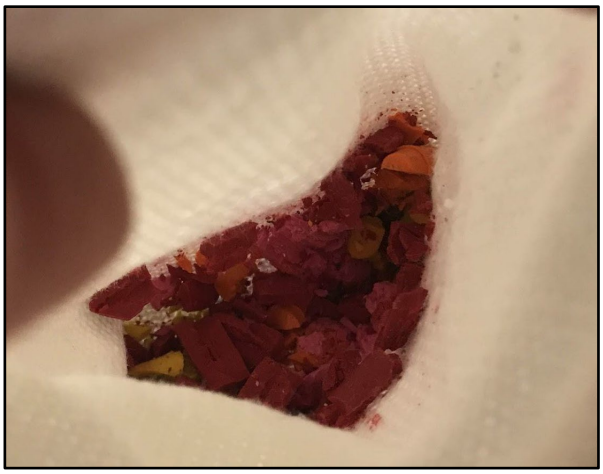
Students will pound the sock using the wooden mallet, causing the rocks to break down into smaller pieces through the process of **physical/mechanical weathering**.

Ask the class "how else can rocks be broken down?" (plant roots, rain/snow, gravity)

6. The smaller, "weathered," pieces are fragments or **sediments** of the larger rock. The pieces that are stuck together are **sedimentary rock**. Sedimentary rocks form through a process called "cementation.' On Earth, cementation occurs when sediments (small rock pieces) get stuck together, usually because of evaporation of water, layering, deposition, and compaction.

Note: when possible, I connect science vocabulary terms to common language.

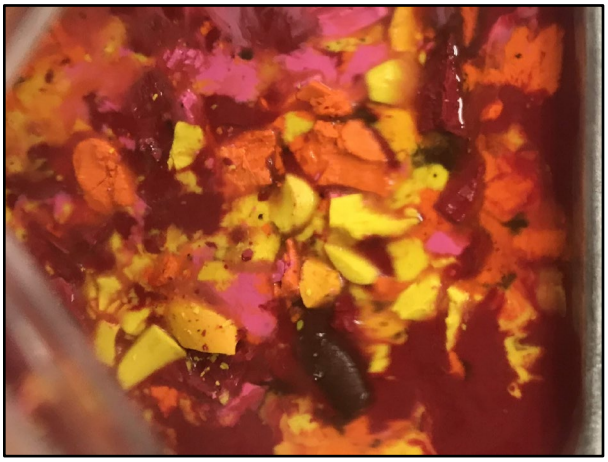
"Deposit → deposition"



7. Carefully move the sediments and sedimentary rocks from the weathering bag onto the heating tray. The movement of rocks from one place to another is called **erosion**. I tell my students to "erode the sediments and sedimentary rocks from the weathering bag onto the melting plate."

8. Have the students describe and draw the processes of weathering and erosion, and the formation of sedimentary rocks in their

lab report.	
9. Spread the sediments evenly on the heating tray and clean up the area around the heating tray. Have students describe and draw what they see on the heating tray.	
10. Close the lid and turn the large green knob clockwise all the way. The red light should appear indicating that the machine is heating, The lid will not be able to open while the machine is heating. This is a safety feature. Note: It takes 15 minutes for the crayon pieces to melt. In that time, students can clean the lab and work on their lab reports. I have students describe what is happening as the sediments are undergoing a transformation caused by heat. The heat from the machine is turning the sediments and sedimentary rocks into a **metamorphic rock**.	

Metamorphic rocks being made!	  

11. When the red light turns off, the melted crayons are ready to pour into the mold. SLOWLY turn the small knob counterclockwise to tilt the metal tray and pour its contents into the mold.

Not all of the melted crayon will move into the mold. Some will stay on the tray.

12. The lid will unlock when the heat tray and mold are cool enough to touch. The large knob will point to the unlocked icon. You can remove the green brackets from the machine and wait for 15 minutes for the wax to harden. The wax is very soft and fragile at this time

Optional: Remove the green mold holder from machine and place in pie pan filled with cool water for about 5-10 minutes. This harden the crayons in the mold faster.

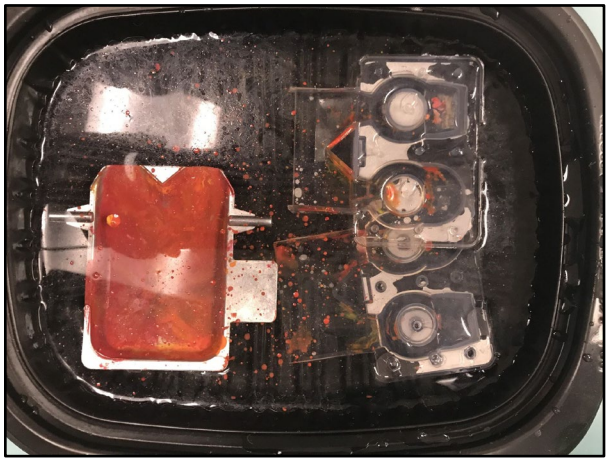
13. Carefully open the green brackets by unlatching the sides first and then pulling them apart.

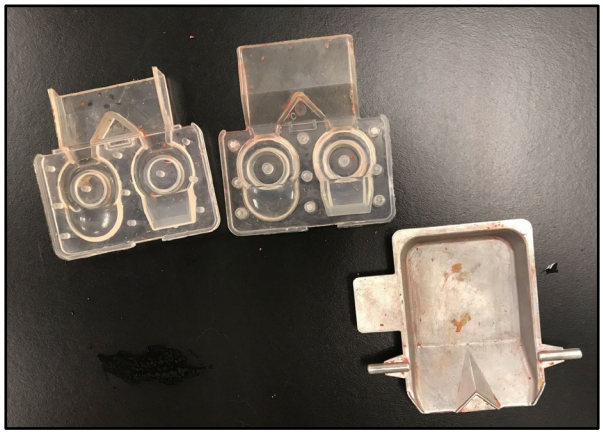
14. Carefully pull the molds apart and remove the metamorphic crayon rocks from the molds. The rocks are soft and fragile, but will harden as they cool.

While the rocks are cooling, the students can describe their rocks, how the colors blended together, and how different their rocks are from their partners and from other classmates.

15. Have students clean up their lab areas while they wait for their crayons to cool. Afterwards, students can work on their lab reports.

Note: While students are cleaning/writing, pour water into an electric kettle and turn it on. Place the metal trays and molds in the pie pan and pour hot water onto them. Wipe the tray/molds clean with paper towels. Set them aside to dry.





Vocabulary

The terms and definitions in this glossary are specific to the Florida NGSSS in science for grades 3 through 5 and the content assessed on the Statewide Science Assessment.

Characteristic — A feature, quality, property, or trait of an object or organism.

Classify — To arrange in a specific order or group by categories based on similarities.

Conclusion — A statement that tells what an investigation showed, based on observations and data.

Control Group — A group in a scientific experiment that serves as a reference for comparison to the experimental group; a group that is untreated by the factor being tested.

Data — Measurements or observations collected and recorded in an experiment or investigation.

Erosion — The process by which rock, soil, and other weathered earth materials are moved from one place to another.

Experiment — A scientific test or procedure that is carried out under controlled conditions to answer a scientific question.

Igneous Rock — A type of rock that forms from cooled magma or lava.

Investigation — An organized scientific study of the natural world that may include making systematic observations, asking questions, gathering information, analyzing data, summarizing results, drawing conclusions, and/or communicating results.

Metamorphic Rock — A type of rock that is formed over time from existing rock due to extreme pressure and/or heat.

Model (scientific model) — A replica or description designed to show the workings or structure of an object or system. (*Not found on the Grade 5 Science Item Specifications)

Observation — Information about the natural world gathered through the senses and/or scientific instruments.

Physical Change — A change of a substance from one form to another without a change in its chemical properties.

Sedimentary Rock — A type of rock formed from layers of sediment.

Testable (scientifically testable) — A term used to describe a question that can be answered through an experiment or observation.

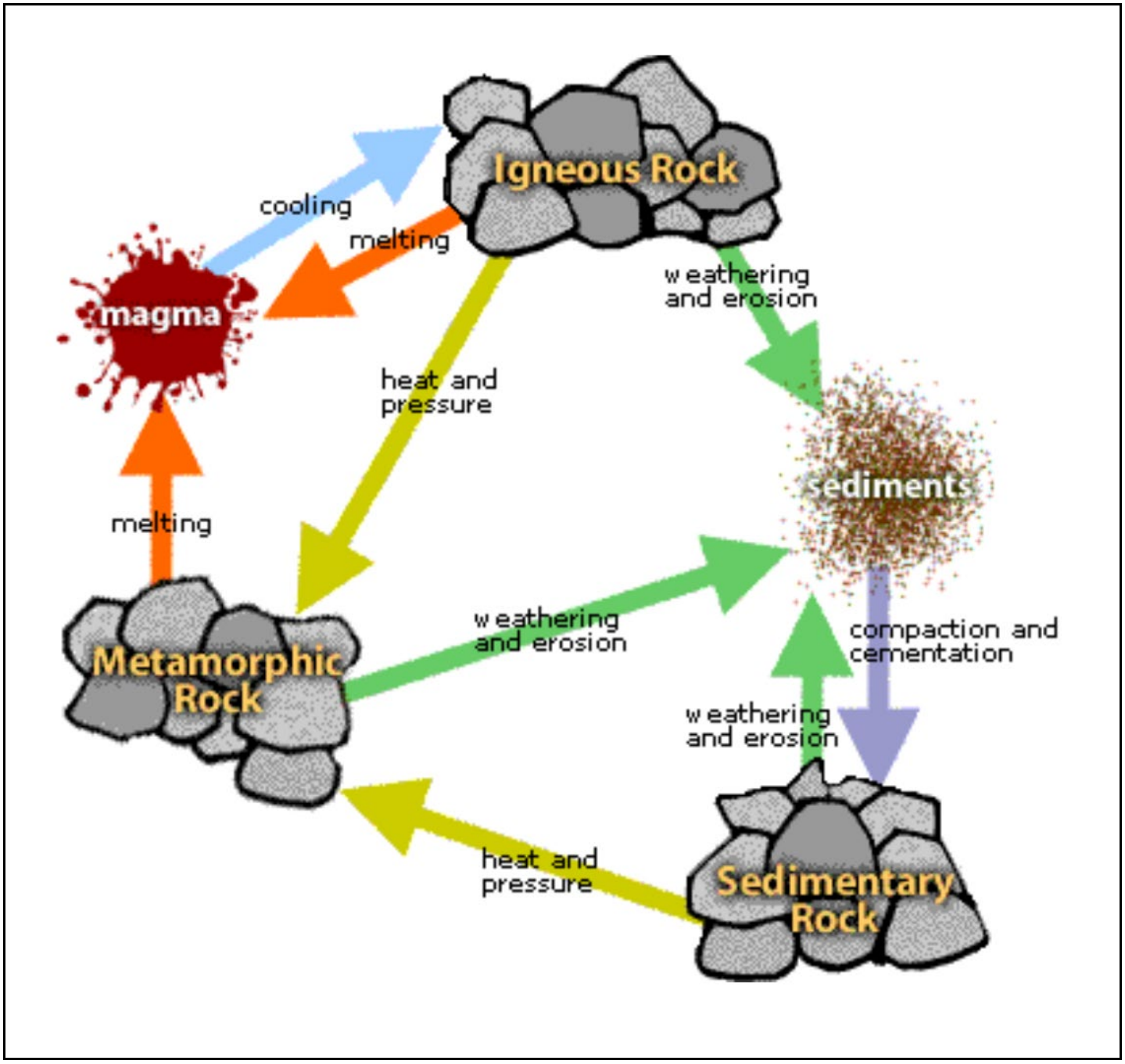
Trials — Multiple sets of measurements or observations in a scientific investigation.

Variable — An event, condition, or factor that can be changed or controlled in order to study or test a hypothesis in a scientific experiment.

Weathering — The process by which rocks and other surfaces are broken down.

Rock Cycle Diagram
(from NASA.gov)

The Rock Cycle



Name: _____ Date: _____

The Rock Cycle Diagram

Directions: Draw, label, and color the rock cycle using the vocabulary words below. Then write a short story of a rock going through the rock cycle using the vocabulary words,

Vocabulary: Rock Cycle, igneous rock, metamorphic rock, sedimentary rock, sediments, weathering, erosion, melting, cooling, lava, magma, heat, pressure

Name: _____ Date: _____

_____'s

Journey Through the Rock Cycle

Jam Campus - The Rock Cycle

Lyrics

Ok now
Let's start with minerals, solid naturally occurring
Substances made from elements, single or combos of many
Inorganic, means they don't come from plants or animals
always a fixed chemical structure, examples are quartz or gold

Alright now different from minerals
Let's talk about what a rock is
composed of many compounds
the structure is not consistent

There are major types of rocks
In total there are three
Igneous, metamorphic
and sedimentary

First off it's igneous
When a volcano erupts
Spews magma then it cools down
hardens within the earth's crust

Going to metamorphic
Formed by massive heat or pressure
Sometimes they're found by fault lines
Where plates push against each other

Sedimentary rocks
From sediment combining
Like a river picking up silt depositing pieces
becomes a rock eventually

Igneous, comes from a volcano
Metamorphic, formed by pressure or heat
Sedimentary, small pieces from a river
Over millions of years
Igneous, comes from a volcano
Metamorphic, formed by pressure or heat
Sedimentary, small pieces from a river

Over millions of years

Ok so over millions of years
Rocks form in a few different ways
And transition to the three rock types
A continuous cycle of change

Most rocks start as igneous
From volcano magma hardened
Wind and water break rock into small pieces
To piles of sediment

This sediment builds up
Sedimentary rock it becomes
The rock is covered up and
Ends up inside the earth's crust

With heat and pressure rising
Rock goes through metamorphosis
Becomes a metamorphic rock
then the cycle starts over again

One thing to know about this cycle
Is the order is not specific
Rocks can change to different types
Based on a different environment

Igneous, comes from a volcano
Metamorphic, formed by pressure or heat
Sedimentary, small pieces from a river
Over millions of years

Igneous, comes from a volcano
Metamorphic, formed by pressure or heat
Sedimentary, small pieces from a river
Over millions of years

Resource List

Supplies needed (for a class of 24)

Item	Vendor	Cost	Quantity	Total
Crayola Melt 'N Mold Factory, (74-7060) (1 per 3 students)	Amazon or Walmart.com	$14.97	8	$128.14
Copy paper- letter sized (ream)	Amazon	$6.41	1	$6.41
Broken crayons	Donations from students, custodians, teachers	FREE	20 grams per trial, about 7 grams per student	FREE
Balance scales (1 per 3 students)	Borrowed from science labs	FREE	8	FREE
Electric kettle (to clean molds and melting tray)	Amazon	$14.99	1	$14.99
Disposable pie/cake pans (to clean molds/melting tray)	Dollar Tree	$1.00	4	$4.00
Rocks & Minerals Mini Bulletin Board Set And Rock types chart	Trend Enterprises	$19.19	1	$19.19
Mallets (pack of 16)	Amazon	$18.99	1	$18.99
Socks	Unmatched socks with thick cotton	Free	1	Free
Paper towels	Dollar Tree	$1.00	1	$1.00

Online Resources

Annenberg Learner - The Rock Cycle
Create a virtual rock collection as you learn about the three main types of rock, find out how to tell the different rock types apart, and see how rocks change from one type into another.

ExploreLearning - The Rock Cycle Gizmo
Play the role of a piece of rock moving through the rock cycle. Select a starting location and follow many possible paths throughout the cycle. Learn how rocks are formed, weathered, eroded, and reformed as they move from Earth's surface to locations deep within the crust.

The Geological Society - The Rock Cycle
Information on rock types and rock cycle. Intended for teachers and higher grades..

The Geological Society - The Rock Cycle Worksheet
A worksheet on the rock cycle for higher level students/upper grades.

Khan Academy - The Rock Cycle
A video that goes over the rock cycle using jelly beans.

NASA - Rockin' the Rock Cycle Activity
An activity guide to further enrich rock cycle studies.

NSTA - The Rock Cycle Activity Booklet
An activity booklet that explores rock types and the rock cycle.

Rock Cycle Song - Jam Campus
A fun song to learn and review the rock cycle. Site includes lyrics!

Science with Mrs. Barton
A reading activity on the rock cycle, useful for going over the information learned in the lab.

Types of Rocks - from Education.com
A reading activity for 2nd graders on types of rocks.

What is the Rock Cycle? - from Education.com
A reading activity for 3rd graders on the rock cycle.