

The Rock Cycle



“If it weren’t for the rocks in its bed, the stream would have no song.” ~ Carl Perkins

What is the surface of the Earth made of? Think about the ground beneath your feet, your car and your house. The surface of our planet is known as the Earth’s crust. The crust is composed of nothing but rocks, soil, and minerals. These components provide the necessary ingredients to grow plants and feed animals. Indeed, they are the essential raw materials for human civilization. Using these materials, we build houses, roads, bridges, parks and nearly everything else which is not organic. Quite simply, life as we know it would not be possible without minerals or rocks.

In the previous topic, we learned about minerals. Now, it is time to explore and appreciate rocks. We will discover the inner workings and implications of the Rock Cycle- the system by which rocks transform from one form to another over time.

First Dimension : Analytical Thinking

SCIENTIFIC UNDERSTANDING OF THE ROCK CYCLE

We learned before that rocks are made of minerals. While minerals are made of elements (or compounds) whose atoms are arranged in specific crystalline structures, rocks might contain various minerals in addition to organic material such as fossilized plants or animals. In fact, it is more likely to find a mineral embedded within a rock rather than on its own. Previously, we also learned that there are three types of rocks: **Igneous, Sedimentary and Metamorphic rocks.**

Igneous rocks are volcanic rocks. These rocks can form in one of two ways.

The first way that an igneous rock is made is when magma (molten rock), deep in the Earth, moves upwards through cracks in the crust, then cools and hardens. This type of rock forms under the ground. An example of a rock that formed in this way is granite (Figure 1).



Figure 1 Granite



Figure 2 Obsidian

The second way an igneous rock is made is through a volcanic eruption. When lava, produced by an erupting volcano, cools above the surface of the Earth, it hardens to form igneous rock. An example of an igneous rock that forms above the ground is obsidian (Figure 2). Our planet's crust is mostly made of igneous rock.

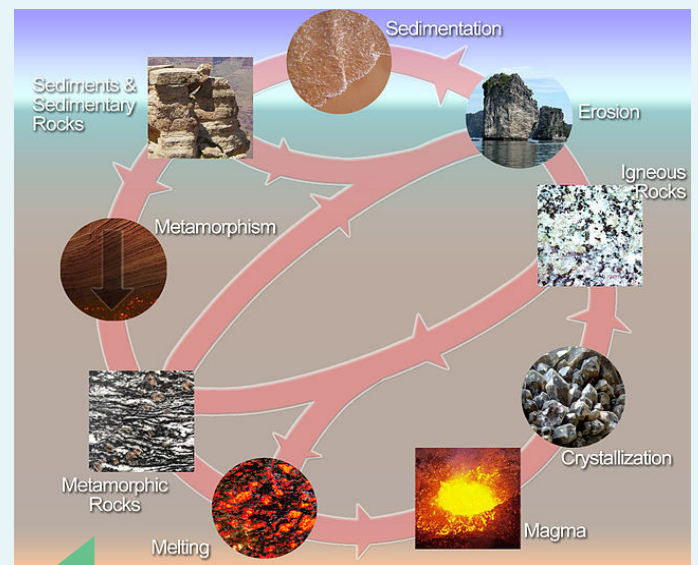
Sedimentary rocks are rocks that are made when small pieces of shells, sand and rock come together. We call these small pieces sediments. Sedimentary rocks form when rivers and streams carry these tiny pieces into lakes and oceans. After several layers of sediments sink to the ocean (or lake) floor over a long period of time, the uppermost layers begin to press down on the lower layers causing the sediments to fuse together. This is called compaction and cementation. An example of sedimentary rock is limestone. Limestone is used to make roads and even, toothpaste!

Metamorphic rocks are rocks that undergo changes in appearance due to changes in temperature and pressure over time. Take a look at the figure below. It shows the metamorphism of shale into different types of rocks such as slate, followed by phyllite, schist and gneiss.

Even limestone, a sedimentary rock, is designed to eventually transform into beautiful marble due to the role of metamorphic pressure. Do you recall what limestone is used for? What about marble?

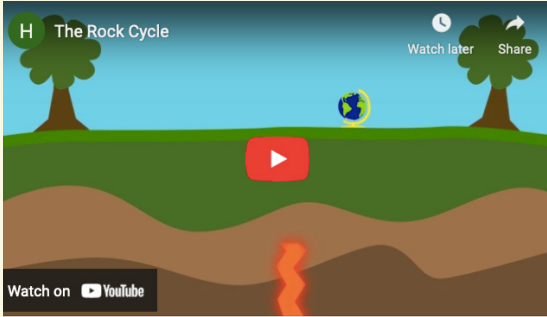
Marble is a beautiful rock used to make elegant kitchen countertops and tiles.

Slate is another metamorphic rock used in roofing and decorative gardening. It forms when the sedimentary rock shale is subjected to heat and pressure.



The Rock Cycle

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<https://youtu.be/7CnjoCu1154>

The Rock Cycle

The Rock Cycle is an illustration that shows how the three types of rock are related to each other. It shows how rocks are transformed from one type to another over time.

The Rock Cycle

The Rock Cycle is an illustration that shows how the three types of rock are related to each other. It shows how rocks are transformed from one type to another over time. First, in order to better understand how rocks change from one form to another, we need to learn what tectonic plates are and how they affect the transformation of rocks. Let us dig a little deeper to understand how tectonic plates affect the Rock Cycle.

The crust and upper mantle of the Earth are divided into pieces called plates. These plates move over time, causing earthquakes, volcanic eruptions and the emergence of mountain ranges. The edges of these plates are known as plate boundaries.

There are three types of plate boundaries. These are:

Divergent Boundaries. These types of boundaries form when plates move away from one another. This results in the formation of a rift between the plates. As the plates move away from one another, liquid lava is produced from deep within the Earth to form a new crust. An example of a rift is the Danakil depression in Ethiopia that formed when three plates moved away from one another. This area is known for its alien-like appearance with its salt lakes, acidic springs and volcanoes.



Alien-like appearance of region in Danakil Depression



Lake Karum, a Salt Lake in the Danakil Depression

Convergent Boundaries: These are formed when plates move towards one another and meet at a junction. When an oceanic plate meets a continental plate, the oceanic plate is forced to move underneath the continental plate, which is lighter. This results in the formation of a mountain range. A famous example of a convergent plate boundary is the one that resulted in the formation of the Himalayan Mountains. What is interesting is that these mountains continue to rise slowly over time as the two convergent plates move against each other.

Transform Fault Boundaries

These are formed when two plates simply slide past one another, like what typically occurs with oceanic plates. This results in the formation of deep oceanic ridges and earthquakes. The San Andreas Fault in California is a rare type of transform fault boundary involving continental plates- the Pacific Plate and the North American Plate.

So how is the **Rock Cycle** related to the movement of tectonic plates? When oceanic or continental plates move towards, away from or slide past one another, the rocks within them are subjected to a combination of heat and pressure. Other factors such as weathering and erosion, compaction and cementation come into play as well transforming the rocks from one form to another in one seemingly endless cycle. Let us revisit the Rock Cycle once again.

“A Mountain Range is formed when oceanic plate meets a continental plate and the oceanic plate is forced to move underneath the continental plate.”



San Andreas Fault

The Rock Cycle

Step 1: Weathering and Erosion

The process of **weathering** breaks down bedrock. Agents such as flowing water, wind, gravity and glaciers then transport the decomposed fragments of rock by a process known as erosion. **Erosion** occurs when pieces of weathered rock (called sediments) are displaced.

Step 2: Deposition, cementation and compaction

Deposition is when pieces of weathered rock (sediments) are deposited at the bottom of lakes and rivers.

As each layer of sediment is piled over another, the weight of the sediments above presses down on the sediments beneath them. This is known as **compaction**. Minerals found between the sediment grains act like cement, fusing the sediments together in a process known as **cementation**.

When these sediments are pressed together by compaction and cementation, they form sedimentary rock.

Step 3: Metamorphism

Both sedimentary and igneous rocks can be subjected to heat and pressure and transform into metamorphic rock.

Step 4: Volcanism

When sedimentary, igneous or metamorphic rocks are buried deep within the Earth by the movement of tectonic plates, they melt, forming magma. When volcanoes erupt releasing lava onto the Earth's crust, the lava eventually cools, forming igneous rock once again.

The igneous rock that forms as a consequence of volcanic activity is again subjected to the effects of weathering and erosion and the cycle by which rocks transform from one form to another repeats once again.



Amazing Scientific Facts

-The Rock Cycle-

1.

Did you know that life would not be possible at all without rocks? Rocks are the source of soil and sand in which plants grow. They are also used to make cement and concrete which are used in construction. We also use rocks (coals) for heating. We derive fuel for cars from rock oil (petroleum). Asphalts on our roads come from rocks and minerals. We make glass through the melting of rock (sand). Indeed, anything that cannot be grown (that is not organic), has to be mined or extracted from rocks.

2.

Did you know that technically we still live in the Stone Age?! Our phones, cars, computers, ovens, and almost everything else we use on a daily basis are all made of rocks. Even our toothpaste, plates, utensils, shoes, and clothes are partially or completely made from elements found in rocks. Despite great advancements in science and technology, we still rely on rocks just like we did in the Stone Age.

3.

Did you know that without rocks, there would be volcanoes everywhere on the Earth's crust? Indeed, deep inside the Earth, between the molten iron core and the thin crust at the surface, there is a very thick layer of rock called the mantle that prevents fiery molten lava from leaking out. The mantle has a thickness of 2900 km (1800 miles).

4.

Did you know that rocks serve as a source of drinking water? Indeed, the sources of many springs and wells all over the world come from rocks. Rocks work like water tanks preserving rain water.

5.

Did you know many useful and valuable minerals are extracted from rocks? Indeed, we even mine gold and diamond from them. Even salts are extracted from rocks.



Second Dimension : Analogical Thinking

ROCK CYCLE VS. THE RECYCLING OF PLASTIC

A human innovation on that mimics the action of the Rock Cycle is the recycling process of plastic bottles. Do you ever wonder what happens to your empty water bottle when you toss it into the recycling bin?

Well, let's follow the journey of a plastic bottle from the store to the recycling center and back.

1. You are thirsty. You walk into the neighbourhood supermarket, grab a bottle off the shelf and pay the cashier. After drinking your water, you toss the empty bottle into a blue bin reserved for plastic on the curb.

2. A passing recycling truck picks up the blue box, emptying its contents into its rear compartment. Your bottle is then transported

along with thousands of other bottles, jars and containers (and their respective caps and lids) to the recycling center.

3. At the recycling center, mounds of plastic are sorted according to the type of material and compressed into bales containing more than 7200 bottles. The bales are then transported to a machine called a bale breaker that cuts them into small pieces.



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<https://youtu.be/zO3jFKiqmHo>

4. Magnets are used to collect metal that was mistakenly tossed into the plastic recycling containers.
5. The pieces of plastic are then washed to remove sticky labels and dirt. (Next time you toss a water bottle in the recycling bin, don't forget to remove the label!).
6. Next, the bottles and caps are chopped into small flakes.
7. The flakes (that have different densities) are then submerged in giant tanks of water where the lighter flakes (from the plastic bottles) float and the denser flakes (from the caps) sink to the bottom.
8. The recyclers then separate the flakes by type, then wash and dry them.
9. Some of the flakes are re-melted into a liquid and laced through a small opening where they are transformed into thin spa-

ghetti-like strands. The strands are then sliced into pellets.

10. The pellets are then used to make furniture, toothbrushes, cutting boards, playground equipment, carpeting and even synthetic fibres that are used to make clothes! This means that your football jersey may have once been someone else's plastic water bottle. The pellets can also be recycled into plastic water bottles (and caps) once again.

Recall that in the same way, rocks are recycled from one form to another. Rock that start off as molten magma within a volcano, become igneous rock after the volcano erupts and the lava cools. Later, as a result of weathering and erosion, the igneous rock gets fragmented into sediments (just like the plastic bottles are chopped into flakes in the recycling center). The sediments get cemented and compacted at the bottom



of rivers and lakes (similar to the process of melting the plastic pellets) to make sedimentary rock. The sedimentary rock then gets buried underneath the ground (usually after the movement of tectonic plates). After being buried beneath the ground, the sedimentary rock then transforms into metamorphic rock seemingly by the intense surrounding pressure. Over time, and after being subjected to high temperatures, the metamorphic rock melts once again. After being directed to find its way to a volcanic shaft, the magma is then released after a volcanic eruption. The lava then cools and forms igneous rock once again.



As you can see, the process of recycling water bottles involves a number of carefully calculated steps and efficient machinery. The cost of recycling plastic has fallen over the years, but it is still far from being considered efficient at solving the problem of accumulated plastic waste. In fact, in developed countries that have national recycling programs, at least two-thirds of plastic waste remains in landfills.

Ironically, the recycling process itself may also have a negative impact on the environment. The emissions produced by trucks used to pick up recyclables from people's homes may negate the positive impact on the environment that the recycling process makes.

Can you now see the resemblance between the man-made plastic recycling system and the Rock Cycle? Which system is more efficient?





Third Dimension : Critical Thinking



EXPLORING THE MAKER OF THE ROCK CYCLE

In the last section, we established that the process of recycling plastic water bottles is an attempt to mimic the Earth's Rock Cycle. Remember, for rocks to change from one type to another, they are subjected to a combination of precise weather and temperature conditions that create just the right environment for them to transform. This process occurs without the interference of human activity.

Conversely, the process of recycling plastic involves a deliberate decision-making process from start to finish. If any of the steps in the recycling process are circumvented or incorrectly executed, the resultant products- the plastic pellets- will not be produced or at the very least be of inferior quality.

The recycling process cannot occur without the trucks that collect the recyclables, or without the action of workers or worker-operated machines who physically sort the plastic into different types. It cannot occur without the decision to compact the enormous amounts of plastic into bales, or the bale breaker machines that break up the bales into smaller pieces. The process would be flawed

if magnets were not used to remove traces of metal from the small pieces of plastic or if these pieces were not crushed into flakes by other machines. The entire process from start to finish must occur with precision. The process requires human input, energy expenditure and resources. In short, it takes strong political will along with good planning, tools, and technology to successfully implement recycling.

On Earth, resources are being recycled indefinitely at a much larger and efficient pace. The movement of tectonic plates, and the resultant seismic and volcanic activity work in combination with elements such as heat and pressure to recycle rocks from one form to another. This process occurs without any human input.

The Rock Cycle utilizes the potential energy stored deep within the Earth's core that heats the rock within the mantle. The process also uses the Sun's abundant solar energy that warms up the oceans- eliciting weathering. The Rock Cycle works efficiently by not wasting a single rock fragment or mineral embedded within it. While the volcanic activity associated with the Rock Cycle can be very destructive, its product- molten lava- eventually cools, resulting in igneous rock that is both a valuable and useful resource for human civilization. No process is futile. Every step in the Rock Cycle is carefully calculated.



“On Earth, resources are being recycled indefinitely at a much larger and efficient pace.”



Volcanic activity, which on the surface appears to be purely destructive, results in numerous extraordinary benefits for the health of our planet.

First, new land is formed as a result of volcanic eruptions. For instance, the recent eruption of one of the world's most active volcanoes, Hawaii's Kilauea volcano, resulted in the formation of a new island in 2018. Generally, after a volcanic eruption occurs, lava that is produced spills into the ocean and new land is added to the coastline. Second, the sulphur produced by an erupting volcano combines with water in the air to produce microscopic droplets that cool the lowest level of the atmosphere.

Third, it is assumed that all the water that exists on our planet probably came from volcanic activity when the Earth was very young. Fourth, volcanic eruptions bring magma containing valuable minerals such as diamonds to the surface of the Earth. Finally, the nutrients that are produced by volcanic eruptions enrich the soil of surroun-

ding areas. This is why, although choosing to live in the proximity of a volcano seems unwise, many farmers choose to grow their crops near inactive volcanoes where the soil is significantly richer.

Who is the Maker of the Rock Cycle?

As we have learned so far, any successful man-made recycling process must be well-planned and executed by someone with intelligence, will, knowledge and power. Thus, the Rock Cycle, which is an equally delicate and very beneficial process, must be the work of an even higher Source of intelligence, knowledge, and power.

“Volcanic activity, which seems destructive, results in numerous extraordinary benefits.”





Fourth Dimension : Meditative Thinking

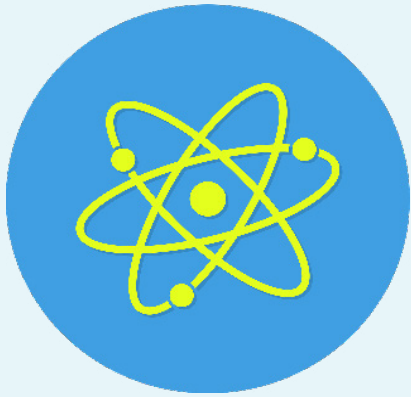
CONNECTING AND COMMUNICATING WITH THE ROCK CYCLE

In the previous section, we learned that human innovation requires knowledge, resources and time. We can thus conclude that the Rock Cycle, that is much more sophisticated and complex than the average man-made recycling system takes an enormous amount of will, knowledge and power to make it happen. Who is the Creator of this flawless cycle? When we observe how the Rock Cycle unfolds, we can witness the signs of its Creator. We can find evidence pointing to the existence of the Rock Cycle's Creator through two main observations:

First, the Rock Cycle is the product of a series of precise, interlaced events at the macro and micro level. Second, all living things rely on this flawless system. At the micro level, for the Rock Cycle to exist,

minerals within each rock need to possess specific physical and chemical properties. For example, the bonds between the individual atoms need to break when subjected to high heat and pressure to allow the rock to be transformed from solid to liquid form in the shaft of an active volcano. The force of gravity needs to be present to allow the spewing lava of a volcano to come back down to Earth, cool and solidify.

At the macro level, the Rock Cycle functions through the apparent collaboration between the Sun, the atmosphere, the oceans, the force of gravity and the solar and galactical systems in which they all exist. According to modern science, the entire universe is the product of Big Bang that occurred 13.6 billion years ago.



Though science cannot tell us what happened before the Big Bang, it does take us to the very beginning of the explosion. It seems like the formation of the universe as we know it today was dependent on certain fundamental physical constants.

Our universe is a Fine-Tuned Universe. In other words, if the initial expansion of our universe occurred too quickly, there would be no formation of elements. Or, we would have nothing more complex than hydrogen with only one electron and one proton. If there was no gravity (or very strong gravity), there would be no life. If the ratio of electromagnetic force between electrons and the gravitational force between protons were slightly smaller than its current value of 1036, the universe would have a very brief lifespan. Can you see how fine-tuned our universe is now?

As we enhance our understanding of the elements of the Rock Cycle, we will realize that the Rock Cycle is in fact connected to the entire universe. We should thus come to the conclusion that the Rock Cycle can only have been designed by the One who designs, creates and maintains the entire

universe. We should realize that rocks and the Rock Cycle are part of the Big Plan. They are meant to go through a long and delicate journey to support life on Earth. It is the work of the One with infinite knowledge and power who has created and sustained everything in the universe since the very beginning.

Consider what would happen if the delicate balance between the stages of the Rock Cycle was affected.

First, let us consider the stage in which igneous rocks are formed- volcanic eruptions. If volcanoes were not able to release the heat within the Earth, temperatures in the Earth's core would rapidly rise. What do you think would happen? Think about boiling a can of beans on the stove. What would occur? On the other hand, what would happen if volcanoes erupted constantly, with no intermission? The planet would soon be covered in molten lava. Who controls when and for how long volcanoes erupt?



What about the stage in which sedimentary rocks form? Recall, sediments are produced when weathering and erosion break down pieces of rock. The rock fragments (sediments) then collect at the bottom of lakes and rivers and become compacted and cemented. If rocks were immune to the effects of weathering, sediments would not be produced. If there was no gravity, the denser sediments would not collect at the bottom of lakes and rivers, nor have the chance to be compacted and cemented.

Consider the conversion of igneous or sedimentary rock to metamorphic rock. If rocks were not subjected to heat and pressure, we would not have access to useful building materials such as marble and slate.

It is evident that the Maker of rocks and the Rock Cycle is the Maker of the Universe. That is because it was necessary to set the right conditions from the very beginning (the Big Bang) in order to create and sustain the presence of rocks. Indeed, the Maker of rocks and the Rock Cycle is the Maker of the Earth and all of its resources. This is because it is clear that rocks and the Rock Cycle were intentionally created to sustain life on Earth. Thus, the Maker must be the One who knows how to maintain the Earth's temperature by allowing volcanoes to erupt at certain times and for certain durations. He must have sufficient knowledge and power to maintain the balance of the Rock Cycle by only allowing specific quantities of rocks to melt

into liquid, to weather into sediment, or to metamorphose into other forms. He must be the One who choreographs the actions of the Earth's tectonic plates and other environmental elements that affect it. The delicate and efficient system of the Rock Cycle shows that he is All-Wise. The abundance of rocks and minerals shows that he is the Most Generous. The fulfillment of various needs and desires through the use of various rocks and the Rock Cycle testifies to His infinite kindness.

Though the formation of rocks and the efficient system by which rocks are recycled from one form to another are truly amazing events, it is important to realize that they are just a veil for the Divine's Mercy. Indeed, it is very difficult to believe that the molten rock found in the core of the Earth can transform into rocks, soil, plant, and food on its own. In other words, material objects (such as molten rock) are not the true causes of their resultant products. This means that causes are just the veils for the Infinite Mercy who directly provides sustenance to living beings through apparent causal mechanisms.

“The delicate and efficient system of the Rock Cycle shows that he is All-Wise.”

Fifth Dimension : Moral Thinking

RESPONDING WITH BETTER CHARACTER

If the Rock cycle stopped functioning, could we mend it? Could we reboot the system if anything goes wrong? Would we be able to purchase a quick fix, or a substitute for its role? The answers to these questions should be quite clear. We did not create the Rock Cycle, nor did we purchase it. Even if we were to bring the world's best experts on geology together, we would simply not be able to re-create the Rock Cycle.



It is clear that rocks and minerals are necessary for life. We get our food, construction materials, cars, computers, phones and many other products from the Rock Cycle. Rocks act as a shield from the fiery center of our planet and are a vital source of drinking water to sustain our lives. Thus,

the Rock Cycle is an extremely valuable gift for us and other living beings. We would never give away a valuable gift for nothing. If so, then what does the True Bestower of the Rock Cycle want from us in return for His precious gift? He does not need money because everything belongs to Him. Instead, what He wants are three things: one is remembrance, another is reflection, and the third is gratitude.

1

Remembrance is realizing that there is a Creator of rocks and the Rock Cycle.

2

Reflection is thinking of the priceless, miraculous rocks and Rock Cycle gifts of our Creator's mercy.

3

Gratitude is being thankful to the Creator for giving us rocks that shield life on the surface of the Earth from the fiery center of the Earth and deliver the means for food, water and the various other necessities of life.

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https://youtu.be/hAOsXcbA_OI

Rocks and the Rock Cycle they are more than just the means to enjoy the material bounties of Infinite mercy on our planet. By reflecting on the existence of rocks and the Rock Cycle, we can also learn how to live in a more meaningful and moral way.

The unrelenting cycling of rock from one form to another is designed to occur because of the interplay between various environmental factors. It requires **Teamwork**. By observing the Rock Cycle, we can learn about this important character trait.

Teamwork mean's contributing to your team's success by doing your part. Your team could be your colleagues at school or work, your family, or the larger global family. When you are part of a team you should contribute responsibly- as a team member. What does this mean in relation to the Rock Cycle? It means that now that you are aware of your impact as a citizen on the planet,

you are more responsible with the use of resources that come from the Rock Cycle. Remember, the irresponsible use of resources increases the effects of global warming and climate change. This results in higher rates of weathering that impacts the intricate balance of the Rock Cycle. As a member of the global human race, you need to be aware of your contribution to its wellbeing.



Another character strength we can develop by observing the Rock Cycle is **Hope**. The metamorphosis of rocks from one form to other shows that under heat and pressure, beautiful forms are created. Volcanic eruptions may be destructive in the short term but eventually result in many beneficial outcomes. Out of the hardship associated with volcanic activity comes ease. The volcanic ash that clouds the sky and limits visibility after an eruption eventually settles to the ground and nourishes the soil with rich nutrients, giving birth to diverse vegetation and nourishment for living beings. We need to learn to develop a sense of **Hope** for better outcomes, regardless of difficult circumstances.



The final character strength that can be developed after observing the Rock Cycle in action is **Perspective**. Perspective means seeing the bigger picture and not focusing on the smaller, less important details. It helps us stay on course when faced with obstacles. A river carrying fragments of rock keeps moving forwards to its destination. It is undeterred by the little obstacles in the form of rock fragments in its path. The sediments will eventually settle to the bottom, coming together to make new rock and strengthening the riverbed. Seeing the forest, not the trees, is a character strength worth having.



TEST YOUR KNOWLEDGE

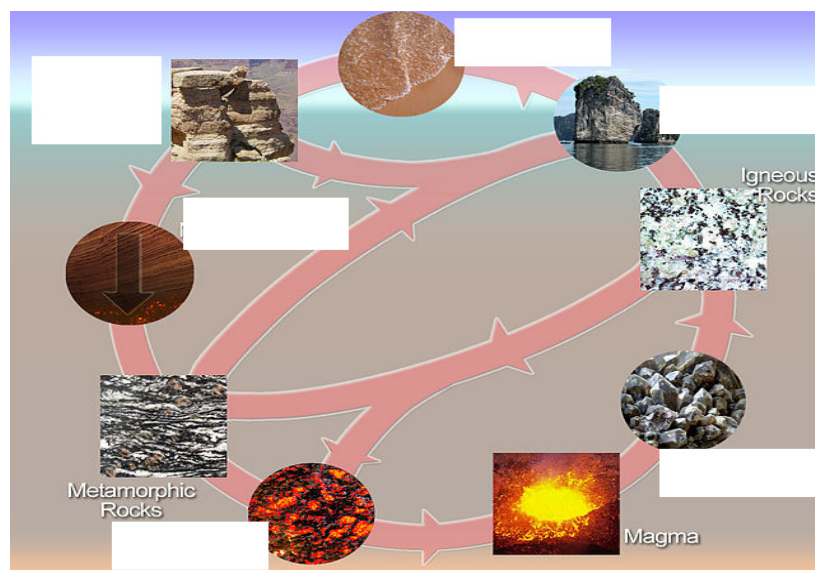
1. UNDERSTANDING SCIENCE TERMS

Complete the following sentences with a word or words from the Science Terms that will make the sentence correct.

*Metamorphic Divergent Convergent Igneous Sedimentary Compaction
Cementation Transform fault*

1. The Danakil Depression is an example of a rift formed by a _____ boundary.
2. The formation of deep oceanic ridges are a consequence of _____ boundaries.
3. Slate is an example of a _____ rock.
4. _____ boundaries form when plates move towards one another and meet at a junction.
5. Limestone is an example of a _____ rock.
6. _____ and _____ occur when uppermost layers of sediments press down on the lower layers causing the sediments to fuse together.
7. Granite is an example of _____ rock.

Label the following diagram:





III.CHECKING FACTS

Determine whether each of the following is true or false.

1. The San Andreas Fault in California is a type of transform fault boundary involving continental plates. _____
2. Sedimentary rock that forms as a result of eruptions is mined for precious minerals. _____
3. Shale is an example of metamorphic rock. _____
4. Weathering results in the formation of sediments. _____
5. Limestone is used to make toothpaste. _____
6. Marble is used to make tiles. _____

II.UNDERSTANDING CONCEPTS

Write a short answer for each question or statement.

1. What are tectonic plates?

2. List the conditions required for the formation of a metamorphic rock.

3. What are rocks made of?



4. How do you know that there is a Hidden Hand behind the design of the Rock Cycle?

5. List two hidden messages found in the Rock Cycle from its Maker.

6. Why is it an offense to deny the presence of the Creator of the Rock Cycle?

IV. APPLYING CONCEPTS

Write a paragraph to answer each question.

1. How is the process by which plastic is recycled different from the cycling of rocks in the Rock Cycle?

2. Describe how your daily life would be impacted if volcanic eruptions became more frequent.

3. Why do you think the elements that make up individual rock fragments could not have created the Rock Cycle?

4. The One who creates the Earth's Rock Cycle has to be the Creator of the Earth. Why?

5. Why do you think the Rock Cycle is an extremely valuable gift? Describe two things that make you appreciate the value of this gift.

6. How can you show your gratitude to the One who granted you the gift of the Rock Cycle?

V. THINK-THANK GAME

In this “think-thank” game, we want you to think about rocks and rock cycle and give thanks to their Maker. We also call it the “play to praise” game. The goal of this game is to think of at least five things about the rocks and rock cycle that you are thankful for.

Number of players:

At least two.

Directions:

Player 1 repeats an appreciation phrase loudly and quickly. Player 2 responds, without pausing, with something to be thankful for. This is repeated five times.

To win:

Player 2 needs to respond five times (without pausing) with different things about rocks and rock cycle to be thankful for in order to win the game.

Here is an example of two rounds of this game:

1. Player 1 repeats the appreciation phrase loudly and quickly. For example: “Thanks to the Maker of rocks and rock cycle!”
 2. Player 2 responds, without pausing, with something about rocks and rock cycle to be thankful for. For example: “creating an efficient system to cycle rocks without wasting a single piece”
 3. Player 1 repeats the appreciation phrase again loudly and quickly. For example: “Thanks to the Maker of the rocks and rock cycle!”
 4. Player 2 responds, without pausing, with another thing about the rocks and rock cycle to be thankful for. For example: “For protecting us from fire through rocks!”
- This should be continued for another three rounds until Player 2 wins or loses.