Science Notebook

Rocks and Volcanoes Unit

- Rocks
- Volcanoes
- Project: Timeline

NAME:

Monday	Tuesday	Wednesday	Thursday	Friday

Introduction to Earth and Space Science

North Mason High School

Rocks and Volcanoes

MAJOR TOPICS OF STUDY:

- **Earth, Mantle, Core**
- **Types of Rocks**
- **Types of Volcanoes**

IMPORTANT VOCABULARY:

igneous	sedimentary	metamorphic
crust	fold	volcano
magma	lava	tsunami
theory	anticline	syncline
fault	cinder cone	shield cone
composite cone	extrusive rock	intrusive rock
basalt	granite	mafic
felsic	strata	core
mantel	mountain	

CONTENT OBJECTIVES AND END OF UNIT PROJECT:

During this unit you will explore the field of geology. You will learn about rocks, the Earth, and volcano formation. You will learn about types of rocks through an analysis of examples, volcanoes through notes and videos, and will begin to understand how the earth is shaped. The project for this unit will consist of creating a timeline of events that have occurred over the past 4.5 billion years. This will allow you to explore the relationship between time and various events of Earth's past.

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Chapter 11.1

State Standard: *Explain how* a given landform (e.g., mountain) has been shaped by processes that build up structures (e.g., uplift) and by processes that break down and carry away material (e.g., *weathering* and *erosion*).

Read Chapter 11.1 pg 218-222 and answer questions 1-5.

1. Name the three groups of rocks.

2. How is sedimentary rock formed?

3.
   a. What is a fold?

   b. Sketch and label an anticline and a syncline.

4. What is a fault?

5. Name a process that may push rock upward to form a mountain. Describe a piece of evidence that suggests this process has occurred.

Types of Rocks Notes

State Standard: Identify samples of *igneous*, *sedimentary*, and *metamorphic* rock from their *properties* and *describe* how their *properties* provide *evidence* of how they were formed.

What are Rocks?

- A rock
- Rocks
- Rocks

Igneous rocks:

- Igneous rock begins

Magma can form

- When
- When
- When
- Magma freezes between _____ and _____
- Magma

Felsic:

Mafic:

Coarse-grained:

Fine-grained:

Granite is:

Rhyolite is:

Gabbro is:

Basalt is:

Intrusive Igneous Rocks:

Extrusive Rocks:

Sedimentary Rocks:

- Sedimentary rock
- Sediments
- Sediments
- The layers
- Sedimentary
- No heat

Strata:

Stratification:

Clastic:

Chemical Sedimentary:

Organic Sedimentary:

Metamorphic Rock:

- Meaning
- Changes
- Usually

Contact metamorphism:

Regional Metamorphism:

- Large

Foliated:

Non-foliated:

Rock Identification Lab:

At this point you should have a good understanding of the rock cycle, the 3 main classifications of rocks (sedimentary, metamorphic, and igneous) and the forces/processes that change them. This lab will help you gain a basic understanding of the characteristics used to classify rocks within these groups. Now you are going to attempt to use that information to identify individual rock names.

In this lab you will be using dilute HCl (hydrochloric acid) since this is an acid and it can cause skin and eye irritation safety precautions are required. Safety goggles and gloves will be worn. Do not touch, taste or smell the solution in the beaker or on the rocks. Use only the required amount 1-2 drops.

Objective:

To identify unknown rock samples

Materials:

10 rock samples numbers 30-50 only
beaker of dilute HCl
paper towels
safety goggles

Procedure:

1) Choose one of the rocks. Observe its texture, color, crystal size and composition with and without the hand lens. Record your observations in the data table.

2) Use the key to rock classification table below to classify your rock. Begin by reading the first questions. Answer Yes or No based on your observations.

3) After the words Yes or No, you will find directions to proceed to another question, or you will discover to which group of rocks your specimen belongs. If you find directions to proceed to another question, go to that question, answer it, and follow the directions.

4) Continue working through the key in this way until you come to a statement that allows you to classify your sample rock.

NOTE: before proceeding to answer Question 8 in the Key to Rock Classification, see your teacher and follow these cautions.
CAUTION: All team members must wear safety goggles. Only the student using the HCl needs to wear disposable gloves. Do not handle the rocks after you put HCl on them without gloves. Put the rock on a piece of paper towel and place a single drop of HCl on the rock. If no reaction is observed place another single drop on the rock. When done pat the rock dry with a paper towel then rinse the rock in tap water. Properly dispose of the gloves and paper towel.

5) In your data table record the route you took to identification using the numbers for each question answered. For example your route could be "1,4,5". Then complete the Group Identification in this example it would be "extrusive igneous" and the Rock Name would be "obsidian". If more than one rock name is listed, use your tables in your textbook to identify the rock name.

6) When you have identified all your rock samples, remove safety goggles, remove and dispose of your gloves.

KEY TO ROCK CLASSIFICATION

1. Does the rock contain visible connecting crystals?	Yes: Go to question 2. No: Go to question 4.
2. Are all of the crystals the same color and shape?	Yes: The rock is a nonfoliated metamorphic rock (possibly marble or quartzite) No: Go to question 3.
3. Are all of the crystals in a mixed "salt and pepper" pattern?	Yes: The rock is an intrusive igneous rock (possibly granite or diorite) No: The rock is a foliated metamorphic rock (possibly schist or gneiss)
4. Is the rock glassy (does it resemble broken glass)?	Yes: The rock is an extrusive igneous rock (obsidian) No: Go to question 5.
5. Does the rock have flat thin layers that can be broken apart?	Yes: The rock is a foliated metamorphic rock (slate). No: Go to question 6.
6. Does the rock contain many small holes or have a uniform dark color?	Yes: The rock is extrusive igneous rock (possibly pumice or basalt) No: Go to question 7.
7. Does the rock contain pebbles, sand, or smaller particles that are cemented together?	Yes: The rock is a clastic sedimentary rock (possibly conglomerate, sandstone or shale). No: Go to question 8.
8. Does the rock fizz when dilute HCl is dropped in it?	Yes: The rock is chemical or organic sedimentary rock (limestone or chalk) No: Ask your teacher for assistance.

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Data Table

Sample #	Description	Route to Identification	Group Identification	Rock Name
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Analysis and Conclusions

1) Compare your results to one other group. Do their results support or not support yours? What was different?

2) How difficult was it to use the classification key and tables to identify your rocks? What problems did you encounter?

3) How useful was rock color in classifying the rock samples? Explain.

4) Which two rock samples were the easiest to identify? What properties made it easy?

5) Which two samples were hardest to identify? Why?

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Chapter 11.2 Reading Guide

State Standard: *Explain how* a given landform (e.g., mountain) has been shaped by processes that build up structures (e.g., uplift) and by processes that break down and carry away material (e.g., *weathering* and *erosion*).

Read Chapter 11.2 pg 224-231 in your textbook and answer the following questions.

1. What is a volcano?

2. Molten rock found in the earth is called _____ while molten rock found on the earth's surface is called _____.

3. The Parícutin volcano grew _____meters tall and _____ meters across at the base.

4. Look at figure 11. 8 and draw a diagram of the type of volcano indicated. Be sure to label the parts and provide the name of an example of each kind of volcano.

Cinder Cone	Shield Volcano	Composite Cone
Example:	Example:	Example:

5. The most common igneous rocks on Earth is _____.
6. What area of the country does the Columbian Plateau cover?

7. Describe the difference between extrusive igneous rock and intrusive igneous rock.

8. What are batholiths? Which mountains were created by batholiths?

9. What is one way that volcanoes can be predicted?

10. What effects did Mt. St. Helen's have on Washington State?

11. By studying the volcanoes, we can learn

_____

_____.

12. CERT stands for _____ _____ _____ _____

13. FEMA stands for _____ _____ _____ _____

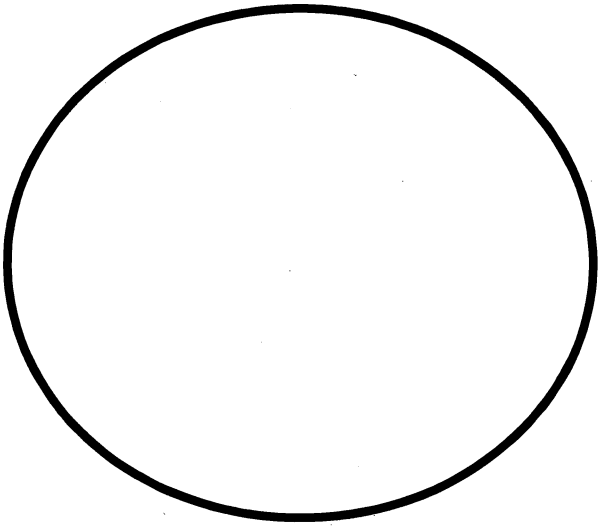
14. All volcanoes are located on _____ and none are located in _____ or _____ of North America.

Earth Shape and Type of Volcano Notes

State Standard: Sketch and label the major layers of Earth, showing the approximate relative thicknesses and consistency of the *crust, core,* and *mantle.*

Earth Shape

Geology –
geo –
ology -



Metamorphic –

Igneous –

Sedimentary –

Geography of Mountains

No Volcano	Volcano

Mountain Formation (no volcano)	Mountain Formation (volcano)

Volcano Types

Shield	Cinder Cone	Composite

Volcano Assignment Requirements

1. Cut out all the strips of paper.
2. Organize them into their correct groups and place the type of volcano at the top.
    a. Have your teacher check BEFORE going on to the next step.
3. Glue them to a piece of paper, one per volcano type.
4. Draw a diagram of the volcano on the back of the paper. (pg 225) You must add color.

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Mt. St. Helen's Back From The Dead Video Questions:

Read and answer the following questions.

1. How many miles of life were destroyed by Mt. St. Helen's blast?

2. How big was the earthquake that rocked the mountain?

3. How many people died in the explosion?

4. How far did the avalanche life the lake bed?

5. Define a stratovolcano. (this is not in the video, but in your notes)

6. Describe the process of how a stratovolcano is formed (this is in the video)

7. How long did it take for life to come back? What was the first animal to come back?

8. What is growing out of the volcano that the time laps camera caught on tape?

9. What did Chris find in the middle of the pumice plain?

10. How much did the lava dome grow over the winter?

11. How often were earthquakes happening on the mountain?

12. How long does the cycle of dome building continue for?

13. How long did it take for phytoplankton to come back to the lake?

14. What are the new threats that immerge as life is returning to the mountain? What proof did the scientists have?

15. What are pushing their way out of the ground?

16. What gives volcanoes their explosive force?

17. How are the three types of lava different from the three types of eruptions?

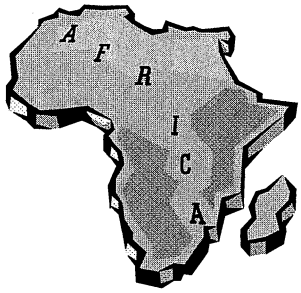
18. How do scientists use the rock walls to discover the history of the mountain?

19. When will the mountain erupt again?

20. What is the take-home message about ecology in studying the mountain?

Visualizing Time in a Biological Context

How long is a million years? How long is a billion years? The vast amount of time that has passed since the origin of Earth is difficult for most people to imagine. However, when events in time are considered in relationship to one another, the concept of time is easier to grasp. A timeline helps to place events in context with one another so that the vast amount of time can be understood more easily.



YOUR TASK:

In this activity, you will construct a timeline of the events that have occurred during the past 4.5 billion years. This will allow you to explore the relationship between time and various events of Earth's past. ***Be creative in your drawings and diagrams on your timeline. You will be graded on effort and creativity.***

MATERIALS: White paper (5 sheets), transparent tape, Metric ruler

PROCEDURE:

1. Line up the short ends of five sheets of paper with the ends overlapping slightly. Tape down the edges to produce one long piece of paper.

2. Turn the sheet over and draw a line that is **125 cm long**. Label the left end of the line "5,000,000,000 years" and the right end "present". EACH 25 cm ON THIS LINE REPRESENTS 1 BILLION YEARS. (Refer to diagram below).

Timeline:

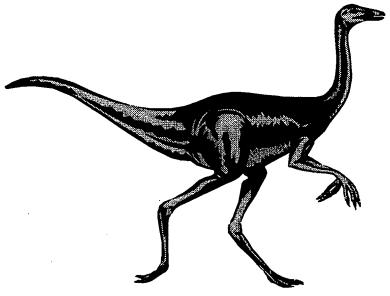
5,000,000,000_____Present

125 cm

3. One billion written in scientific notation is 1×10^9. Five billion, 5,000,000,0000, can also be written in scientific notation and is written 5×10^9. Mark and label each 1 billion year increments on your timeline.

4. Using the list of geologic events on the next page, sort the events in Earth's history from the oldest event to the most recent.

5. Transfer the sequence of events to your timeline. Remember each 25 cm increment on your timeline represents 1 billion years.

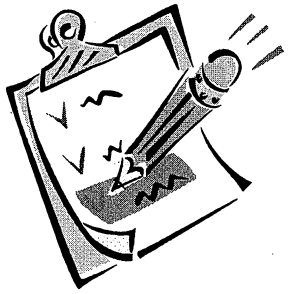


6. On your timeline draw a picture (colored, detailed, and neat) for at least ***6 events.***

7. On your timeline – write a paragraph about an event you would have liked to witness. Discuss why it would be cool to have been there. 5-6 sentences.

LIST OF GEOLOGIC EVENTS TO PLACE ON YOUR TIMELINE

Place the events in order by numbering them from 1-15 with 1 being the oldest and 15 being the youngest. Place this number in the right column in the table below.



Earth's Formation	**4.5 billion years**	
Art Drawn in Caves	**30,000 years ago**	
Significant Oxygen in the Atmosphere	**1.5 billion years ago**	
Formation of Pangaea	**250 million years ago**	
Continents reach present positions	**55 million years ag0**	
First Birds	**200 million years ago**	
First Mammals	**225 million years ago**	
Invention of Spears	**300,000 years ago**	
Breaking apart of Pangaea	**200 million years ago**	
Invention of Writing	**5,000 years ago**	
First Reptiles	**310 million years ago**	
Dinosaurs Appear	**240 million years ago**	
Eruption of Mount St. Helens	**33 years ago**	
First Fish	**505 million years ago**	
Beginning of Agriculture	**30,000 years ago**	

Grading Rubric for Biological Timeline

This activity is worth 50 points:

Accuracy/Correct order of events:

0 4 8 12 15

Effort/Creativity:

0 4 8 12 15

Drawings – Neat, Well done, Vivid Color:

0 2 6 8 10

Paragraph of Event to Witness:

0 2 4 8 10

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Chapter 11.3 Reading Guide

Read Chapter 11.3 pg 233-236 in your textbook and answer the following questions.

1. Earth quakes last for how long, normally?

2. The earthquake that occurred in Alaska happened in _____?
3. What happened to the gas and water lines? The buildings? The school? Homes on a cliff?

4. What was the furthest state that the quake was felt in?

5. More than _____ quakes occur per year.
6. The first paragraph in the Earthquakes and Faults section describes how earthquakes happen. Summarize that paragraph.

7. The San Andreas Fault moves _____ per year. During the 1906 quake it moved as much as _____.

8. What is a tsunami and how does it form?

9. What observations were put together in the 1960s?