

# Geology Topics Unit Notes

Name: \_\_\_\_\_

(PLEASE DO NOT LOSE!)

- Continental Drift: The gradual \_\_\_\_\_ of the \_\_\_\_\_ across the earth.
- Plate tectonics - The earth's \_\_\_\_\_ and upper mantle are broken into \_\_\_\_\_ called plates. These plates float on the mantle like rafts (moving very slowly)

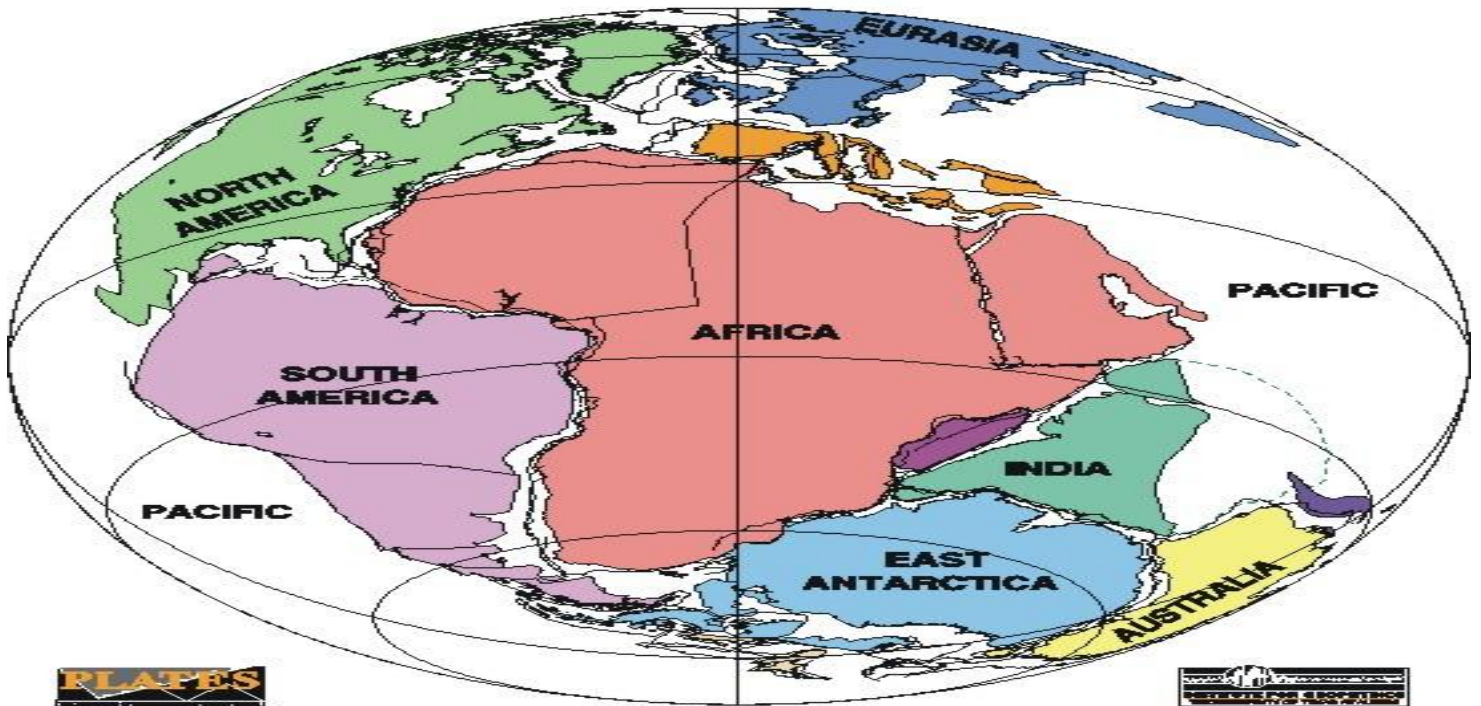
## Evidence for Continental Drift

- The Shapes \_\_\_\_\_
- Same \_\_\_\_\_ found on different continents
  - These are the pictures on the puzzle pieces.
- The \_\_\_\_\_ rock structures on different continents
- Fossils of \_\_\_\_\_ and Animals in Antarctica
- M\_\_\_\_\_ layers in sea floor spreading

Gondwondaland and Laurasia were two mega \_\_\_\_\_ before P\_\_\_\_\_.

Pangea – The “Super Continent” All of the plates were once \_\_\_\_\_.

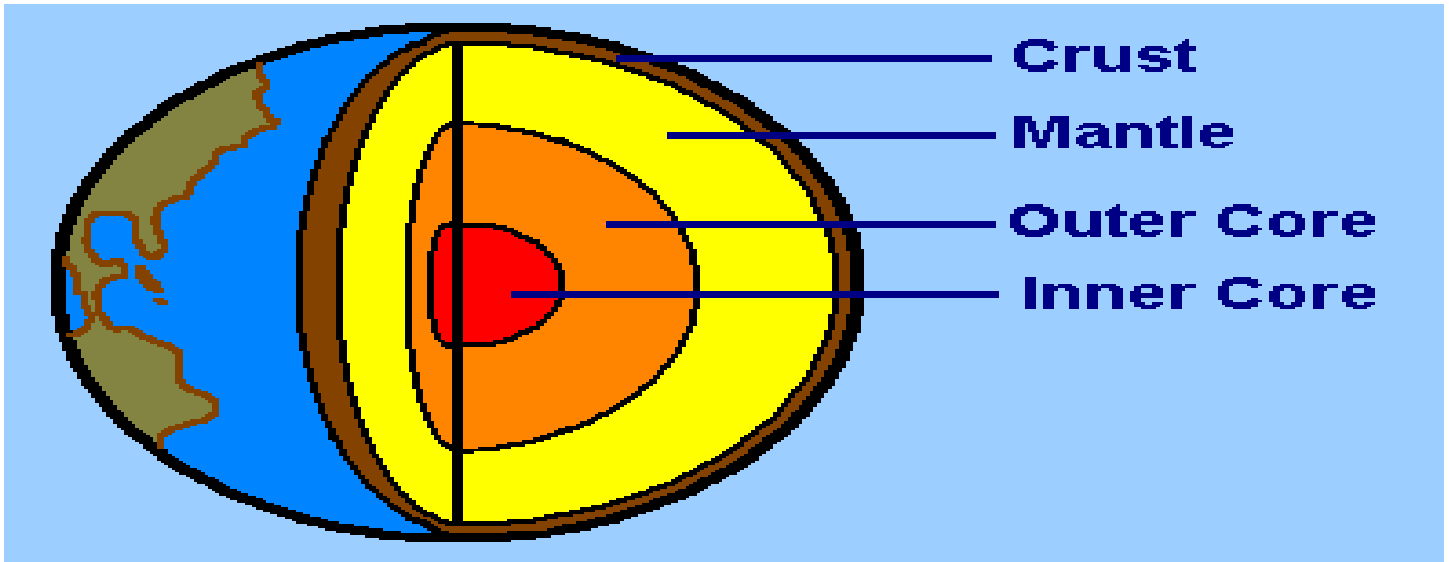
# PANGAEA



We know the material of the interior of the earth based on how \_\_\_ and \_\_\_\_\_ waves move through planet.  
(Both Body Waves)

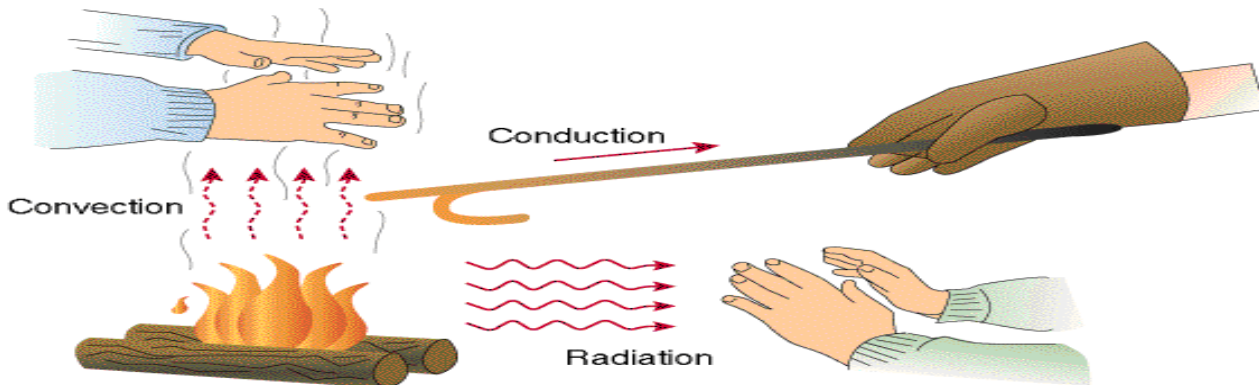
- P Wave: P\_\_\_\_\_ wave. Moves lateral and faster.
- S Wave: S\_\_\_\_\_ waves. Stronger and moves back and forth (Slower moving than P)

Layers of the Earth



- Layers formed \_\_\_\_\_ in Earth System History (Archean Eon) G\_\_\_\_\_ pulled heavy elements toward the middle.
- Inner Core: S\_\_\_\_\_ Iron and Nickel (Dense).
- Outer Core: L\_\_\_\_\_ Iron and Nickel
- Mantle: Composed of Magnesium Silicates, \_\_\_\_\_, Calcium
  - Outer Mantle (asthenosphere)
- Lithosphere: The outer part of the earth, consisting of the \_\_\_\_\_ and upper \_\_\_\_\_.
- Lithosphere is broken into tectonic \_\_\_\_\_.

## Pictures for heat transfer



Convection: Vertical circulation in which warm \_\_\_\_\_ and cool \_\_\_\_\_.

--Flow of heat by this circulation.

Conduction: The movement of \_\_\_\_\_ from one molecule to another.

Radiation: \_\_\_\_\_ that is radiated or transmitted in the form of rays or waves or particles.

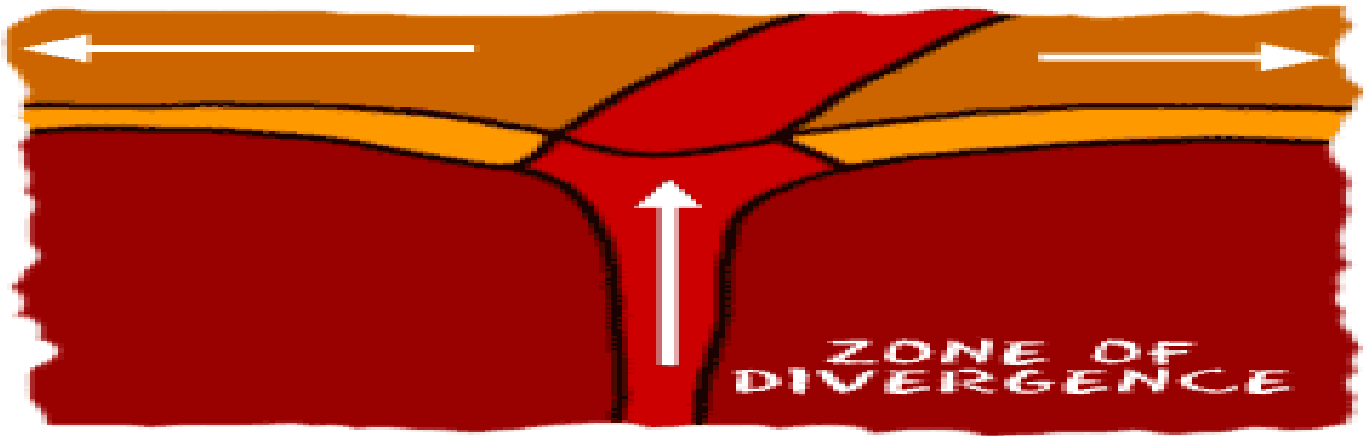
The two types of Crust

O \_\_\_\_\_ Crust (Basalt) Denser

C \_\_\_\_\_ Crust (Granite) Less Dense

## PLATE BOUNDARIES

**Divergent Boundaries:** At divergent boundaries new crust is created as two or more plates \_\_\_\_\_ away from each other.

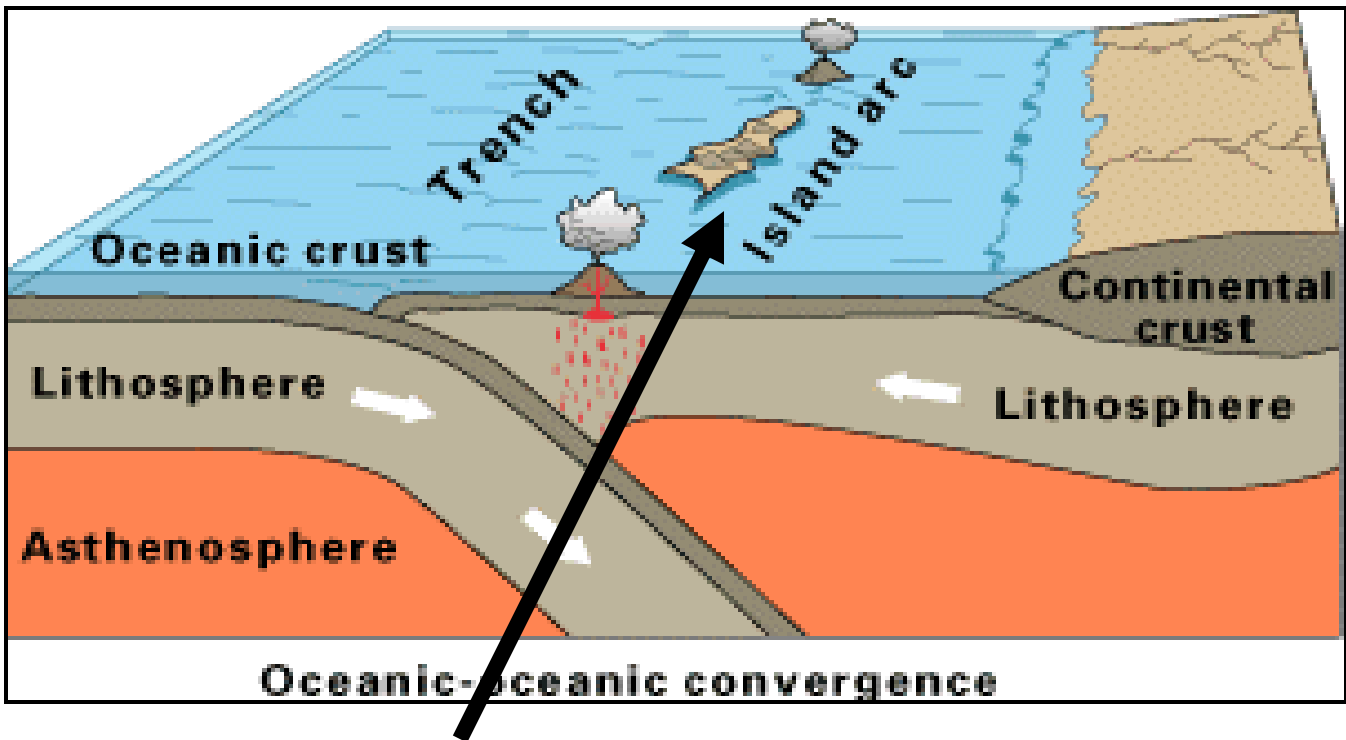


Mid-Atlantic Ridge is like a baseball because it \_\_\_\_\_ the earth, showing the places where new earth is formed.

Convergent Boundaries: Here crust is destroyed and recycled back into the interior of the Earth as one plate dives \_\_\_\_\_ another.

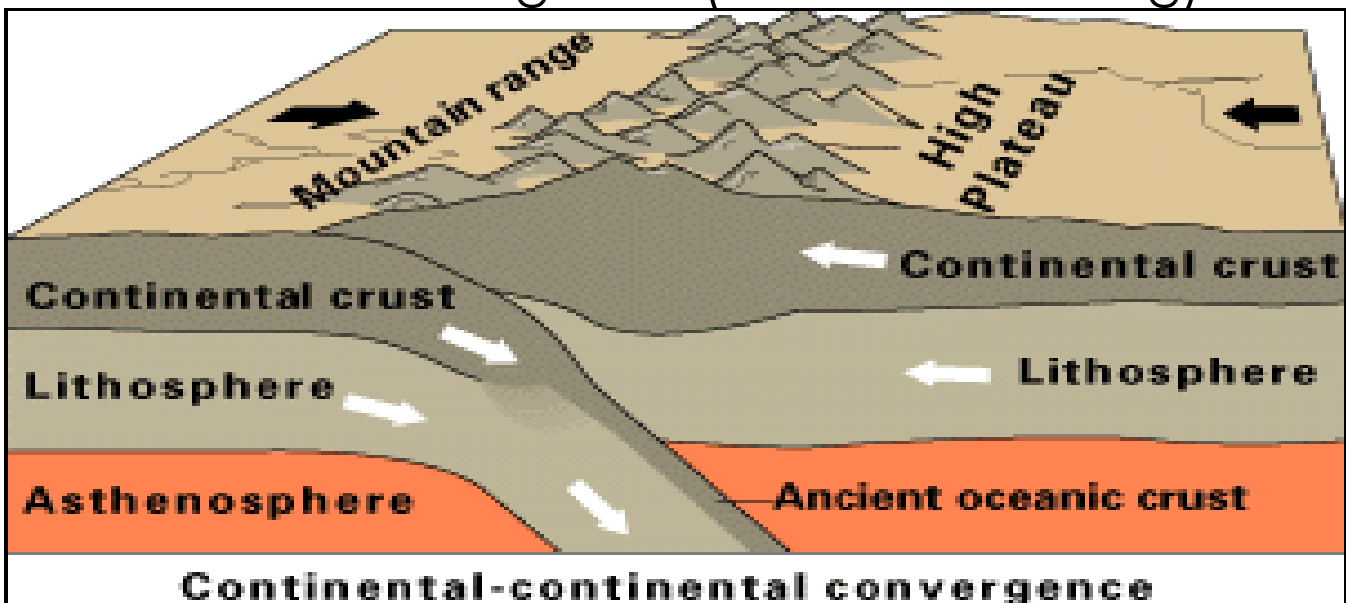


Ocean Convergent: Two ocean plates \_\_\_\_\_ and one goes under the other.

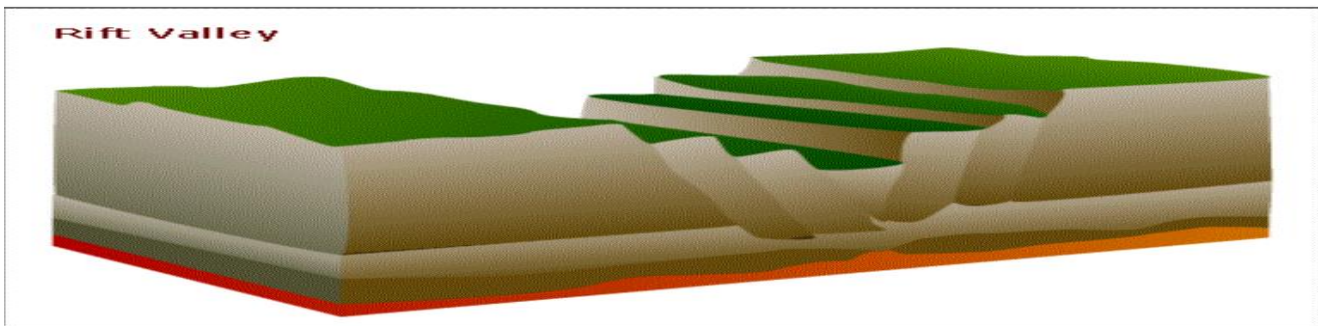


Archipelago (Island Arc) – Group of \_\_\_\_\_ islands formed from ocean crust convergence.

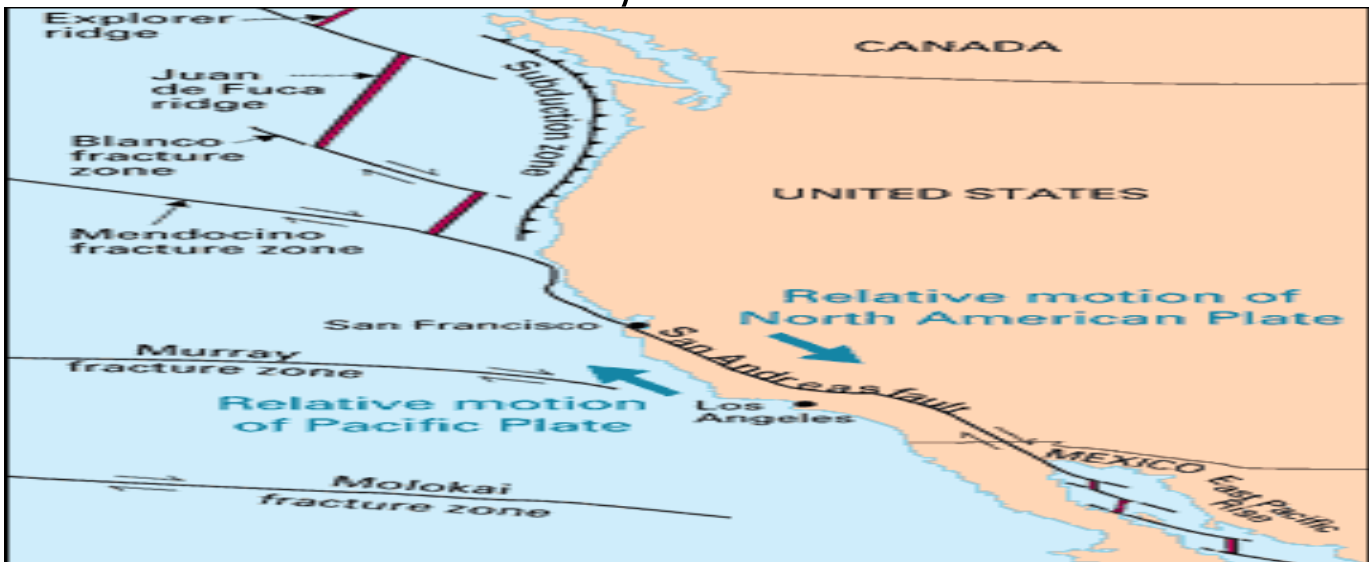
Continental Convergence (Mountain Building)



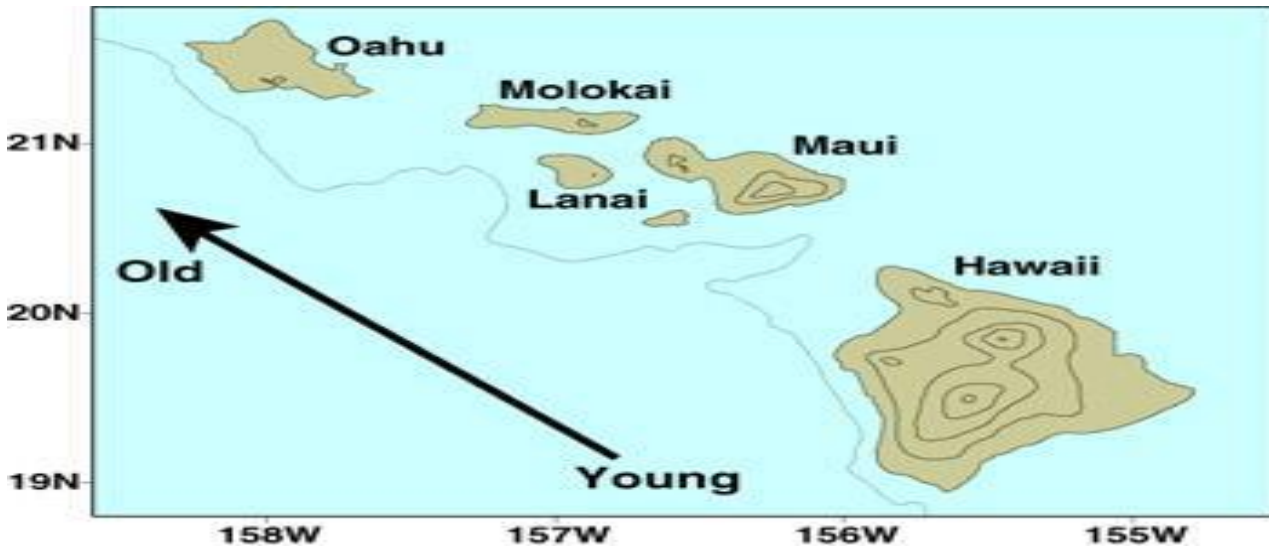
## Continent Divergence (Moving \_\_\_\_\_) Rift Valley



Transform-Fault Boundaries: Where two plates are sliding \_\_\_\_\_ past one another. (To be discussed more later)



Hawaii is caused by a hot \_\_\_\_\_: A location above an upwelling of \_\_\_\_\_ from the mantle.



## VOLCANOES

- Volcano - An opening in the Earth's crust through which molten \_\_\_\_\_ and \_\_\_\_\_ erupt.

### The Negatives of Volcanoes

- D\_\_\_\_\_ and Destruction
- Loss of land until...?, Permanent loss of structures.
- Release of poisonous and greenhouse \_\_\_\_\_.
- Eruptions can have a tremendous impact on global \_\_\_\_\_.
- The positives of volcanoes
  - New \_\_\_\_\_ is formed
  - Release of healthy \_\_\_\_\_
  - Many \_\_\_\_\_ and ores worth \$



-Hominids used obsidian (cutting tools) to advance

-Volcanic ash \_\_\_\_\_ land

-Volcanic eruptions formed oceans and early

\_\_\_\_\_  
-T\_\_\_\_\_

## Types of Volcanoes

F\_\_\_\_\_

Shield – Olympus Mons on Mars Ex.

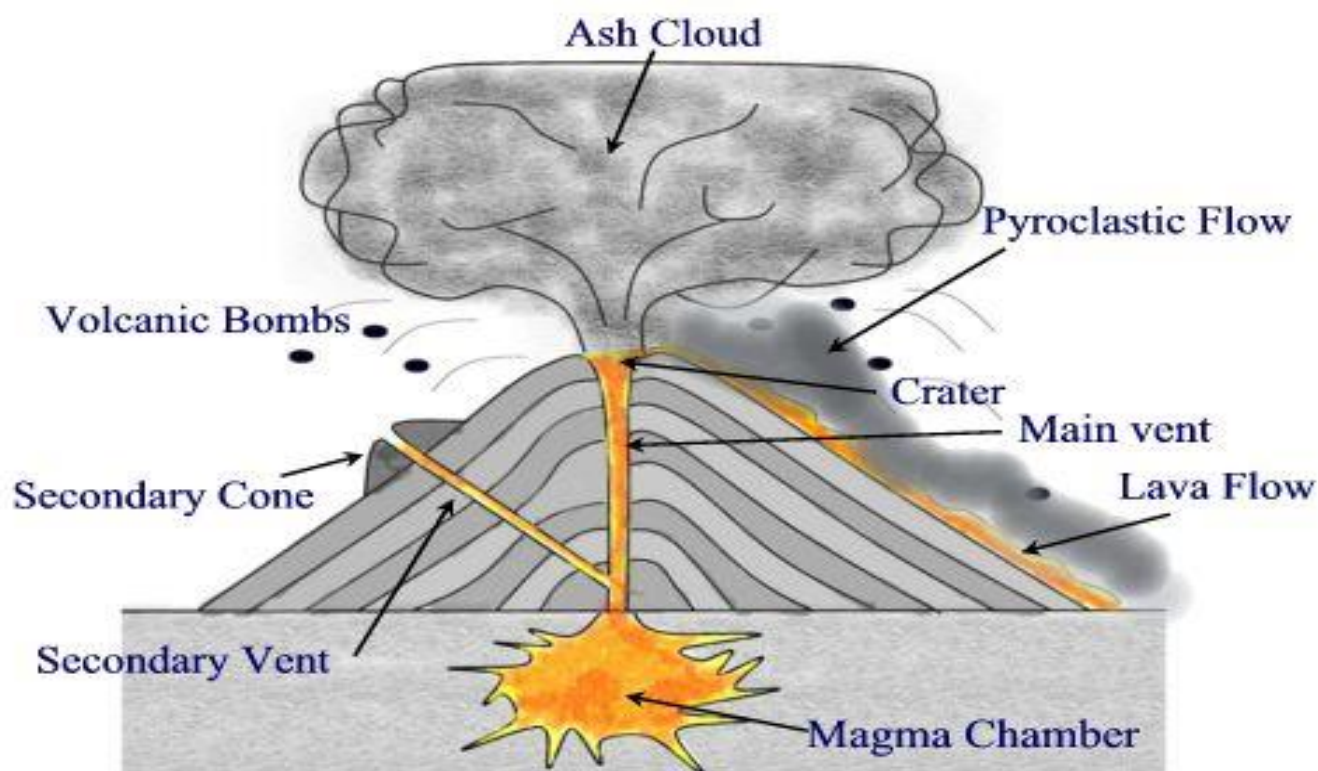
Dome

Ash \_\_\_\_\_

Composite

Caldera: Large \_\_\_\_\_ caused by the violent explosion of a volcano that collapses into a depression.

## PARTS OF A VOLCANO



### **Main Features of a Volcano**

Pyroclastic rock: Rock \_\_\_\_\_ from volcano

Lahar - A flow of volcanic ash and water.

Magma is \_\_\_\_\_ the earth's surface

Lava is above the surface

### 3 Types of Lava

Felsic lava – High in \_\_\_\_\_. (sticky and chunky) Highly explosive.

Mafic lava – Flows more, high in \_\_\_\_\_.

Intermediate – Has a higher amount of silica (Silica = liquid quartz or sand)

Viscosity: Resistance of liquid to \_\_\_\_\_.

High viscosity = Travels \_\_\_\_\_ because of high resistance

Low viscosity = travels \_\_\_\_\_ because low resistance

Types of lava when cooled

'A'ā – R\_\_\_\_\_ lava, older and has crystalized, Pronounced “ahh ahh”

Pāhoehoe – Fresh lava, (Pa hoy hoy) Basaltic lava that is \_\_\_\_\_ and flowing.

New Area of Focus: Faults and Folds.

Orogeny: The formation of mountain ranges by intense upward \_\_\_\_\_ of the earth's crust.

- Usually associated with folding, thrust faulting, and other \_\_\_\_\_ processes.

Movement of tectonic plates

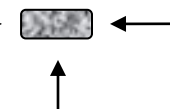
\_\_\_\_\_ each other causes the plates to fault and fold.

- Stress on a rock can be...

● Compression 

● Tension 

● Shearing 

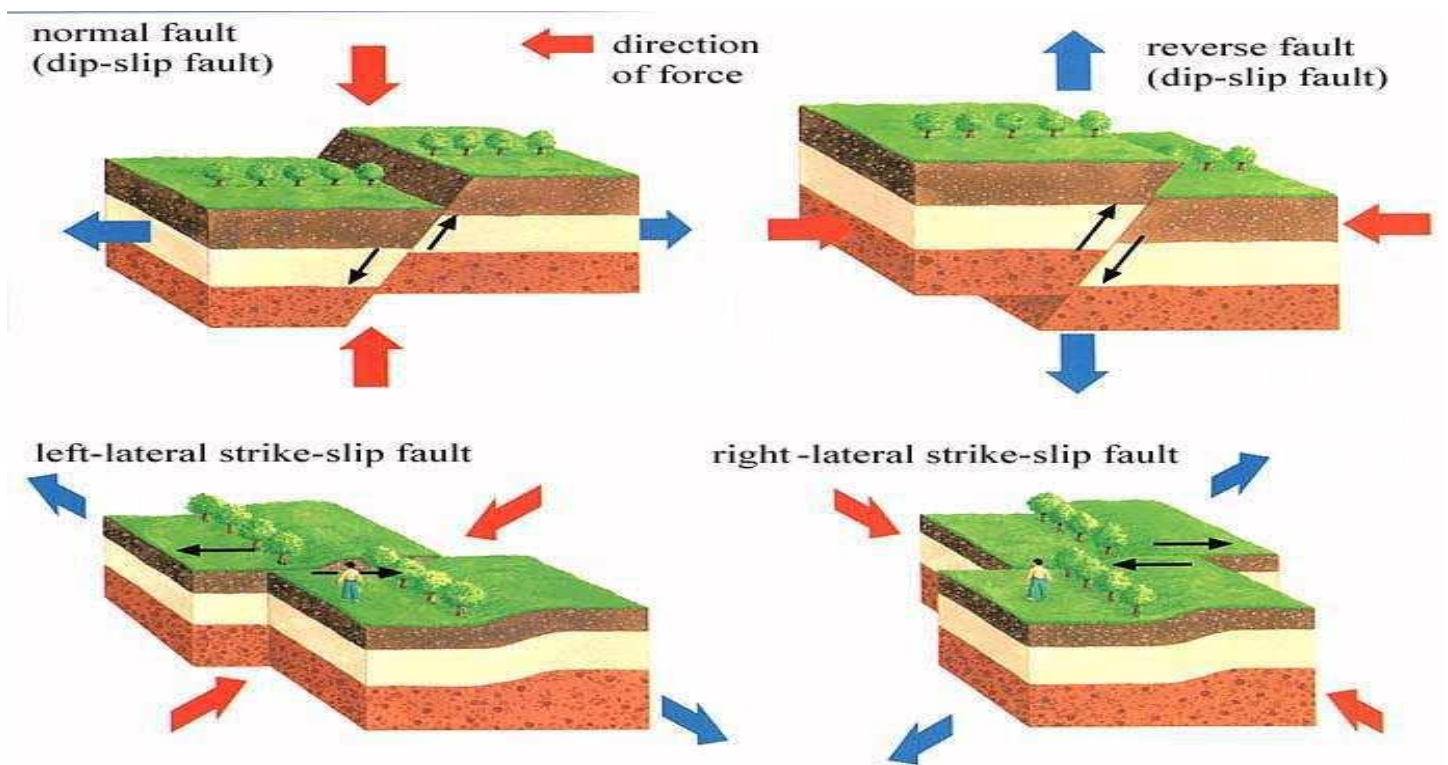
● Confining / Uniform 

- Fault – Break / c\_\_\_\_\_ where movement occurs.
- Fold – Collision of crust \_\_\_\_\_ rock layers “stress”

Normal Fault – Pulling \_\_\_\_\_ tension causes crust to drop down.

Reverse / Thrust Fault – C\_\_\_\_\_ forces cause crust to move up.

Lateral or Strike Slip Fault – Crust moves \_\_\_\_\_ each other in opposite directions.



## Types of Folds

- Compression
  - Anticline: ☹️ O \_\_\_\_\_ layer is at core of fold (Oil)
  - Syncline: 😊 Y \_\_\_\_\_ later is at core of fold (Water)
- Tension
- Sh \_\_\_\_\_

Earthquake – Shaking of the earth's crust from a sudden release of \_\_\_\_\_.

Seismograph - An instrument used to measure the \_\_\_\_\_ caused by an earthquake

Richter Scale - Scale for measuring earthquake m\_\_\_\_\_. A magnitude 7.0 earthquake generates \_\_\_\_\_ times larger amplitude waves than those of a magnitude 6.0.

Epicenter: The point on the Earth's surface that is directly \_\_\_\_\_ the hypocenter or focus.

- Just above the earthquake.

Tsunami - An ocean wave generated by a submarine \_\_\_\_\_, volcano or landslide.

- Can travel across whole oceans.

## ROCKS AND MINERALS

Rock – Mass or grouping of m\_\_\_\_\_

They can be big

They can be small

Used in buildings

In\_\_\_\_\_ (non-living)

Minerals are natural inorganic (non-living) \_\_\_\_\_ that join together (c\_\_\_\_\_ ) to make unique compositions.

A crystal is a solid in which the \_\_\_\_\_ are arranged in a repeating pattern.

Uses of minerals

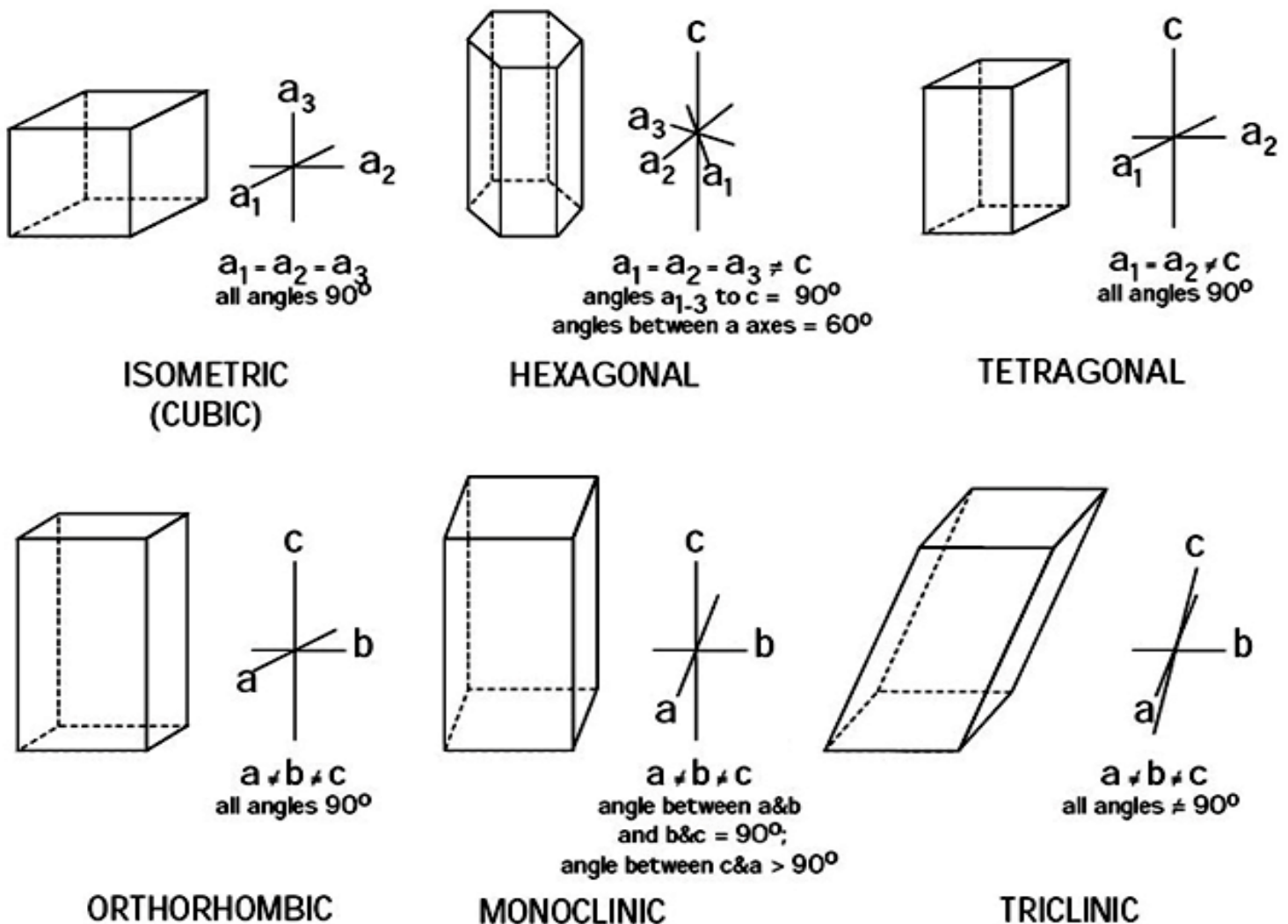
Gems \$

O\_\_\_\_\_, Mined for \$

Types of crystals.

- H\_\_\_\_\_. (Four axes, three are equal in length and lie at an angle of  $120^\circ$  from each other).
- T\_\_\_\_\_: (3 axis, all unequal and none at  $90^\circ$  angles).

- Or \_\_\_\_\_: (All axis unequal in length, and  $90^\circ$  degrees from each other).
- M \_\_\_\_\_: All axis unequal in length. Two of them are at right angles to each other, while the third is lies at an angle other than  $90^\circ$ .
- T \_\_\_\_\_. (Three axes, two are equal in length, one is unequal.)
- I \_\_\_\_\_: (All three axes are equal in length an at  $90^\circ$  degrees from each other.)



## Crystal Properties / Chemical Bonds

- **C**\_\_\_\_\_ **Crystals:** Covalent bonds between all of the atoms.  
Example: Diamond, Zinc Sulfide crystals.
- **M**\_\_\_\_\_ **Crystals:** Individual metal atoms of metallic crystals sit on lattice sites.
  - Many free electrons. High melting points.
- **I**\_\_\_\_\_ **Crystals:** The atoms are held together by electrostatic forces (ionic bonds).
  - Ex: (NaCl) table salt
- **M**\_\_\_\_\_ **Crystals:** Contains recognizable molecules within their structures.
  - Held together by non-covalent interactions, like van der Waals forces or hydrogen bonding.
    - Example – Sucrose in rock candy, ice cube

- Two main types of minerals

Silicate Minerals – Contain \_\_\_\_\_ and oxygen. 75% of all minerals.

Non-silicate minerals

Non-silicate minerals: All others.



Physical Property of Minerals- a characteristic that can be observed or measured without \_\_\_\_\_ the identity of the substance.

Luster – How light is \_\_\_\_\_ from a mineral.

- Metallic (shiny)
- or non-metallic (dull)

Hardness – How easily a mineral can be \_\_\_\_\_.

Color – Tells what \_\_\_\_\_ make up the mineral.

Streak – The \_\_\_\_\_ of the mineral when it is broken up and powdered

Specific Gravity – How \_\_\_\_\_ the mineral is?

The rock cycle – How one rocks \_\_\_\_\_ into another.

- Driven by continental \_\_\_\_\_ (plate tectonics)



heavier elements. Have more of the lighter elements. (S\_\_\_\_\_ and o\_\_\_\_\_, aluminum, and potassium) Feldspar

### Classification of Igneous Rocks

B\_\_\_\_\_ – Dark, heavy (dense), Iron

G\_\_\_\_\_ – Light colored, less heavy, filled with oxygen

A\_\_\_\_\_ – Between the two

### Common Igneous Rocks

Granite is Igneous Rock types include Q\_\_\_\_\_ and f\_\_\_\_\_

Basalt

Ob\_\_\_\_\_ – Glassy

Gabbro

Rhyolite

Metamorphic – Rock that \_\_\_\_\_ forms due to extreme \_\_\_\_\_ and \_\_\_\_\_.

### Common Metamorphic Rocks

Slate

Gniess

M\_\_\_\_\_

Schist

## Sedimentary Rocks

Sediments are c\_\_\_\_\_ and  
c\_\_\_\_\_ together

Caused by weathering, erosion, and deposition

Usually l\_\_\_\_\_

Layers can be from old living materials

(\_\_\_\_\_).

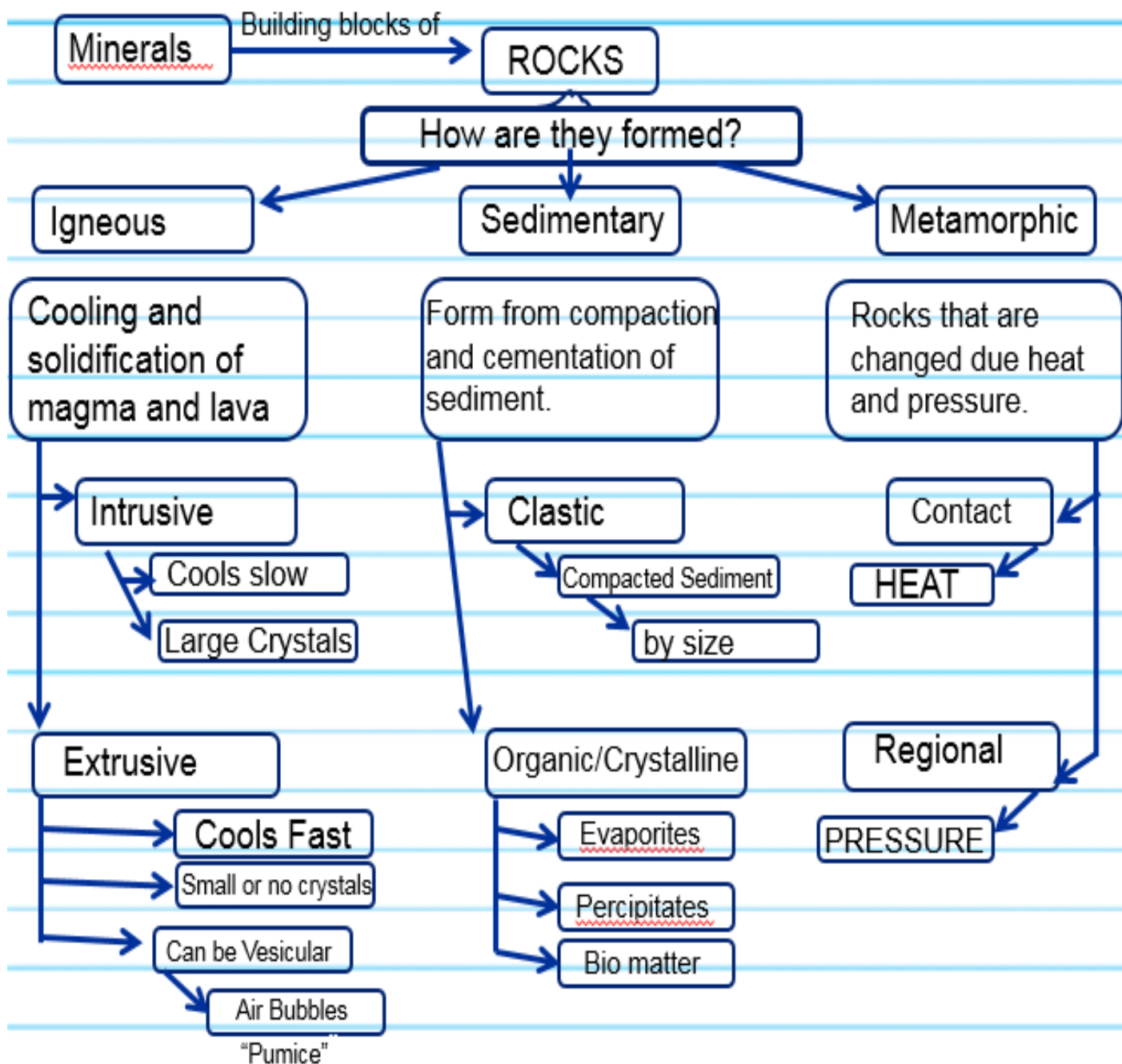
## Common Sedimentary Rocks

L\_\_\_\_\_

Sandstone

S\_\_\_\_\_

Conglomerate



## Earth System History

### Earth History Components

- Earth system history has \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_ components

- Uniformitarianism: Laws of nature have n\_\_\_\_  
c\_\_\_\_\_ over time.
- The system is fragile. Changes in living conditions for animals have been \_\_\_\_\_  
throughout earth's history.
- 99.5% of all things that have ever lived have become \_\_\_\_\_.
- **Principle of superposition – O\_\_\_\_\_ rocks and fossil are on bottom, y\_\_\_\_\_ on top.**

C - Youngest

B - Middle

A - Oldest

GEOLOGIC TIME SCALE								
Time Units of the Geologic Time Scale				Development of Plants and Animals				
Eon	Era	Period	Epoch					
Phanerozoic	Cenozoic	Quaternary	Holocene	Earliest <i>Homo sapiens</i>  Earliest hominids  "Age of Mammals"  Extinction of dinosaurs and many other species First flowering plants First birds Dinosaurs dominant First mammals				
			Pleistocene		0.01-1.6			
		Tertiary	Pliocene		5.3			
			Miocene		23.8			
			Oligocene		33.7			
			Eocene		55			
			Palaeocene		65			
	Mesozoic	Cretaceous	145	"Age of Reptiles"				
		Jurassic	208					
		Triassic	248					
	Palaeozoic	Carboniferous	Permian	"Age of Amphibians"	Extinction of trilobites and many other marine animals  First reptiles Large coal swamps Amphibians abundant			
			Pennsylvanian			286		
			Mississippian			320		
		Devonian	360			"Age of Fishes"		
			Silurian				410	
			Ordovician				438	
			Cambrian				505	
Vendian			545					
Proterozoic	Archean	Hadean	"Soft-bodied faunas"	First organisms with shells Abundant Ediacaran faunas				
					Precambrian	Collectively called Precambrian  comprises about 87% of the geological time scale		
							Proterozoic	First multicelled organisms
Hadean	Origin of the earth							
	2500							
	3800							
	4600 Ma							

## Precambrian

### Hadean, Archean, and Proterozoic Eon's

Earth's M\_\_\_\_\_ layers form (Denser to middle)  
Formation of Earth's Crust (c\_\_\_\_\_).

- Meteorites bombard the planet and carry with it water molecules and amino acids (building blocks of protein).



M\_\_\_\_\_ created from protoplanet impact  
(Theia)

A\_\_\_\_\_ originates (No oxygen yet)

Earliest \_\_\_\_\_ begins (primitive protocells)

- Microbes helped produce an \_\_\_\_\_ atmosphere through photosynthesis.

First Multi-cellular life (\_\_\_\_\_ cells)

Explosion of new a\_\_\_\_\_ (sea)

## Paleozoic Era

### Vendian, Cambrian, Ordovician, Silurian, Devonian, Carboniferous, and Permian Periods.

M\_\_\_\_\_ invertebrates dominate

Jawed \_\_\_\_\_ Evolve



Plants invade \_\_\_\_\_ (Oxygen to atmosphere)

l\_\_\_\_\_ emerge

First Amphibian

First R\_\_\_\_\_

First winged insect

## **Mesozoic Era**

### **Triassic, Jurassic, Cretaceous Periods**

D\_\_\_\_\_ dominate

First Birds

First Mammals

First F\_\_\_\_\_

K-T Mass Extinction Event, \_\_\_\_\_ mya

## **Cenozoic Era**

### **Tertiary, and Quaternary Periods**

M\_\_\_\_\_ change

Earliest Monkeys

Climate becomes drier

Panama attaches South America to North America

First \_\_\_\_\_ hominids

Modern Man (Whoa)

Civilization

Age of Exploration, Industrial and Computer Age

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