



Master Lesson Plan

For

Inside Our Earth

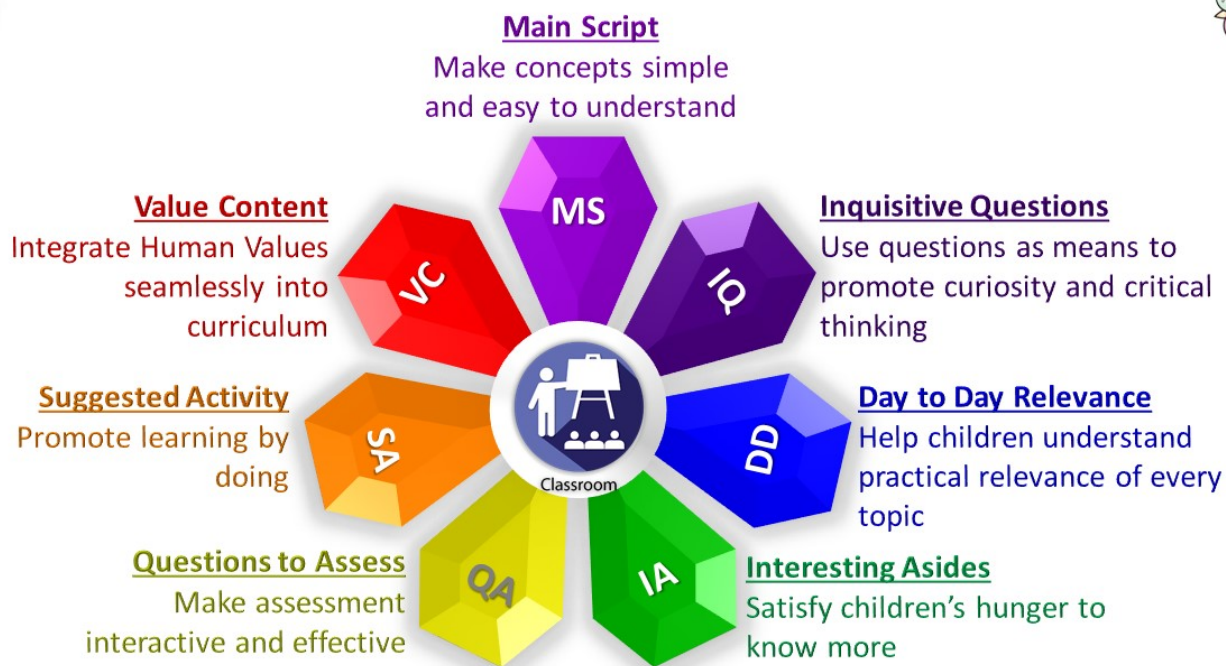
Board	Standard	Subject	Chapter	Language	Reference Link	Creation date
CBSE	STD VII	Social Science	Inside Our Earth	English	Inside Our Earth	2021-07-02 20:27:08

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Master Lesson Plan (MLP) - Covers the entire chapter with the help of these 7 asset types



For more information on how to use the lesson plan effectively, please scroll to the guidelines at the end of this document.

Inside Our Earth

1. MS_Objective_Inside our earth

(Notes to the teacher: This asset lays down the proposed plan for transacting this chapter. It states the asset objectives of the MLP. This asset is for teacher's reference and need not be taught to the students)

Students will be able to:

- reserve the information on the depth of the earth from the surface for later use
- explain the characteristic features of different layers of the earth
- imagine how the asthenosphere acts as an important layer of earth's mantle
- create a model of the earth's interior
- analyse the formation of different types of rocks
- relate to the games played with stones
- recognize that challenges in life make human beings stronger
- connect how rocks develop from one type to another
- discuss the rock cycle
- relate to the uses of minerals that form the rocks
- differentiate between igneous, sedimentary and metamorphic rocks based on their formation
- assess themselves on the chapter on Earth's interior including the types of rocks
- summarise the layers of the interior of the earth and types of rocks that it is made up of.

Time to teach	Asset Type	Theme	SubTheme
3 Minutes	Main Script	Solar system & the earth	Lithosphere, Interior Of The Earth, Rocks and Minerals, Lithosphere, Interior Of The Earth, Rocks and Minerals

2. IA_How deep is the center of the earth

How deep is the center of the earth

(Note to Teacher: Teacher may begin by asking the students whether they have seen activities like digging a hole in the ground. After they respond, the teacher may further ask how deep was the hole dug and what was the purpose for digging. The students may not be able to give a perfect estimate of the depth but an approximate number could be prompted e.g. approximately 30 feet to find water or 3-4 feet for a small residential building.)

A video on the depth of the earth's core

Let us watch a video !!

(Note to Teacher: Teacher may show the video on the depth of the core of the earth, to the students, at this point. After the video is shown, the teacher may ask some questions based on the video like, what is the depth below which the mantle starts, what are the other different facts they gathered after seeing it, how far could animals dig the earth, how much distance is still beyond our capacity to reach the core, etc.)

Some interesting facts about center of the earth

- The distance from the surface of earth to the center of the earth or inner core is almost 6000 kms.
- The outer core is 3000 kms away from earth's surface.
- Since it is not possible to travel to the earth's center, scientists have tried to gather information through indirect methods like digging holes as deep as possible.
- *Kola Superdeep borehole in the Russian Arctic*, is the deepest borehole (according to true vertical depth) drilled although it covered only 2% of the distance from surface to core of the earth. Digging of this hole started in 1970 and in 1979 it created history of being the deepest man made hole.
- One of the deepest mines in the world was the TauTona gold mine in South Africa with a depth of about 3.9 kms. Temperature crosses 60 degree celsius. Although it closed down in 2017.
- This journey would be through high temperatures enough to melt rock. Temperatures increase as we go deeper.

Diagram showing the location of Core of the earth:

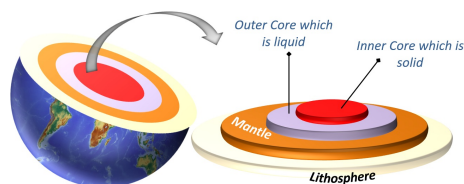


Table for teacher's reference

(Note to Teacher: The teacher may consider the table provided below only as additional information based on the video. There is no need to explain the table to the students.)

Sl No.	Depth (ft.)	Objects
1	06	Grave for dead bodies
2	10	Olympic swimming pools
3	39	Nile crocodile dig deepest burrows
4	65	Paris Catacombs
5	279	Ancient city of Derinkuyu below Turkey
6	718	Greenbrier Nuclear bunker (W. Virginia)
7	1063	If the Eiffel Tower were buried to the tip, its base would reach this depth
8	1285	Woodingdean well. Deepest hole dug by hand
9	2722	If the Burj Khalifa would go below the surface, it will go down to this depth
10	7208	Deepest known point of cave (Krubera Cave, Georgia)
11	7546	Deepest railway tunnel in the world, located in Switzerland
12	13,000	Gold mine (Mponeng) at South Africa.
13	40,230	Kola super deep borehole.
14	40,603	Oil well dug by human beings

Image reference :

Diagram : OC- chandranidebhaumik@gmail.com

world map : <https://pixabay.com/illustrations/africa-map-continent-south-america-1804896/>

Video Reference:

<https://www.youtube.com/watch?v=60TSVhYj7Zg> (Attribution - Facts Beast)

Reference :

https://en.wikipedia.org/wiki/Kola_Superdeep_Borehole

https://en.wikipedia.org/wiki/TauTona_Mine

<https://www.youtube.com/watch?v=XHUWTyFkyw>

<https://www.nbcnews.com/mach/science/deep-inside-earth-scientists-find-weird-blobs-mountains-taller-mount-ncna997111>

<http://www.bbc.com/earth/story/20150814-what-is-at-the-centre-of-earth#:~:text=The%20central%20point%20of%20the,down%20a%20pitiful%2012.3%20km.>

<https://www.universetoday.com/15020/how-far-down-is-the-center-of-the-earth/>

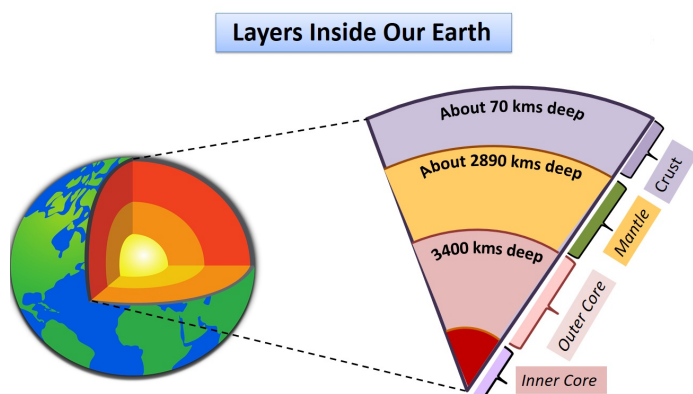
https://www.mining-technology.com/projects/tautona_goldmine/

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Interesting Asides	Solar system & the earth	Interior Of The Earth, Rocks and Minerals, Interior Of The Earth, Rocks and Minerals

3. MS_Interior layers of the earth

Interior layers of the earth

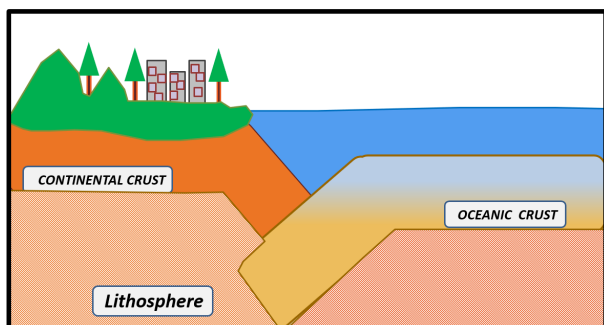
Note to Teacher: Teacher may ask the students if they ever peeled off an onion. Teacher may further ask what they noticed when an onion is cut. After the students respond, the teacher may continue saying that just like onion has layers, our earth's interior is also arranged in layers which has different characteristics and composition. Teacher may draw the diagram on the black board and ask the students to draw the same in their note books.



Crust:

- Uppermost and thinnest of all the layers of the earth's interior.

- It is about 40 km thick.
- The crust is divided into the **continental** and the **oceanic crust**.
- The continental crust is made up of mainly Silica and Aluminium and hence has been named as **SIAL**
- The oceanic crust is made up of mainly Silica and Magnesium and hence is named as **SIMA**



Mantle:

- It extends up to a depth of 2900km inside the earth.
- The mantle is located just below the crust.
- Mantle is divided into upper and lower mantle.

[Note to teacher : Teacher may also mention to the students that, the mantle is mostly made up of Oxygen(45%), Magnesium(23%) and Silicon(22%).]

Core:

- The distance from the surface of earth to the centre of the earth or inner core is almost 6000 kms.
- The outer core is 3000 kms away from earth's surface.
- The main mineral constituents of the core are Nickel (Ni) and Iron (Fe). core is hence named as **NIFE**.
- The core of the earth is characterised by very high temperature and pressure.

Total volume coverage by the interior layers of the earth:

- The crust constitutes only **1%** of the earth's total volume.
- Out of the total volume of the earth the mantle constitutes **84%**

- The core makes up 15% of total volume of the earth.

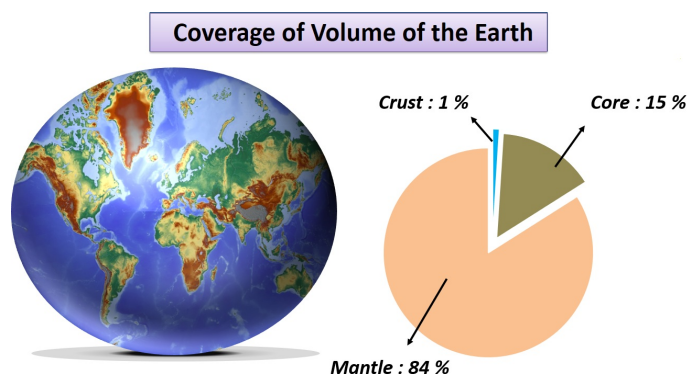


Image reference:

Diagram (Layers of earth's interior) OC- chandranidebhaumik@gmail.com

Diagram (continental and oceanic crust) OC- chandranidebhaumik@gmail.com

Maps used for creating sphere: <https://pixabay.com/illustrations/africa-map-continent-south-america-1804896/>

Globe : <https://pixabay.com/illustrations/earth-globe-layer-soil-rocks-5660940/>

Reference :

<https://www.universetoday.com/40229/what-is-the-earths-mantle-made-of/>

<https://www.forbes.com/sites/trevornace/2016/01/16/layers-of-the-earth-lies-beneath-earths-crust/?sh=61308178441d>

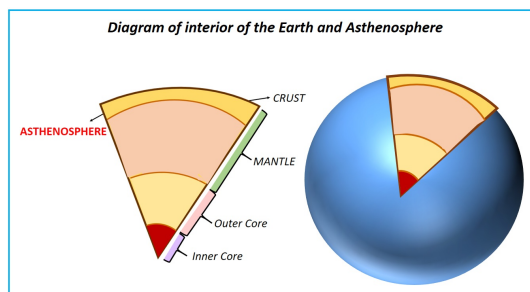
<https://www.shutterstock.com/image-vector/continental-crust-oceanic-sectional-view-vector-1496340794>

Time to teach	Asset Type	Theme	SubTheme
8 Minutes	Main Script	Solar system & the earth	Interior Of The Earth, Rocks and Minerals, Interior Of The Earth, Rocks and Minerals

4. IA_Asthenosphere

Asthenosphere

Note to Teacher: Teacher may begin by saying that we generally see the crust of the earth which is a hard outer layer of the earth's interior. The layers of earth's interior play an important role in the phenomena on the earth's surface. The movements within the earth affect the surface as well.



Asthenosphere is a layer in the mantle of the earth's interior. It is derived from a *Greek* word *Asthenes* meaning 'weak sphere'.

Characteristics of Asthenosphere:

- Lies between 100 km and 410 km beneath the earth's surface.
- Temperature of the mantle varies between 1000° Celsius to 3700° Celsius and Pressure (100 mpa)
- The boundary of the lithosphere and Asthenosphere has a temperature of about 1300 degrees Celsius. The mantle is solid in nature below this temperature while it is ductile in nature above 1300 degrees Celsius.
- The upper part of the Asthenosphere consists of brittle lithospheric plates moving freely over distances.
- The temperature and pressure condition of the asthenosphere is so high that rocks become soft and partly melt, becoming semi-molten.
- It is a highly viscous (sticky), mechanically weak and ductile (can easily change form or mouldable) layer. The rocks in the Asthenosphere can be deformed due to stress without fracturing.

Image: Rock deformation or ductility



Minerals found in this layer:

- Olivine
- Pyroxene
- Garnet

Abundant water is present in the mantle, but it is trapped in the minerals as ions of hydrogen and oxygen. Scientists believe the amount is similar to the amount we find in the oceans and seas. But since it is not in the liquid form, its presence is probably not that significant.

To conclude, the asthenosphere is the layer that is soft and flows despite being solid. It is because of the extremely high temperature that the asthenosphere flows like a toothpaste.

Image reference :

[https://en.wikipedia.org/wiki/Ductility_\(Earth_science\)#/media/File:Spaghetti_Rock.jpg](https://en.wikipedia.org/wiki/Ductility_(Earth_science)#/media/File:Spaghetti_Rock.jpg)

Attribution : Mike Beauregard from Nunavut, Canada

Diagram - OC-chandranidebhaumik@gmail.com

References:

<https://www.nationalgeographic.org/encyclopedia/mantle/#:~:text=The%20asthenosphere%20is%20the%20denser,melt%2C%20becoming%20semi%2Dmagnetic.>

<https://www.glossary.oilfield.slb.com/en/Terms/a/asthenosphere.aspx>

<https://www.encyclopedia.com/earth-and-environment/geology-and-oceanography/geology-and-oceanography/asthenosphere>

[https://en.wikipedia.org/wiki/Asthenosphere#:~:text=The%20asthenosphere%20\(Ancient%20Greek%3A%20E1%BC%80%CF%83%CE%B8%CE%B5%CE%BD%CF%8C%CF%82,the%20upper%20mantle%20of%20Earth.](https://en.wikipedia.org/wiki/Asthenosphere#:~:text=The%20asthenosphere%20(Ancient%20Greek%3A%20E1%BC%80%CF%83%CE%B8%CE%B5%CE%BD%CF%8C%CF%82,the%20upper%20mantle%20of%20Earth.)

<https://www.nationalgeographic.org/encyclopedia/lithosphere/8th-grade/>

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Interesting Asides	Solar system & the earth	Interior Of The Earth, Rocks and Minerals, Interior Of The Earth, Rocks and Minerals

5. SA_Model of interior of the earth

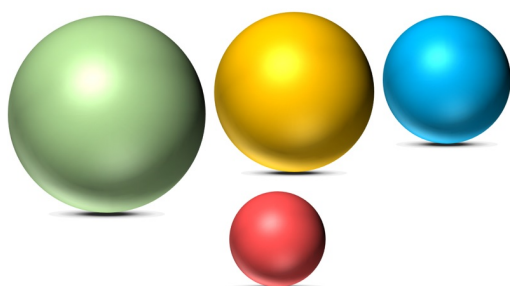
(Note to Teacher : Teacher may briefly discuss about the layers within the earth before explaining the activity. The PPT may be used to explain the activity)

Aim: Through the activity students will get a clear idea of how the different layers exist within the earth's interior.

Resources Required:

- Colours and sketch pens,
- Hard Plastic balls (2 large size, 2 medium size , 2 small size),
- Plastic balls smallest size (4 nos.),

Reference image for plastic ball size :



*Plastic Ball sizes required for making the layers
(colours are optional)*

- Old newspapers,
- Toothpicks (10nos. for creating labels for the layers in the model),
- Note books, pen, pencil eraser, scale,
- Chart paper(any colour) for creating the booklet and labels for the model (2 for each group),
- Glue, scissors, knife /cutter,
- Coloured papers (it can be used instead of colours so this is optional),

- Worksheet (number of prints depend on the class strength),
- Cello tape (1 for each group).

Setting for the Activity: *Indoor*

Type of Activity: *Project*

(Note to teacher: Teacher will divide the class into 4 broad groups to ensure participation by all students in the class. Number of students in each group will be decided by the teacher.)

In the previous class:

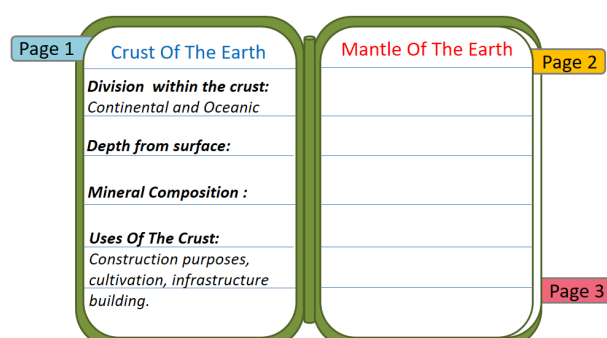
- The teacher will announce the groups for the activity and explain the activity and its procedure to the students. PPT may be used for explaining the activity.
- Resources required to be discussed and arrangements for it to be made.

Procedure:

- Plastic balls and old newspapers may be supplied by the school, if the teacher thinks that students may not be able to bring it.
- One member of each group will be the group in charge, who will divide the group into 4 sub-groups. **3 sub-groups** will prepare ***model of each of the different layers*** of earth's interior, while the fourth sub-group will prepare a ***booklet with information*** on each layer within the earth's interior.

(Note to teacher : The booklet sample given below is just a reference. Groups may be encouraged to design their own booklet.)

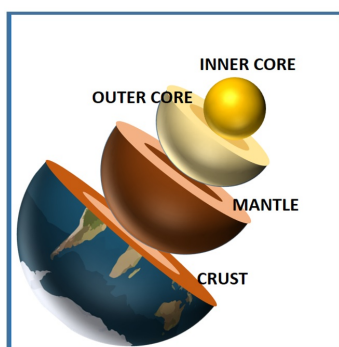
Booklet Sample



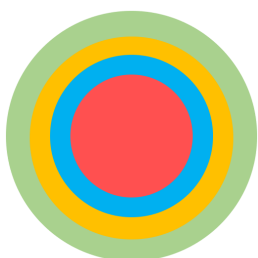
- The **plastic balls need to be cut into halves**. The balls cut in halves will be **wrapped with newspapers to provide a thick padding** and then **coloured appropriately** (coloured paper may be wrapped if colouring is difficult). The **balls used to create inner core need not be cut** and should be used as it is.
- **Each ball used for creating crust , mantle and outer core may be shared by two groups**, since they will use only half of it.
- The model of the layers prepared by the sub-groups can be assembled at the end to create a complete model of the earth's interior.

(Note to teacher : The following images may be referred to while assembling and arranging the layers)

Reference image for assembling :



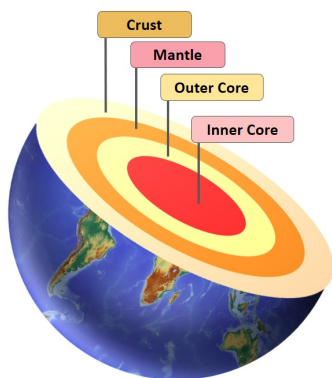
Reference image for arranging the layers :



- Toothpicks and pieces of chart paper may be used to label the layers.
- The completed models can be submitted to the teacher by the 4 groups and it can be displayed in the classroom.
- Marks or grades may be awarded by the teacher. The model which has all the layers shown may be given 'A'. The second best may be given 'B' and so on.

- The worksheet may be distributed after the activity and it may be completed in the class if time permits or may be completed as homework.
- The sample model image may be followed to create the model and teacher may provide required help during the activity.

Sample Model Image :



Observation:

- The teacher walks around the class during the activity. The teacher supervises and guides the students to create the layers of the the earth's interior correctly and assemble smoothly in the form of a model.
- Teacher ensures that all the students are engaged in the work.

Conclusion: The model making will help the students to remember the position of the layers inside the earth and retain information regarding those layers.

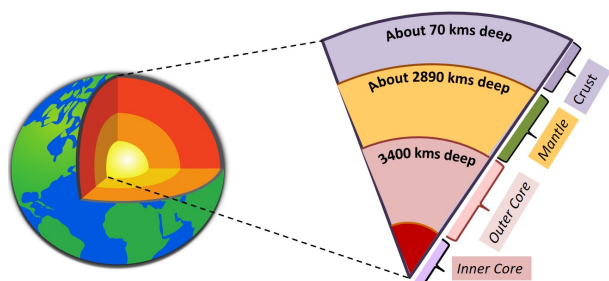
Troubleshooting:

- In case the resources required for the activity cannot be arranged and the activity cannot be conducted according the procedure suggested, the students may draw diagram of the earth's interior in their notebook and describe each layer in detail.

Follow up questions/ worksheet

1. Draw a diagram of the earth's interior.

Ans. (Students may show the layers in a 2D image)



2. What is the importance of the crust?

Ans. The crust is important as:

- Crust provides us land for growing crops which provide us food.
- We build houses and buildings on the crust.
- We construct various infrastructure which help in human development.

(Students may give other points as answers)

Image Reference:

Map used for creating sphere: <https://pixabay.com/vectors/world-globe-earth-continent-296692/>

Map used for creating sphere: <https://pixabay.com/illustrations/africa-map-continent-south-america-1804896/>

Globe : <https://pixabay.com/illustrations/earth-globe-layer-soil-rocks-5660940/>

Time to teach	Asset Type	Theme	SubTheme
30 Minutes	Suggested Activity	Solar system & the earth	Interior Of The Earth, Rocks and Minerals, Interior Of The Earth, Rocks and Minerals

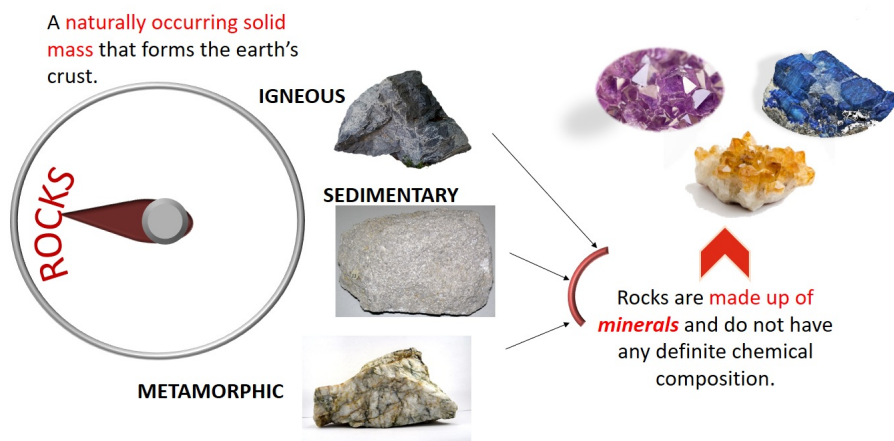
6. MS_Types of Rocks

Types of Rocks

(Note to teacher: Teacher may begin by saying that, we see various types of rocks everywhere around us. All rocks do not belong to the same type nor are they formed by the same process. Let us see what are the various types of rocks and how they are formed. The teacher may draw the following diagrams on the board to explain the different types of rocks. The students may be encouraged to draw them in their note books simultaneously.)

What are rocks?

Rocks may be defined as mass of the harder portion of our earth's crust. Solid part of the lithosphere is mainly made up of rocks. They are made up of minerals and do not have a definite chemical composition. There are different type of rocks and their formation also varies from one another.



Igneous Rocks

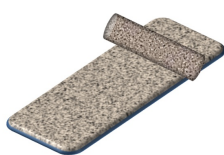
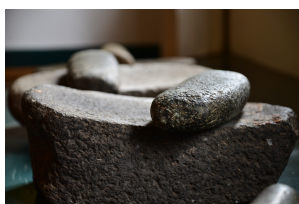
- Igneous rock owes its name to the Greek word **ignis** meaning fire.
- Formation of igneous rocks take place when hot molten magma gushes out to the earth's surface from the interior and solidifies.
- Igneous rocks form the basis of formation of other type of rocks and therefore referred to as primary rocks.
- On the basis of formation, the igneous rocks may be classified into two different types.

1. Intrusive Igneous Rock

- When the magma rises up to the surface, sometimes a part of it cools down before reaching the surface.
- Since there is very high temperature inside the earth the cooling takes at a slow rate and hence the grains of intrusive igneous rocks are large.
- **Example** of such igneous rock is *Granite*.
- Grinding stones made of granite blocks are used in the modern as well as traditional kitchen to make pastes and grind spices.



Gabbro



Grinding Stone

2. Extrusive Igneous Rock

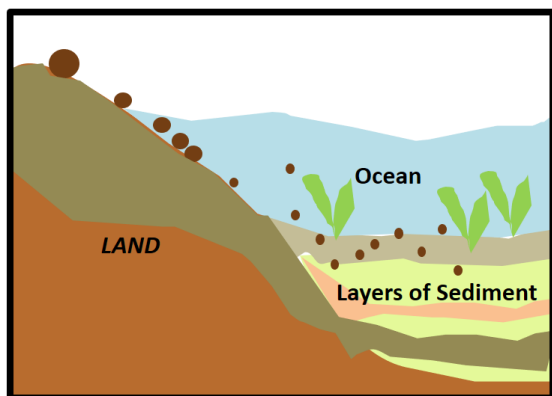
- When the magma gushes out on the earth's surface it cools at a faster rate as temperature on the surface is cooler than the interior.
- The grains of extrusive igneous rocks are finer. **Example** of extrusive igneous rock is *Basalt*.
- In India, Deccan plateau was formed by solidification of magma and is composed of basalt.



Basalt

Sedimentary Rocks

- The rocks roll down from elevated surface to lower surface and break into fragments.
- These fragments further break into smaller pieces which eventually turn into dust like particles called sediments.
- The natural agents like wind, water, rain, carry these sediments from one place and deposit them at another place.
- These sediments get deposited in layers or strata and become compact and hard forming rocks.
- Examples of sedimentary rocks are sandstone, limestone, shale, conglomerate.



Sandstone



Limestone

Metamorphic Rocks

- Metamorphic rocks are formed when igneous and sedimentary rocks undergo a complete transformation.
- Under tremendous heat and pressure the igneous and sedimentary rocks evolve into a new kind of rock with different physical appearance and chemical composition called metamorphic rocks.
- **Examples** of metamorphic rocks are marble, slate, quartzite, gneiss, schist.

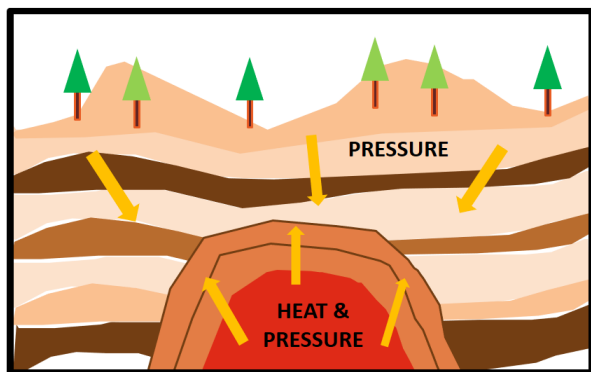


Diagram Showing The Process of Formation



Marble

Image references –

Amethyst - <https://pixabay.com/photos/jewel-crystal-amethyst-stone-3328166/>

Crystal - <https://pixabay.com/photos/citrine-crystal-mineral-minerals-3201605/>

Afganite crystal- <https://pixabay.com/photos/afghanite-crystal-calcite-pyrite-872368/>

Rock types - <https://pixabay.com/photos/rocks-granite-limestone-stones-2485461/>

Sandstone - https://www.flickr.com/photos/seismo_schwa/43918266012/ (Attribution jmmcbeth)

Gabbro : <https://en.wikipedia.org/wiki/Gabbro#/media/File:1gabbro.jpg>

Basalt - <https://www.flickr.com/photos/jsigeology/albums/72157710695396678>

(Attribution : James St. John)

Stone grinder - <https://pixabay.com/photos/stone-grinding-archeology-mapuche-751890/>

Diagram - OC- chandranidebhaumik@gmail.com

Limestone - <https://www.flickr.com/photos/jsigeology/49202030231> (Attribution : James St. John)

Marble- <https://www.flickr.com/photos/gnu2000/5583451346/> (Attribution : Stuart B)

Time to teach	Asset Type	Theme	SubTheme
8 Minutes	Main Script	Solar system & the earth	Lithosphere, Interior Of The Earth, Rocks and Minerals, Lithosphere, Interior Of The Earth, Rocks and Minerals

7. DD_Games with Stones

Games with Stones

(Note to teacher: Rocks are huge blocks that form the earth's crust. Stones are smaller pieces of rocks or smaller fragments of rocks that are used for many purposes, e.g. for construction purposes, as gemstones in ornaments, in industries and so on. The teacher may ask the students whether they have played games using stones. Students may also be asked to recollect names of games they have played or have seen others play with stones. Let us look at some of the games played using stones.)

SATOLIYA

- Satoliya is also known as Pitthoo or Lagori in some parts of our country. Number of players are not fixed or restricted.
- Use of 7 flat stones are common in this game.
- Stones need to be arranged in decreasing size order, so the size of the stone has to vary from each other and each stone should be comparatively smaller than the other.
- The pile of stones is then hit with a ball from a distance and the game continues.



KANCHA

- A game played with marbles is popularly known as Kancha in India.
- Marbles are hit with another marble and the winner collects marbles from the other players and the game continues.
- The game is very common among children in India and played by all children across India.



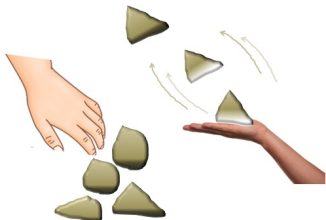
HOPSCOTCH

- This is a hopping game known differently all over India.
- It is known as *Stapoo* or *Kith Kith*, or *Nondi*.
- To play this game grids are drawn on the ground and numbered.
- Small stones are used to throw on the grids and the players are expected to hop across the grids to collect the stone without stepping on the boundary lines of the grids.



GUTTE

- A traditional game played by children as well adults using 5 pieces of stones.
- A stone is made to spin in the air and before it drops on the ground the players are supposed to pick up the rest of the stones on the ground.
- Number of players are not restricted in this game.



(Note to teacher: After teaching the content, the teacher may ask the students, if they play any of these games, what type of stones they would look for).

References:

<https://www.thebetterindia.com/10492/lesser-known-traditional-games-sports-india/>

<https://parenting.firstcry.com/articles/magazine-15-traditional-games-of-india-that-probably-internet-generation-dont-know/>

Image references :

Gutte - OC- chandranidebhaumik@gmail.com

<https://pixabay.com/photos/guide-handful-of-help-lead-423824/>

<https://pixabay.com/photos/guide-handful-of-help-lead-423824/>

Satoliya -

<https://www.flickr.com/photos/venkatarameshkommoju/8019898135/in/photostream/> -

Attribution : Venkataramesh Kommoju

Kancha -

https://commons.wikimedia.org/wiki/File:Sculpture_depicting_village_kids_playing_marbles_jalandhar_punjab_haveli_rangla_punjab.jpg - Attribution : Gopal Aggarwal

Hopscotch - <https://www.freepik.com/free-vector/boys-girls-playing->

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Day-to-day Relevance	Solar system & the earth	Lithosphere, Interior Of The Earth, Rocks and Minerals, Lithosphere, Interior Of The Earth, Rocks and Minerals

8. VC_Face the challenges in life

Face the challenges in life

(Note to Teacher : Teacher may begin the following story by saying that igneous and sedimentary rocks withstand tremendous heat and pressure and transform into a new kind of rock called metamorphic rocks.)

Story :

Two monkeys, a father and his son, were sitting together in a tree.

The little monkey turned to the father and said, “Father, I’m hungry, can you please get me some fresh leaves to eat?”

The father looked at the young one and smiled, “Well, why don’t you get some yourself?”

The son said, “The ones near the strong trunk are unpalatable and the fresh leaves are at the edge of the branches. I’m afraid to reach there because I could lose my grip and fall.”

“Son, you have a choice,” said the father. “You can either eat the unpalatable leaves or the fresh ones.”

“That’s not fair, why can’t the fresh leaves be found where I can get to them easily?”

“Son, listen carefully. When you take the risk and go to the farthest branch, you will find that it was worth taking the risk and facing the challenges.”

“If that is so, why doesn’t every monkey go there and get the fresh leaves?” asked the son.

The father replied, “Because of the fear of perceived danger, my son. Many monkeys would rather eat rubbish and complain about it than take a risk and go for those really fresh and sweet ones. The challenges are out there son, go and face them! If you remember this, you’ll be successful in everything you do and will always have the nicest leaves to eat.”

(Note to Teacher : Teacher can initiate a discussion after telling the story. Teacher can ask the following questions to the students to initiate the discussion)

1. As a student, what are the challenges you face?
2. Your father is transferred to another city and you are not too keen to move leaving your good friends and comfortable surroundings. You are faced with challenges of relocating, joining a new school and making new friends. How would you deal with it?)

(Notes to teacher : Summing up by the teacher with the following sentences)

Human lives are subjected to stressful situations, mental pressure, difficulties etc. Life's challenges are not supposed to paralyze us nor do they come to stop or hinder our progress. They are there to help us discover who we really are, strengthen us, so that we evolve into stronger and more stable human beings. To understand this is to keep advancing. If you are willing to face the world head-on with all of its difficulties and challenges, the sky's the limit.

Time to teach	Value Type	Value Sub Type	Value Attribute
5 Minutes	Right Action	Courage	Stories

9. IQ_Recycling of rocks

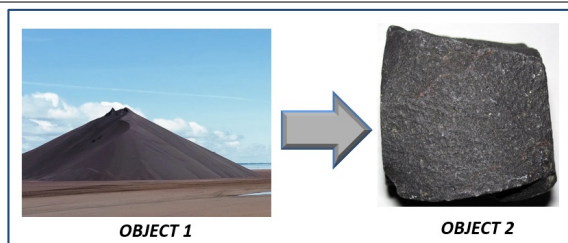
Recycling of rocks

Notes to teacher: Teacher may enable the students to think and come out with as many answers as possible before giving out the right answer/ answers.

Q1. What comes to your mind when you hear the word 'change'?

Answer: It may refer to change of state of any object or a situation. (Students may come up with their own answers)

Q2. Look at the picture below. Can you identify the difference that has occurred to **Object 1**?

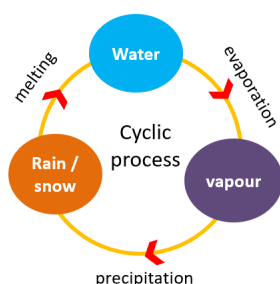


Answer: The **object 1** has changed to become harder and compact and transformed into a block.

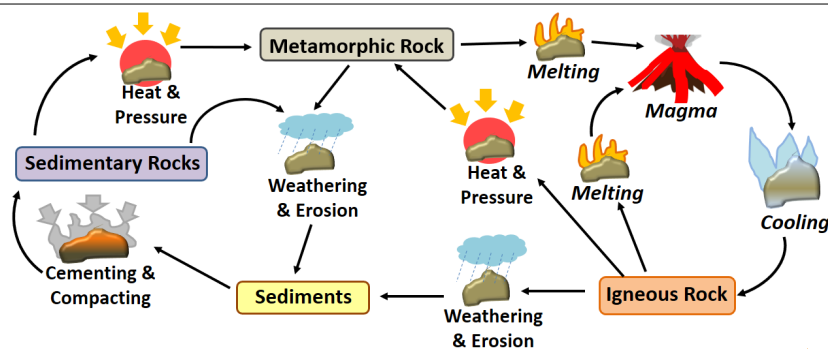
Q3. What are the changes you observe in the following diagram?



Answer: From the image it appears that, water changes into vapour, which changes into water and falls as rain or becomes a solid to fall as snow. The snow melts into water and the process continues. It is cyclic in nature and it goes on like a cycle.



Q4. What changes do you find in the transformation of rocks from the following diagram and how can you relate it with the water cycle?



Answer:

- The rocks get transformed into a totally different kind of rock due to factors like heat, pressure, weathering, erosion, cooling etc.
- One rock gets transformed into a new kind of rock and the process is cyclic which resembles the process involved in water cycle.

Image Reference:

Heap - <https://pixabay.com/photos/port-reluctantly-heap-3675982/>

Rock - <https://www.flickr.com/photos/jsjgeology/albums/72157710695396678>

(Attribution : James St. John)

Erupting volcano - <https://pixabay.com/illustrations/disaster-hazard-forest-fires-5545306/>

Diagram - https://www.freepik.com/free-vector/water-cycle-diagram_838306.htm#page=1&query=water%20cycle%20diagram&position=3 (by [natalka_dmitrova](#))

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Inquisitive Questions	Solar system & the earth	Lithosphere, Interior Of The Earth, Rocks and Minerals, Lithosphere, Interior Of The Earth, Rocks and Minerals

10. MS_Rock Cycle

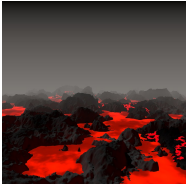
ROCK CYCLE

(Notes to Teacher:

- Transaction of this asset may begin with the concept of cycle in which, a process or phenomenon is repeated.
- Teacher may show the video given in the link at the end of this asset. It explains the rock cycle through a song.)

Rock cycle is a process of transformation of rocks. One form of rock changes into another form under certain circumstances. The constant changing of one form to another happens in a cyclic process. This is referred to as a **rock cycle**.

- Magma, which is hot molten material, is ejected out of a volcano from inside the earth.

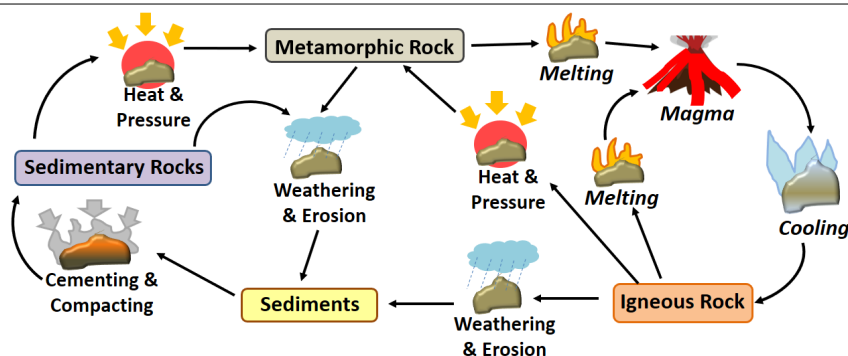


- Magma that oozes out, cools down and solidifies to form rocks called the igneous rocks.
- Igneous rocks break into smaller fragments. The natural processes of erosion and weathering are responsible for such breakdown.



- The sediments are then transported and deposited from one place to other by natural agents like wind, water and ice. These layers of sediments harden to form sedimentary rocks.
- Igneous and sedimentary rocks transform to form metamorphic rocks when they are subjected to tremendous heat and pressure.
- The sedimentary and metamorphic rocks melt to form magma when they are subjected to further heat and the igneous rocks are formed from the magma.

There is a complete change from one rock form to another as time passes, as shown in the diagram below.



Reference link to a video on **Rock Cycle** :

<https://www.youtube.com/watch?v=FMS8VLcLWoU>

To conclude, the cycle continues and each type of rock gets converted into a different type of rock with time

Image references :

Erupting volcano - <https://pixabay.com/illustrations/disaster-hazard-forest-fires-5545306/>

Rock types - <https://pixabay.com/photos/rocks-granite-limestone-stones-2485461/>

Lava - <https://pixabay.com/illustrations/lava-magma-islands-venus-landscape-3492940/>

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Main Script	Solar system & the earth	Lithosphere, Interior Of The Earth, Rocks and Minerals, Lithosphere, Interior Of The Earth, Rocks and Minerals

11. DD_Composition of the Rocks-Minerals

Composition of the Rocks-Minerals

Note to teacher:

- Teacher can begin by asking the students about the three types of rocks and discuss briefly that rocks are made up of minerals.**
- A Map of India with distribution of some major minerals is provided towards the end of this asset. It is suggested that the teacher prepares a list of important minerals found in their state and discuss it in the classroom.**

Minerals are components which occur naturally and have a definite chemical and physical properties. Rocks are made up of minerals.

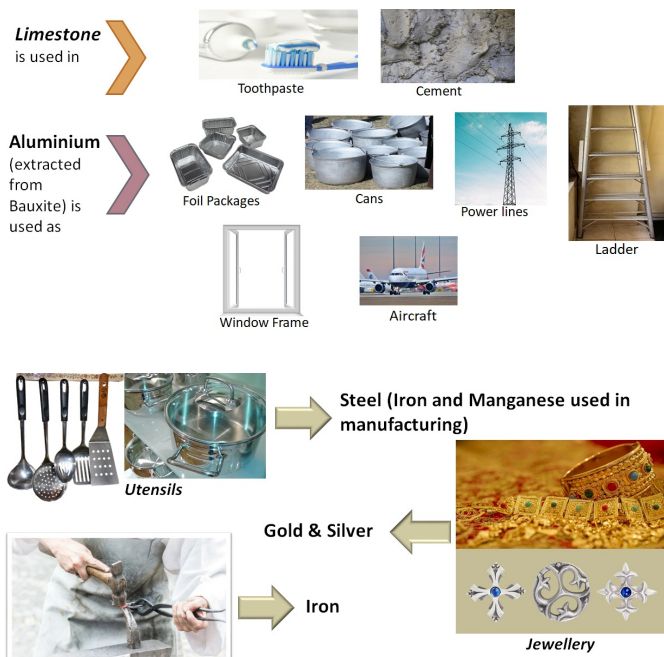
What are the minerals that make up the rocks?

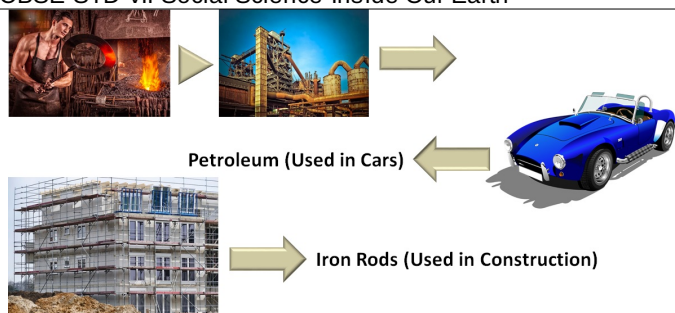
Feldspar, Mica, Uranium, Aluminium (Bauxite), Limestone, Manganese, etc. are some of the minerals found in the rocks.

Note to teacher: Teacher may ask the students some questions like what metals do they find in their houses, or surrounding areas or within the school campus. After the students respond, the images of different uses of minerals may be shown to the students.

Uses of minerals by human beings are many. Some examples are:

- **Limestone** is used in toothpaste, in building material like cement and so on.
- **Aluminium** (extracted from Bauxite) is used as power lines, high-rise buildings, Window frame, Household appliances, aircraft components, spacecraft components, ships and many more.
- **Iron** (got from iron ore) is used in steel utensils, tools, industrial structures, construction materials like rods, sheets and so on.

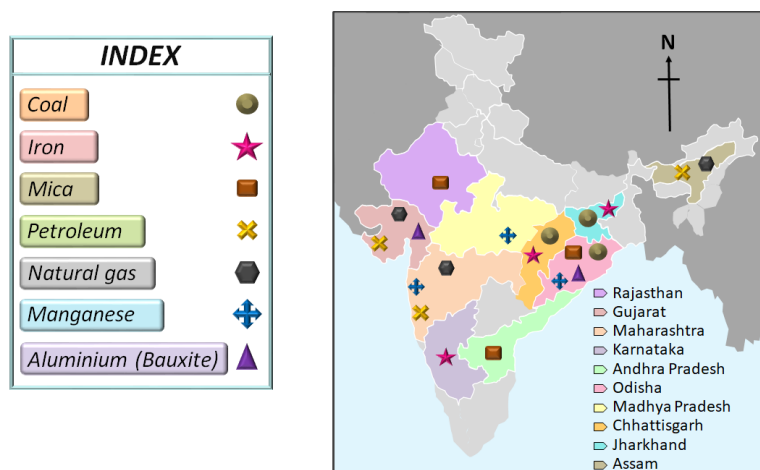




(Note to teacher: Teacher may ask the students to think of some more uses of minerals. After showing the following map to the students they may be asked a question like, what are the important minerals found in their state?)

Some minerals found in different Indian states

- Coal - Jharkhand, Odisha, Chhattisgarh.
- Iron - Jharkhand, Chhattisgarh, Karnataka.
- Mica - Andhra Pradesh, Rajasthan, Odisha.
- Natural Gas – Maharashtra, Gujarat, Assam
- Petroleum – Maharashtra, Gujarat, Assam.
- Aluminium (Bauxite) – Odisha, Gujarat,
- Manganese - Maharashtra, Odisha, Madhya Pradesh



Thus, minerals that make up the rocks, are of immense importance to mankind.

Image reference:

- Cement - <https://www.publicdomainpictures.net/en/view-image.php?image=85998&picture=wet-cement-background>
- toothpaste - <https://pixabay.com/photos/toothpaste-toothbrush-brushing-teeth-3067569/>

- Aluminum packaging - <https://pixabay.com/illustrations/shells-aluminum-trays-packaging-1984293/>
- Aluminum cans - <https://pixabay.com/photos/caldrion-aluminium-aluminum-cast-88428/>
- Plane - <https://pixabay.com/photos/airbus-airplane-jet-flight-airport-4454338/>
- Power lines - <https://pixabay.com/photos/power-lines-cables-tower-1868352/>
- Window frame- <https://pixabay.com/illustrations/window-transparent-open-window-4794423/>
- Ladder – OC – suhasini.nagraj@gmail.com
- Spoons - <https://pixabay.com/photos/kitchen-utensils-cooking-household-2716156/>
- Pots- <https://pixabay.com/photos/cooking-pot-pot-boiler-boiling-pans-476346/>
- Jewellery - <https://pixabay.com/photos/gold-bahraini-gold-bahrain-jewelry-1369453/>
- Hammer - <https://pixabay.com/photos/smith-furnace-hammer-anvil-iron-1139033/>
- Silver - <https://pixabay.com/photos/pendant-silver-ornament-jewelry-2885040/>
- Car - <https://pixabay.com/vectors/car-auto-sports-car-automobile-158795/>
- Industry - <https://pixabay.com/photos/factory-industry-abandoned-1639990/>
- Construction - <https://pixabay.com/photos/new-building-housebuilding-site-3284911/>
- Coal - <https://pixabay.com/photos/blacksmith-fire-iron-forger-man-2740128/>

References:

- <https://opengeology.org/Mineralogy/8-metamorphic-minerals-and-metamorphic-rocks/>
- https://en.wikipedia.org/wiki/Metamorphic_rock#Metamorphic_minerals
- <https://www.jagranjosh.com/general-knowledge/list-of-indian-states-in-mineral-wealth-1474863637-1>
- https://en.wikipedia.org/wiki/Natural_resources_of_India
- <https://mdlpa.org/things-you-never-knew-we-made-from-limestone/#:~:text=Limestone%20in%20Toothpaste&text=The%20limestone%20content%20in%20toothpaste,for%20cleaning%20and%20scrubbing%20teeth.>
- <https://www.bbc.co.uk/bitesize/guides/z6gqmsg/revision/3>

Time to teach	Asset Type	Theme	SubTheme
5 Minutes	Day-to-day Relevance	Solar system & the earth	Lithosphere, Interior Of The Earth, Rocks and Minerals, Lithosphere, Interior Of The Earth, Rocks and Minerals

12. SA_Identification of Rocks

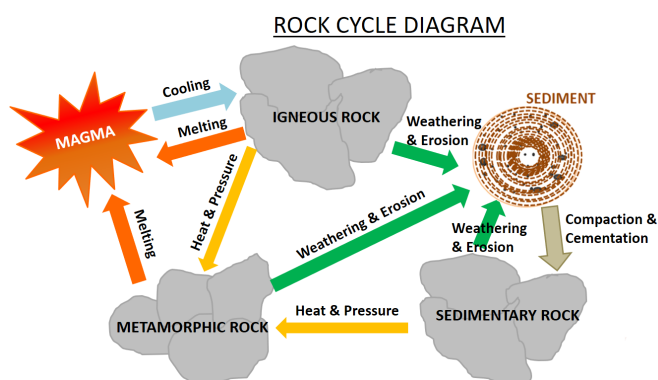
Identification of Rocks

(Note to Teacher: Teacher may introduce the activity by mentioning that rock cycle is a process by which a particular type of rock transforms into another type under conditions like heat, pressure, weathering, and erosion.)

Aim: To learn about rock forming processes through a game on rock cycle.

Resources Required:

- Dice (at least 3 for each of the 5 stations)
- Rock Cycle printout (One for each of the 5 stations)



- Printouts for each station containing tables with dice numbers and corresponding effect on the rock.

1. Print out of Rock Cycle Station: Igneous
2. Print out of Rock Cycle Station: Metamorphic
3. Print out of Rock Cycle Station: Sedimentary
4. Print out of Rock Cycle Station: Magma
5. Print out of Rock Cycle Station: Sediment

- A **sample print** out has been shown here for reference

Rock Cycle Station : Igneous Rock

Number Rolled on the Dice	Effect on the Rock
1	Winter (Cooling)
2	Buried Underground (Heat and Pressure)
3	Ocean waves (Erosion)
4	High Heat (Melting)
5	Hurricane (Weathering)
6	Sunny day (No Change)

- Chits containing one example of each of the 3 types of rock. Number of chits depends on the number of groups.
- Notebooks and pens.

- A chart showing the rock cycle may be prepared for display. This can be used in place of the PPT slide showing 'Rock Cycle' if necessary.

Setting for the Activity: Indoor

Type of Activity: Game

(Note to teacher: *The teacher will explain the game to the students in the previous class so that it can be conducted smoothly. PPT will be used to explain the procedure. It will be a group activity and each group may have 2 or 3 students. The groups will collect the chit from the teacher.*)

On the previous day:

- Groups will be made,
- Chits will be prepared,
- Printouts will be taken and kept ready.

On The day of the Activity:

- Arrangement for stations need to be made by setting up 5 desks, which will serve as Rock Stations.
- Print outs and dice need to be kept on each station.
- The slide showing the rock cycle may be displayed during the activity.

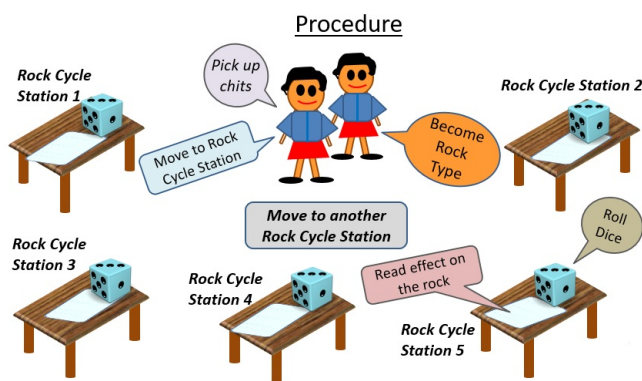
(Note to teacher: *After the activity students may be asked some questions to start a discussion on the rock cycle. The slide containing the questions in the PPT may be displayed during the discussion)*

Procedure:

- Chits to be prepared with **one example of igneous, sedimentary or metamorphic** rock. Chits may contain names like Sandstone, Gneiss, Limestone, Granite, Basalt Marble.
- The groups will move one after the other to avoid overcrowding.
- When each group starts moving, **they will first pick one chit from the teacher** and

read out the name of the rock in it and **identify the type of the rock** (igneous or sedimentary or metamorphic) that they become.

- The groups will **pretend to be a type of rock** according to their chit.
- They will move to the station which contains the type of rock they pretend to be. For example, if a group picks a chit which has granite written in it, they will identify it as igneous rock and pretend to be igneous rock. They will move to the igneous rock station and roll the dice.
- The **groups will move from one station to another** depending on the **number rolled** on the dice. **For example**, if a group at a **metamorphic station** rolls the dice and it **displays number 2** the **effect on the rock** will be **high heat (melting)**. The group will then **move to rock station magma** and **roll the dice again**. If the number displayed after **rolling the dice is 3** the effect on the rock **will be cooling and the group will move to igneous station**.
- The **table containing numbers rolled** on the dice and corresponding effect on the rock, will be **displayed in the respective stations** during the activity.



(Note to teacher: The above image is just a suggestion of how the stations can be set up for the game.)

- During the activity **one group member may note down the number rolled each time, its effects on the rock and other details in their notebook**. It can be shared with other members of the group after the activity ends.
- The groups will go back after they have visited 3 rock cycle stations at least. Visit to the other two rock cycle stations is optional and depends on time left.**

(Notes to teacher: *The students will roll the dice as many number of times required till they get an option to move out of the station***)**

Observation: Students will identify the types of rock and recognize the factors leading to formation of new kind of rocks.

Conclusion: The students will develop a clear concept of how one type of rock transforms into another over a long period of time, which can be referred to as geologic time scale.

Post Activity discussion Questions

(Note to teacher : Answers are given only for teacher's reference)

- What happened to the igneous rock when weathering and erosion affected it?

Answer : It transformed into sediment.

- Why didn't you move when the dice rolled to Hurricane (Weathering) effect in the magma station?

Answer : Magma is in molten state so **weathering or erosion** doesn't affect it. When it solidifies and becomes igneous, then it is affected by erosion or weathering.

- Why did you move to metamorphic station from sedimentary station?

Answer : The dice rolled to heat and pressure effect. When sedimentary rock is subjected to **heat and pressure** it forms metamorphic rock.

- Why did you move to sedimentary rock from the sediment station?

Answer : The dice rolled to **compaction and cementation**. sediments form sedimentary rock when they become compact after cementation.

- What happened to metamorphic rock after the dice rolled to the option of high heating?

Answer : Metamorphic rock transformed into magma.

Image reference :

Dice - <https://pixabay.com/vectors/dice-games-play-1294902/>

Reference :

<https://www.nasa.gov/sites/default/files/rockingtherockcycle.pdf>

Time to teach	Asset Type	Theme	SubTheme
30 Minutes	Suggested Activity	Solar system & the earth	Lithosphere, Interior Of The Earth, Rocks and Minerals, Lithosphere, Interior Of The Earth, Rocks and Minerals

13. QA_ Interior of The Earth And Types of Rocks

Notes to teacher : Students will be encouraged to answer as many questions as possible, before revealing the answers on the PPT. They may be asked to note down the lyrics of the Rock Cycle song provided in the PPT. As a homework, students may be asked to learn the lyrics of the song.

1. Fill up the blanks:

- The continental mass is made up of _____ and _____.
- Percentage wise volume coverage of the crust is _____.
- Molten lava comes on the surface and forms _____.
- Remains of the dead plants and animals trapped in the sedimentary rocks are called _____.
- Rocks are made up of different _____.

Answers:

- Silica, Aluminium
- 1%
- igneous rocks
- fossils

e) minerals

2. State whether the following are true or false.

(Note to teacher : Correct answers for 'false' statements may be provided)

- a) Sedimentary is a Latin word meaning rising up
- b) When lava cools rapidly, it forms intrusive igneous rocks
- c) Sandstone is an example of sedimentary rock
- d) Metamorphic rocks are formed from igneous rocks only
- e) The outer and inner core is collectively known as NIFE

Answers :

- a) False; It means settling down
- b) False; extrusive igneous rock is formed
- c) True
- d) False; It is formed from igneous and sedimentary rocks
- e) True

3. Watch a video to answer question 3 a, b and c.

(Notes to Teacher: The video is only for Question no. 3

- Teacher will play the video before displaying the question based on the video
- If required, the video may be played more than once for the students to watch it carefully
- Arrangements for playing the Video may be done before the class begins.)

- a) What happens to the igneous and sedimentary rocks when they are affected by weathering?

Ans. The igneous and sedimentary rocks are broken into smaller fragments and eventually reduced to sediments.

b) What kind of rock is formed when layers are deposited in layers?

Ans. The layers when deposited and compacted forms Sedimentary rocks

c) Why does a rock change into another rock over a period of time?

Ans. A rock undergoes a number of processes like weathering, erosion, heat, pressure and melting which transforms the rock into a different kind.

4. Describe the Mantle and the Core of the Earth.

Answer:

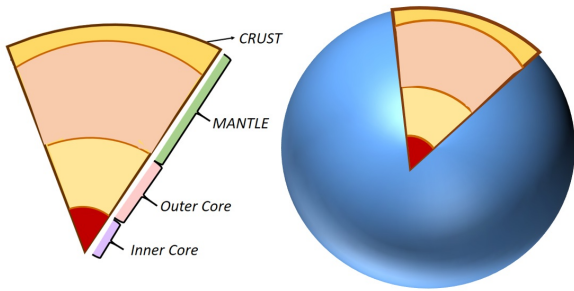
Mantle

- It extends up to a depth of 2900km inside the earth
- The mantle is located just below the crust
- Out of the total volume of the earth the mantle constitutes 84%
- Mantle is divided into upper and lower mantle.

Core

- The distance from the surface of earth to the centre of the earth or inner core is almost 6000 kms
- The outer core is 3000 kms away from earth's surface
- The core makes up 15% of total volume of the earth
- The radius of the inner core is almost 3500 kms
- The main mineral constituents of the core are Nickel (Ni) and Iron (Fe). core is hence named as **NIFE**.

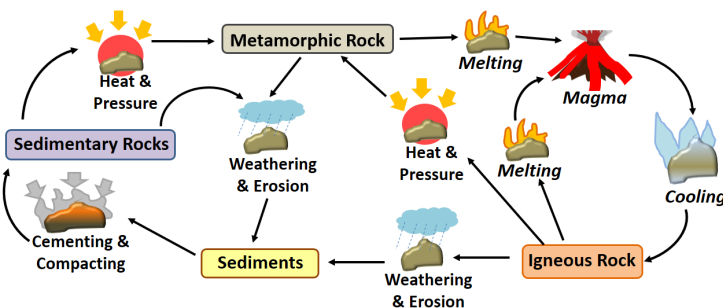
5. Draw a suitable diagram showing the layers inside the earth.

Answer:

6. What changes take place to the different types of rocks in a rock cycle? Explain with a diagram.

Answer:

- In a rock cycle *igneous rocks* and *metamorphic rocks* changes into *sedimentary rock* due to weathering and erosion
- *Igneous* and *sedimentary rocks* changes into *metamorphic rock* when high temperature and pressure acts on them
- *Metamorphic rocks* and *sedimentary rocks* melts to form magma due to high heat and when the magma solidifies, it form *igneous rocks*.



(Notes to Teacher: The rock cycle song given in the video may be learnt by the students and performed by them in the school campus on a **Science Day**. The song lyrics is provided below for the convenience of the students.)

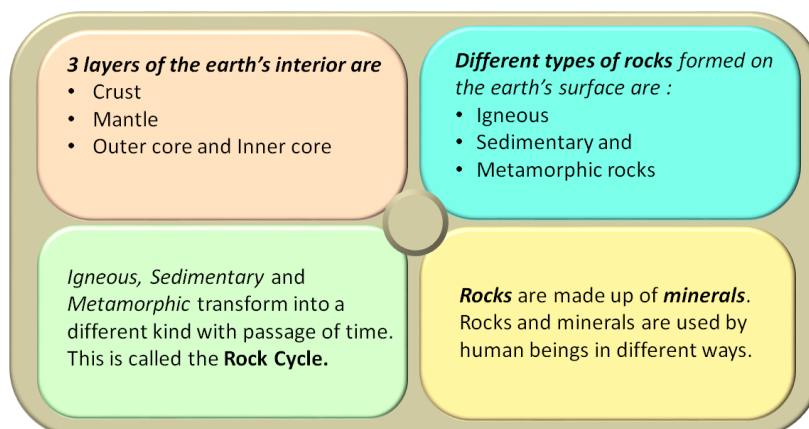
Rock Cycle Song - Lyrics

Igneous rocks are born with the earth Molten lava cools and hardens for rebirth Then these rocks are broken apart Into fragments and smaller parts <i>(La la la la la la la... la la la la la la la)</i> Sediments formed from these smaller rocks Grind and break up into finer parts Sedimentary rocks, how you form? Deposition & compaction is how I form. <i>La la la la la la la ...la la la la la la la</i>	Igneous and sedimentary rocks Changes into Metamorphic rocks Pressure and temperature acts on them and Change the nature we found in them <i>(La la la la la la la... la la la la la la la)</i> High heat acts on all the rocks and Melts them to form igneous rocks This is a cycle that rocks go through As each rock interchange and renew
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Image reference:

Erupting volcano - <https://pixabay.com/illustrations/disaster-hazard-forest-fires-5545306/>

Time to teach	Asset Type	Theme	SubTheme
15 Minutes	Assessments	Solar system & the earth	Lithosphere, Interior Of The Earth, Rocks and Minerals, Lithosphere, Interior Of The Earth, Rocks and Minerals

14. MS_Summary_Inside our Earth**LET US SUMMARISE**

- The different layers of the earth's interior are the **Crust, Mantle, Outer core and Inner core**. The crust is further divided into continental and oceanic crust.
- The crust of the earth, consists of **different types of rocks formed** through different natural processes. Three types of rocks found are **igneous, sedimentary and metamorphic** rocks.

- Each rock gets transformed into another rock with the passage of time. This is called the '**Rock Cycle**'.
- Rocks and minerals are used by human beings in different ways as construction materials, in manufacturing utensils, in electrical gadgets, manufacturing of aircrafts, making jewellery, toothpastes and many more.

Time to teach	Asset Type	Theme	SubTheme
3 Minutes	Main Script	Solar system & the earth	Lithosphere, Interior Of The Earth, Rocks and Minerals, Lithosphere, Interior Of The Earth, Rocks and Minerals

Master Lesson Plan

Seven Asset Methodology for MLP

What is the purpose of this Master lesson Plan?	This Master Lesson Plan (MLP) prepared by Sri Sathya Sai Vidya Vahini (SSSVV), covers the entire chapter for the given board. The MLP for the chapter given in the textbook is broken down into smaller modules known as assets. Any chapter can be taught using the 7 asset types in SSSVV methodology. Several different assets together complete the entire chapter. Depending on the requirement, each asset is supported by teaching aids such as animated presentation, audio, video, and learning aids such as worksheets. The MLP is for the teacher's preparation and the teaching aids are for use in the classroom.
How to use it?	You can prepare for your class with this MLP by following 3 simple steps: 1. Read your textbook; 2. Go through the information given in the assets (document & multimedia); 3. Prepare your teaching notes. Great! Now you are ready to transact the chapter.
Duration	Kindly note the duration given for each asset. Due care has been taken in planning the assets, to ensure the chapter is completed within the time specified by the Board. Note: Preparation time is not included in the asset duration. The teaching time depends on the duration of the teaching aids and is not impacted by the length of the MLP.
What is a 'Main Script' (MS) Asset?	The Main Script asset is there for explaining the main concepts of the chapter clearly. The information given in the textbook is simplified, organised and structured to give more clarity. Additionally, you may find a video or mnemonics or a graphic organiser to deepen the understanding of the concept.
How to teach using the MS asset?	Please use the blackboard, slides and interaction to develop the concept.
What is an 'Inquisitive Questions' (IQ) asset?	The Inquisitive Questions asset uses questions to promote higher order thinking like the n^{th} why, what-if, new perspectives, cause-effect, and others, creating curiosity.
How to teach using the IQ asset?	You may use the questions to connect with the students, encourage exploration to engage them in the learning process. You may allow multiple responses and instead of rejecting any of the responses, ask why, before revealing the suggested answer or hints.
What is a 'Day to day Relevance' (DD) Asset?	The Day to Day Relevance asset helps students understand the practical relevance of every topic, making them eager participants in the classroom. If students connect the concepts to their environment, they would learn meaningfully without dislike or simply memorizing for exams.

How to teach using the DD asset?	You may use the asset by asking questions about their experience and use it to establish why they are learning the topic. If necessary you may substitute with a recent or local example.
What is an 'Interesting Aside' (IA) asset?	The Interesting Aside asset uses attention grabbing titbits or anecdotes to bring joy and satisfy the child's hunger to know more. This is a quick/short asset intended to bring attention back to the main concept being taught.
How to teach using the IA asset?	You may use this asset to give a piece of interesting information relevant to the topic, without prolonged explanation/discussion. You may suggest appropriate books for further reading.
What is a 'Suggested Activity' (SA) Asset?	The Suggested Activity asset provides a detailed step by step procedure for the teacher to conduct a hands-on activity. This promotes Activity Based Learning.
How to teach using the SA asset?	You may use this asset to energise your students to learn by doing simple, fun-filled activities based on the topic. The asset includes - preparation, activity, and follow-up. You may engage the students in the preparation and follow-up stages to develop collaboration and responsibility. You could try it once, yourself, before the actual delivery to be more comfortable with it. Note: The duration mentioned in the asset is usually for the activity part only.
What is a 'Value Content' (VC) Asset?	The Value Content asset integrates Universal Human Values (such as empathy, inclusivity, respect for nature that translates into responsible behaviour) seamlessly into the curriculum, as the "End of education is character".
How to teach using the VC asset?	You may use this asset to engage with the students to bring out their innate values and connect with the intrinsic values in the topic/concept. The asset includes pointers on the specific pedagogical technique followed.
What is a 'Questions to Assess' (QA) asset?	The Questions to Assess asset uses an interactive approach to check learning of different types of learners, and provides feedback to the teacher for appropriate action. The questions cater to all the levels of Bloom's Taxonomy. Questions from 'Apply' level and above enable students to reflect on their learning.
How to teach using the QA asset?	You may go through the slides to understand its flow and know when to click for the answer (slides include suggested answers). While presenting in the class, you may display the question and encourage multiple responses, before revealing the answer. In some cases, this asset may include extra questions/worksheet that can be given as homework.