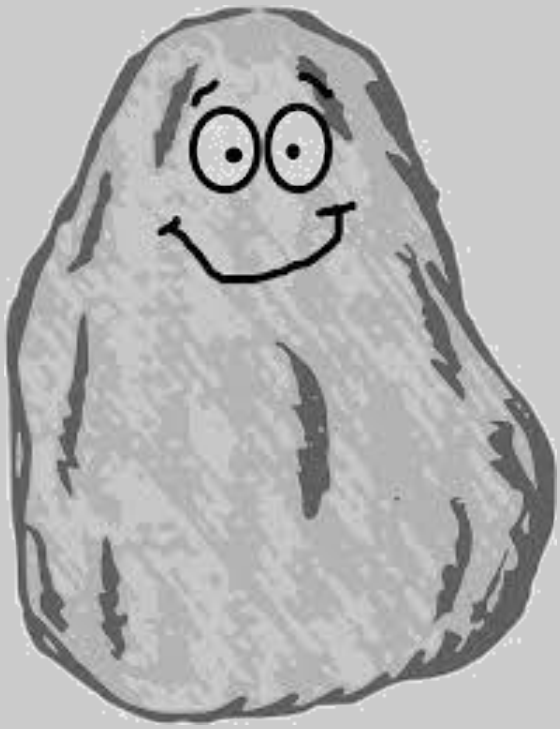
# My Science Journal

## Rocks & Minerals

**Name**_____



# Rocks & Minerals

## Unit Outline

| Day | Lesson Topic |
|---|---|
| **One** | "Introduction to Rocks & Minerals"<br>**Experiment**: "Looking at Mock Rocks" |
| **Two** | "The Scientific Method" |
| **Three** | "All About the Rock Cycle" |
| **Four** | "Weathering & Erosion"<br>**Experiment**: "Effects of Chemical Weathering" |
| **Five** | "Minerals" |
| **Six** | "Mohs Scale of Mineral Hardness"<br>**Activity**: "Exploring Birthstones" |
| **Seven** | Review of Unit (*includes a review game*) |
| **Eight** | Unit Test |

# Vocabulary

| | |
|---|---|
| **Crystal** | **Solid form** of material; identified by its **shape or pattern** |
| **Depth** | The **thickness** of an object |
| **Geologist** | A person who **studies** the **Earth and Earth's materials** |
| **Geology** | The study of **Earth's history and structure** |
| **Igneous Rock** | Rock formed from **magma** |
| **Metamorphic Rock** | Rock that forms when **heat and pressure change** an igneous or sedimentary rock |
| **Mineral** | Solid matter from Earth that is **non-living** |
| **Moh's Scale of Harness** | **Numerical scale** that is used to **identify and rank minerals** based on their hardness<br>(1 = softest; 10 = hardest) |
| **Properties** | **Observations**: color, shape, size, texture, and mass |
| **Rock** | An **Earth material** that is made up of minerals |
| **Scientific Method** | A **method of procedure** in which a question is asked/ problem is identified, research is gathered, and hypotheses are formulated and tested |
| **Scratch Test** | Determines **how hard** a mineral is |
| **Sedimentary Rock** | A rock that is **made up of sediments** that are pressed together |
| **Weathering** | The **effect of water, temperature, and wind** on the landscape |

# Introduction to Rocks & Minerals

- Rocks are made up of materials called **minerals**.
- Rocks have been on Earth for **over four billion years**.
- The rocks you see today could have **once been part of a cave**, **mountain**, or even **stepped on by a dinosaur**.
- Since **all rocks are different**, they are grouped into **three categories**: **igneous, sedimentary, and metamorphic**.
  - **Igneous**: a rock that is **formed from magma** (lava). When a volcano erupts, the **lava is extremely hot and is in liquid form**. Once the **lava cools down**, when it reaches the surface of the Earth or a place within the Earth's crust, **it hardens**. This hard rock is called igneous. Examples include **basalt and granite**.
  - **Sedimentary**: a rock that is formed from **sediment (particles carried by water or wind and that settle at the bottom of a body of water)**. Over the years, sediment gets pressed together and eventually becomes a rock. Examples include **limestone, shale, and sandstone.**
  - **Metamorphic**: a rock that is formed by **extreme heat and pressure**. These rocks are usually **found within the Earth's crust**. Most times, metamorphic rocks have **changed from one type to the other**. For example, shale can change into slate. Other examples include **marble and schist**.
- The study of Earth's history and structure is called **"geology"** and a person who studies this is called a **"geologist."**

# Igneous Rocks

## (IG Nee Us)

- Igneous rocks are the **oldest type of rock**.
- "Igneous" is **Greek for "Fire"**
- Deep inside the Earth, the **temperature is very hot**. The **minerals** that are found there are in **liquid form**, called **magma**.
- As the magma **pushes upward towards the surface** of the Earth, it **begins to cool**.
- There are two types of igneous rocks: **extrusive and intrusive**
  - **Extrusive**: rocks that **cool near or on the Earth's surface**
  - **Intrusive**: rocks that **cool deep below Earth's surface**
- Igneous rocks have very distinct characteristics:
  - **Do not** contain fossils.
  - Rarely or never react with **acid**.
  - **Do not** have layering.
  - Made up of **two or more minerals**, usually crystals of different sizes.
  - Are **light or dark colored**.

| Name | Description | Usage |
|---|---|---|
| Granite | **hard**; pink, black, and green speckles | cabinets; monuments; tiles |
| Pumice | **rough surface**; has holes; very light; only rock that **floats on water** | cleaning grills; removing calluses off feet |
| Obsidian | **smooth**; dark black; forms from **quickly cooling lava** | blades on surgical instruments; arrowheads; mirrors |

# Guess the Rock!

Look back at the characteristics. Write the name of the rock on the line.

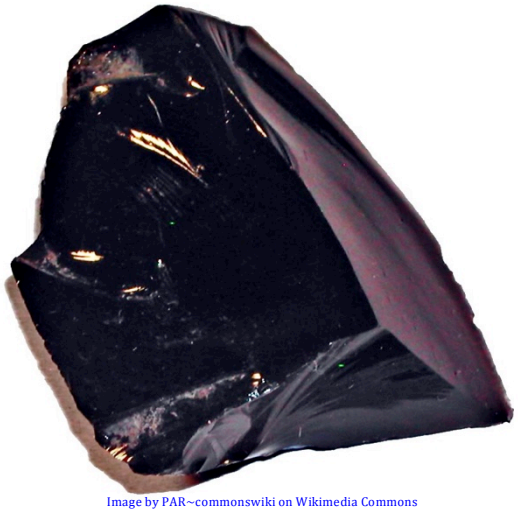


Image by PAR~commonswiki on Wikimedia Commons

**Obsidian**

Image by Benjamint444 on Wikimedia Commons

**Pumice**

Image by Khruner on Wikimedia Commons

**Granite**

# Sedimentary Rocks

- Sedimentary rocks are formed from **sediment**.
- Earth's surface is **constantly being eroded by weathering agents** (wind, water, ice). Erosion causes rocks to break into smaller pieces.
- Tiny rock pieces can become **pebbles, gravel, sand, or clay**.
- When these tiny pieces fall into streams, they **settle at the bottom**. Eventually more pieces settle and pile up.
- **Lithification** is the **transformation** of sediment into a rock or stone.
- Sedimentary rocks have very distinct characteristics:
  - Classified by their **texture and composition** (make up).
  - Contain **fossils**.
  - May **react with acid**.
  - May have **flat or curved layers**.
  - Made up of pieces that have been **pressed together**.
  - Can be a **variety of color**.
  - May contain **cross bedding, mud cracks, worm burrows, or raindrop impressions**.

| Name | Description | Usage |
|---|---|---|
| Limestone | made of calcium carbonate (white or colorless powder); **coloring depends on the minerals**; can also be made up of fossils; found in **wet areas** | paint thickener; roofing tiles; food ingredient for animals, especially chickens |
| Shale | found in limestone; forms in **muddy areas, such as the ocean floor or rivers**; very **thick**; usually gray | bricks; cement; concrete; ceramics |
| Sandstone | Made of **sand grains**; forms from the **sand** found on the **beach**, in **riverheads, or sand dunes** | glassware; clocks; books; architectural pillars |

# Guess the Rock!

Look back at the characteristics. Write the name of the rock on the line.

Image by James St. John on Flickr

**Shale**

Image by Hannes Grobe on Wikimedia Commons

**Limestone**

Image by Óðinn on Wikimedia Commons

**Sandstone**

# Metamorphic Rocks

- Metamorphic rocks are formed **deep in the Earth, where the temperature is very hot and the pressure is intense**.
- A **chemical change** can turn one rock into another.
- "Metamorphic" comes from **two Greek words meaning "change" and "from" ("changing form")**
- It takes **millions of years** for a rock to change its form.

- Metamorphic rocks have very distinct characteristics:
  - Classified by their **texture and composition** (make up).
  - Contain **fossils**.
  - May **react with acid**.
  - Have **alternating bands** of light and dark minerals.
  - May contain **only one mineral**.
  - Have a **visible layer of crystal**.
  - **Rarely** have openings or pores.
  - May contain a **curved foliation (parallel rock lines)**.

| Name | Description | Usage |
|---|---|---|
| Quartzite | **very hard**; white or gray | beads; landscape decorations |
| Slate | fine-grained; can be **split into thin layers** | roofs; sinks |
| Marble | **Soft**; contains calcium carbonate and crystals. | tiles; clocks; hot plates; statues |

# If you squeeze and heat a rock, in a few million years you will have a new one!

Image by Jon Zander (Digon3) on Wikimedia Commons

Sandstone + Heat & Pressure = Quartzite

Image by James St. John on Flickr

Image by James St. John on Flickr

Shale + Heat & Pressure = Slate

Image by Jon Zander (Digon3) on Wikimedia Commons

Image by Hannes Grobe on Wikimedia Commons

Limestone + Heat & Pressure = Marble

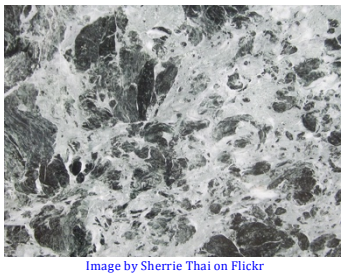


Image by Sherrie Thai on Flickr

# Experiment:
# Looking at Mock Rocks

Name_____

**Directions**: Use the tools provided by your teacher to break apart your "mock rock" (fake rock). Discuss your observations with your group. Then, fill in the chart below.

| Rock's Size | Rock's Color | What Was Inside | Other Comments |
|---|---|---|---|
| | | | |

**Directions**: On the left side, draw a picture of your mock rock before you broke it apart. On the right side, draw a picture of your mock rock after your broke it apart.

# The Scientific Method

- The scientific method is a **method of procedure** in which a question is asked/ problem is identified, research is gathered, and hypotheses are formulated and tested,

- The are six steps in the scientific method:

  - **Step 1: Ask a question/ Make an observation.**
  - **Step 2: Gather information.**
  - **Step 3: Create a hypothesis.**
  - **Step 4: Make predictions.**
  - **Step 5: Perform Tests and/ or experiments.**
  - **Step 6: State your findings/ conclusions.**

Image by Scout on Openclipart

| Step 1 | Step 2 | Step 3 |
|---|---|---|
| What do you **wonder** about?<br><br>What do you **question**? | What **information do I need** to conduct my research? | What **do you think the answer to your question is?**<br><br>What is the **reason** for your research/observation? |
| **Step 4** | **Step 5** | **Step 6** |
| What are the **if/then statements** that explain your hypothesis? | How will you **test your predictions?**<br><br>If your hypothesis is not right, that is okay! | What did your **tests/ experiments show?**<br><br>Was your **hypothesis confirmed?** |

# Activity:
# Label the Scientific Method!

**Directions**: Read each statement and determine which step of the scientific method it is. Write the step on the line.

- **James knows chalk is a soft rock and that lemon juice and vinegar are very acidic. He fills up two cups and puts lemon juice in one and vinegar in another. He puts a piece of chalk inside each cup. He waits a day and records his results. STEP 5**
- **James wants to know if a piece of chalk will dissolve quicker in lemon juice or in vinegar. He goes on the Internet to search for experiments that have been done on his question. He makes a list of the items he will need to conduct his own experiment. STEP 2**
- **James predicts that the chalk in the cup of vinegar will dissolve quicker than the chalk in the lemon juice. STEP 3**
- **James writes a paper explaining his experiment. He writes down his hypothesis, the steps he did, and what the results of his experiment were. He confirms his hypothesis. STEP 6**
- **At school, James learns that chalk is a type of soft rock. He wonders what would happen if he put a piece of chalk in a cup of lemon juice. STEP 1**
- **James determines that if the chalk dissolves quicker in the vinegar than in the lemon juice, the vinegar must be stronger or more acidic. STEP 4**

Image by Clker-Free-Vector-Images on Pixabay

# The Rock Cycle

- Rocks are constantly being **recycled**.
- Rocks that were around a million years ago are **undergoing a change and are becoming new rocks**.
- We begin our journey through the rock cycle in the **Earth's mantle**.
  - The Earth's mantle is **very hot**.
  - Magma pushes **up towards Earth's crust**.
  - Some of the magma **goes into volcano cracks**; the rest goes through a **volcano as lava**.
- Some of the igneous rocks **roll down mountains and end up in the ocean**.
  - As the rocks roll, they **break apart**. These pieces **form sediment**.
  - As the **sediment gathers up** (presses together and cements), **sedimentary rocks are created**.
- Some of the sedimentary rocks are **exposed to heat and pressure**. They **change into metamorphic rocks**.
  - When a metamorphic rock **gets buried, it gets hotter and eventually melts**.
  - Once again, the metamorphic rock **becomes magma** and the **cycle starts all over again**.

Image by Scout on Pixabay

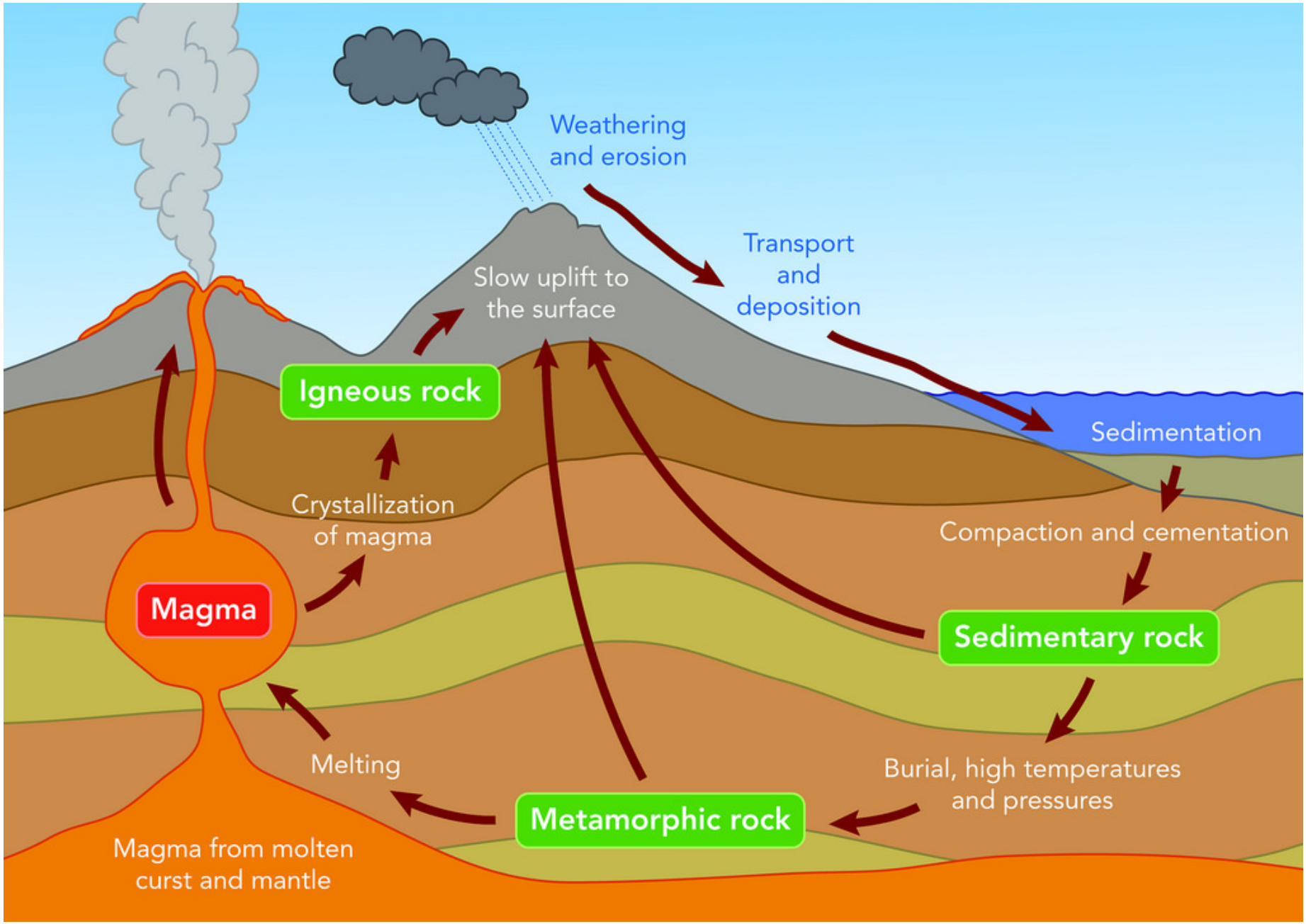



Image by Siyavula Education on Flickr

# Weathering & Erosion

- Erosion is a **very important (key) part of the rock cycle**.
  - Erosion has helped to **form many of Earth's amazing landscapes**.
  - Erosion is the **result of weathering**. Weathering is the **effect of water, temperature, and wind on the landscape**.
  - One example of a landscape that is the result of erosion is the Grand Canyon.

- Erosion is **mostly caused by water**.
  - Some rocks are **very sensitive to acid**. When acid rain falls, these rocks **dissolve**.
  - When exposed to rain, **marble and limestone weather**.
  - Monsoons, heavy rainstorms, cause flooding. Flooding plays a role in weathering rocks.
  - Cliffs on the ocean's coast also weather because of the **constant pounding from waves**.
  - When **water gets in between the cracks of a rock**, it causes it to **expand and eventually split**.
  - **Denudation**: when cracks in a rock fill up with water during a thaw period, more water goes deeper into the rock. When the freeze period comes, the rock will split apart.

- Weathering can also be the result of **chemical reactions**.
  - Chemical weathering **occurs in all rocks, but more frequently in smaller rocks**.
  - When a rock undergoes chemical weathering, the **minerals in the rock are changed chemically by air, sunlight, or acid rain**.

Image by Pexels on Pixabay

*The Grand Canyon(United States of America)*

# Physical Weathering vs. Chemical Weathering

| Physical Weathering | Chemical Weathering |
|---|---|
| *Rocks are affected by:* | *Rocks are affected by:* |
| Being **hit by material** | **Oxidation** (rusting) |
| Plants **growing through cracks** or Water **freezing in the cracks** | **Hydrolysis and hydration** (addition of water) |

**Take a look at the pictures of carved stone faces below. Write your observations. How do you think this was caused?**

Image by Slick on Wikimedia Commons

Image by Nino Barbieri on Wikimedia Commons

# Experiment:
# Effects of Chemical Weathering

Names_____

**Directions**: With your group, make predictions about what you think will happen to each rock when it is placed in the lemon juice and vinegar.

| | Limestone | Calcite | Chalk | Quartz |
|---|---|---|---|---|
| **Lemon Juice** | | | | |
| **Vinegar** | | | | |

# Experiment:
# Effects of Chemical Weathering

Names_____

**Directions**: With your group, examine each rock in its liquid. Write your observations in the box.

| | Limestone | Calcite | Chalk | Quartz |
|---|---|---|---|---|
| **Lemon Juice** | | | | |
| **Vinegar** | | | | |

## Questions to think about:

**1)What happens when you put lemon juice on each rock?**

**2)What happens when you put vinegar on each rock?**

3) **Did the rocks react in the same way to the lemon juice and vinegar?**

4) **Why do you think the rocks had different reactions?**

# What are Minerals?

- Minerals are the **building blocks of rocks**.
- Minerals are **inorganic** (nonliving).
- Most rocks are **made up of minerals**.
  - **Coal** is an example of a **rock that is not made up of minerals**. Coal is formed from decayed plants and animals.
- Minerals are **found in nature** (dirt, water, rocks).
- Minerals are **natural and not manmade**.
- Minerals are **made up of chemical substances**.
  - **Some** minerals contain **only one substance** (such as silver or gold)
  - **Some** minerals contain **more than one substance** (such as quartzite and calcite)
- Minerals have the **same chemical makeup** and are usually **solid crystals**.
- The most important component of minerals is **oxygen**.

Image by Robert Lavinsky on Wikimedia Commons

*The mineral dioptase.*

# How Do We Identify Minerals?

| | |
|---|---|
| **Colors** | Minerals come in a **variety of colors** |
| **Luster** | The way the mineral **reflects light** |
| **Streak** | The color that is made by the mineral when it is **rubbed against a hard surface** |
| **Hardness** | How **easy the mineral scratches** |
| **Gravity** | The **weight** of the mineral |


Image by Hannes Grobe on Wikimedia Commons

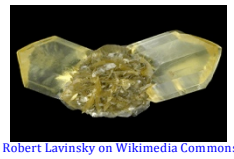
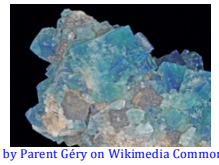
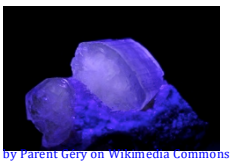
Mineral Identification Kit

# Mohs Scale of Mineral Hardness

- Developed in **1822 by Friedrich Mohs**.
- Mohs was a **German mineralogist**—someone who **studies minerals**.
- Mohs Scale of Mineral Hardness **measures the hardness of minerals using a 1-10 scale rating**, with **1** being the **softest** and **10** being the **hardest**.
- The scale uses **common minerals to represent the numbers 1-10**
- Today, geologists and mineralogists use Mohs Scale of Mineral Hardness.

Image by Dilerius on Wikimedia Commons

*Friedrich Mohs*

| Number | Mineral | Picture |
|---|---|---|
| 1 | Talc |  Image by Didier Descouens on Wikimedia Commons |
| 2 | Gypsum |  Image by Robert Lavinsky on Wikimedia Commons |
| 3 | Calcite |  Image by Parent Géry on Wikimedia Commons |
| 4 | Fluorite |  Image by Parent Géry on Wikimedia Commons |
| 5 | Apatite |  Image by Parent Géry on Wikimedia Commons |
| 6 | Feldspar |  Image by Robert Lavinsky on Wikimedia Commons |
| 7 | Quartz |  Image by JJ Harrison on Wikimedia Commons |
| 8 | Topaz |  Image by Eurico Zimbres and Tom Epaminondas on Wikimedia Commons |
| 9 | Corundum |  Image by Robert Lavinsky on Wikimedia Commons |
| 10 | Diamond |  Image by George Hodan on Public Domain Pictures |

# Birthstones

| | | |
|---|---|---|
| January |  | Garnet |
| February |  | Amethyst |
| March |  | Aquamarine |
| April |  | Diamond |
| May |  | Emerald |
| June |  | Pearl |
| July |  | Ruby |
| August |  | Peridot |
| September |  | Sapphire |
| October |  | Opal |
| November |  | Topaz |
| December |  | Turquiose |

# Activity:

# Exploring Birthstones

**Directions:** Have you ever wondered what your birthstone is? Does your birthstone represent wisdom or strength? Where is birthstone found? Go to the website below to read about your birthstone and the other birthstones. After you finish reading, complete the crossword puzzle on the next page.

https://www.perrysjewelry.com/education/birthstone-facts-legends

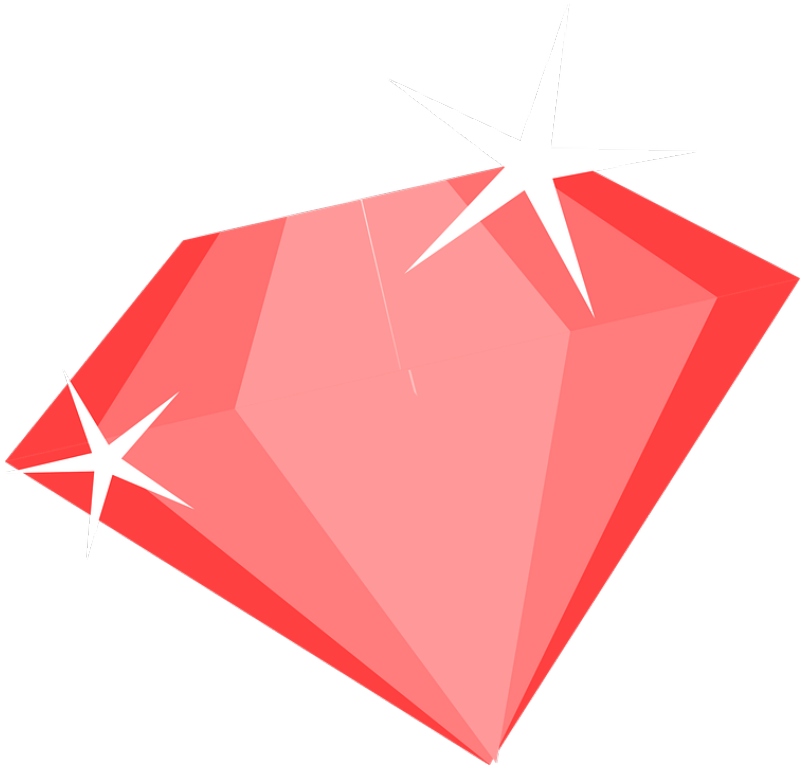


Image by OpenClipart-Vectors on Pixabay

# Exploring Birthstones

Image by OpenClipart-Vectors on Pixabay

Across
2. May's birthstone that was mined by the ancient Egyptians, Indians, and Incans
5. March's birthstone that can be found throughout Africa
7. February's birthstone which represents royalty
9. number ten on Mohs Scale of Mineral Hardness and also April's birthstone
10. November's birthstone which is worn by people in India to insure long life, beauty, and intelligence
12. July's birthstone whose name comes from the Latin word "rube" or "red"

Down
1. September's birthstone that can be found in any color except red and orange-pink
3. January's birthstone which was once believed to heal diseases related to blood flow
4. August's green birthstone that's been found in meteorites
6. October's birthstone that has a high percentage of water
8. December's birthstone which was one called "blue zoisite" but had its name changed by Tiffany & Co.
11. June's birthstone that is found in an oyster's shell