

# Unit 2: Geosphere Part 1 Note Packet

## Structure of Earth

The Earth is made up of 3 main layers:

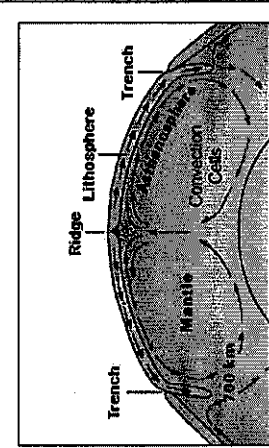
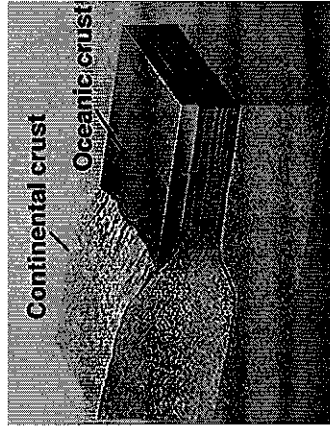
Mantle

## Structure of Earth – Crust

Types of Crust

**Oceanic Crust:** Thin (~7 km), \_\_\_\_\_ (sinks under continental crust), Young, Made \_\_\_\_\_

**Continental Crust:** Thick (10-70 km), Buoyant (less dense than oceanic crust), mostly old, made mainly of granite



Mantle moves via convection currents which is when hot material in the mantle rises, cools, and then sinks.

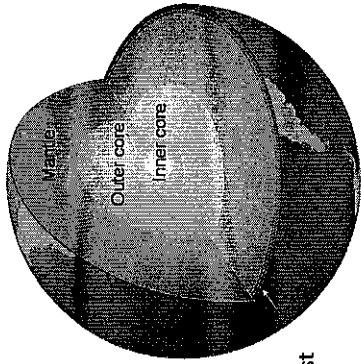
**Structure of Earth –** \_\_\_\_\_  
Mantle between crust and the core.

Made of \_\_\_\_\_ silicate rocks; elastic behavior

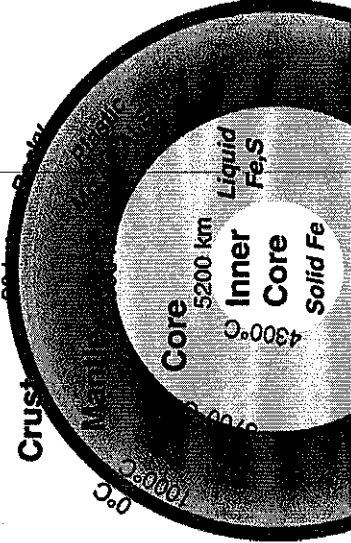
## Structure of Earth – Core

Core is broken into \_\_\_\_\_:

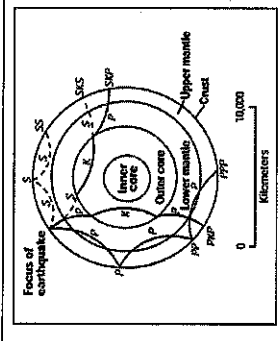
- Outer Core:
  - Made \_\_\_\_\_ iron and nickel
  - Outer core flows slowly creating an electrical current → generates \_\_\_\_\_



- Made of \_\_\_\_\_ and nickel



## Seismograph triangulation



How do we know what the Earth is made of?

Information gathered from \_\_\_\_\_

\_\_\_\_\_ anomalies by air

Satellite images of the Earth's crust

Mining, drilling boreholes in Earth, and \_\_\_\_\_

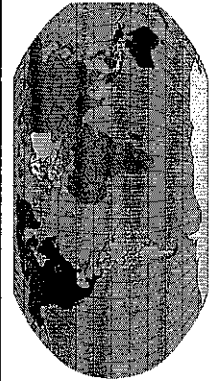
## What is the Theory of Plate Tectonics?

Explains how and why the surface of Earth is \_\_\_\_\_

States that Earth's outer shell, the lithosphere, is divided into \_\_\_\_\_



Scientist hypothesized that the continents appear to fit together like puzzle pieces.



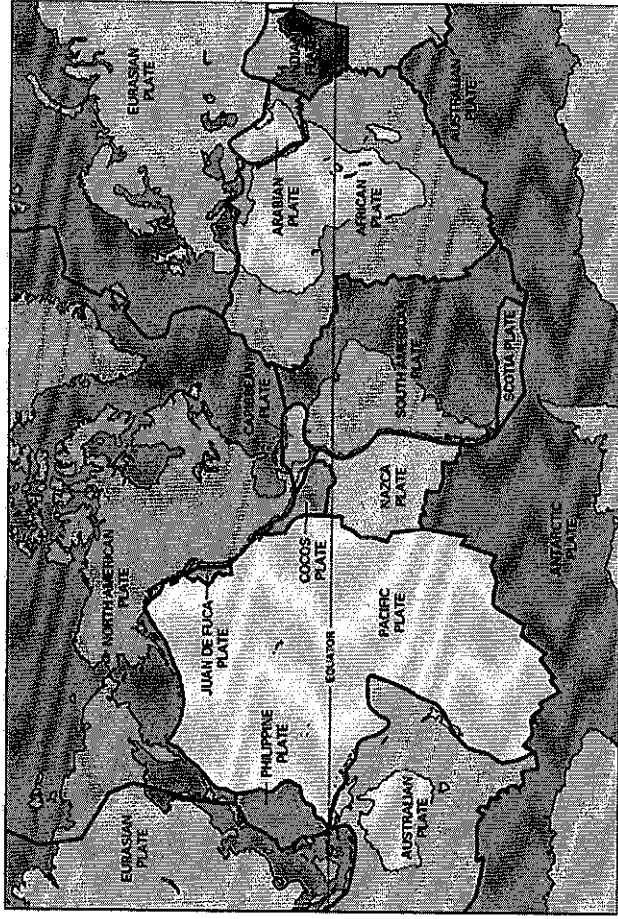
**How many lithospheric plates are there?**

Earth's crust is divided into \_\_\_\_\_

- 7 major & \_\_\_\_\_ minor

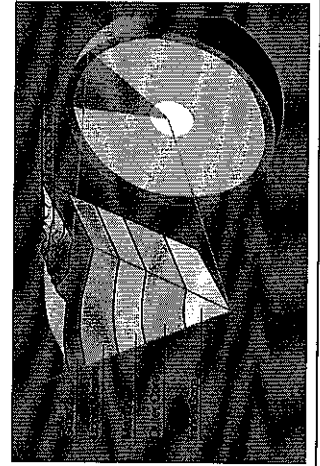
They are \_\_\_\_\_ in different directions.

- Plates can \_\_\_\_\_, pull apart, or \_\_\_\_\_ against each other.



**What are lithospheric plates made of?**

Plates are made of \_\_\_\_\_



Lithosphere is the \_\_\_\_\_ and part of the \_\_\_\_\_.

The \_\_\_\_\_ is below the lithosphere.

It is mostly liquid and made up of the \_\_\_\_\_ of the mantle.

**What causes the lithospheric plates to move?**

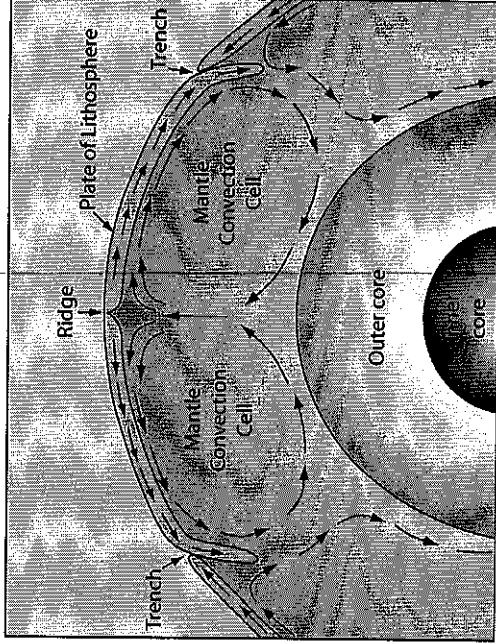
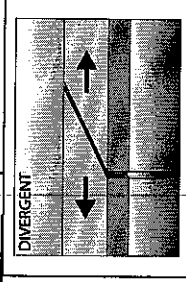


Plate movement is \_\_\_\_\_ the movement of hot mantle \_\_\_\_\_.

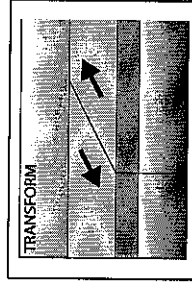
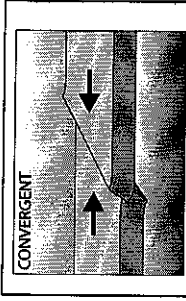
**What happens at tectonic plate boundaries?**

of plate boundaries:

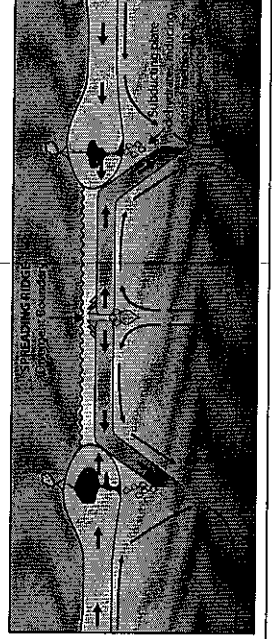
- Divergent



- Convergent



**What happens at divergent boundaries?**



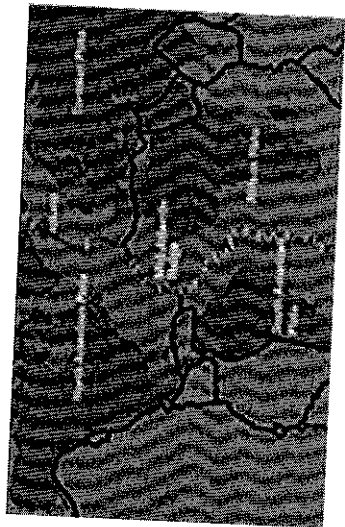
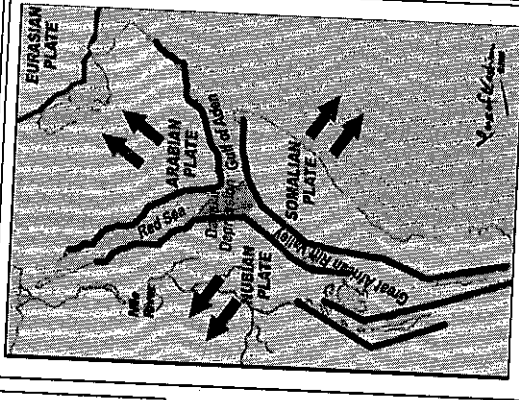
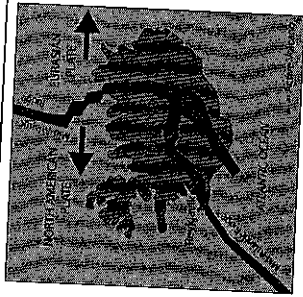
Plates move \_\_\_\_\_ and new material from the mantle \_\_\_\_\_.

\_\_\_\_\_ forms on a continent it is called a rift or \_\_\_\_\_.

Example: African Rift Valley, \_\_\_\_\_.

Divergent boundaries that form under the \_\_\_\_\_ is called an \_\_\_\_\_.

Example: \_\_\_\_\_.



What happens at Convergent Boundaries?

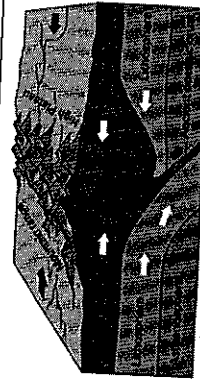
Tectonic plates \_\_\_\_\_ each other or \_\_\_\_\_ of convergent plate boundaries:

- Continent-continent
- \_\_\_\_\_
- Oceanic-Oceanic

Continent-\_\_\_\_\_ Convergent

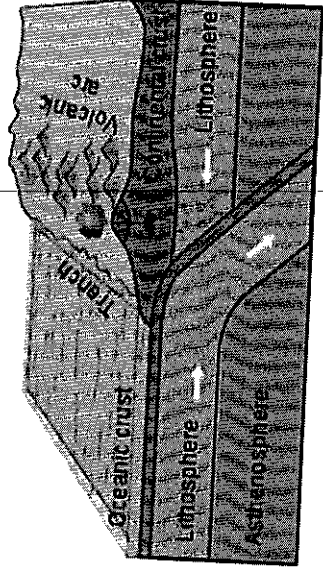
Two continental plates collide forming a \_\_\_\_\_.

Example: Indian plate collided with Eurasian plate created the Himalayan Mountains



Continental-continental convergence

### Continent-Oceanic Convergent



Also called \_\_\_\_\_

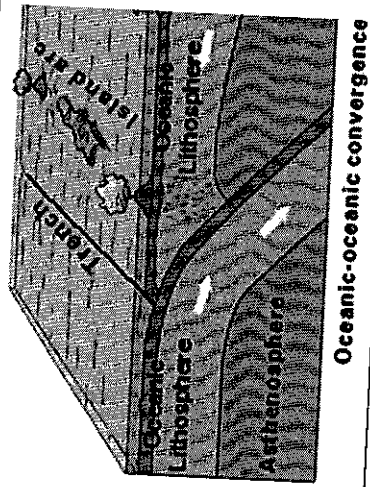
Dense ocean \_\_\_\_\_ beneath the continental crust forming a \_\_\_\_\_.

### Oceanic-Oceanic Convergent

Denser oceanic plate \_\_\_\_\_ (also called \_\_\_\_\_)

subduction) \_\_\_\_\_

Creates \_\_\_\_\_

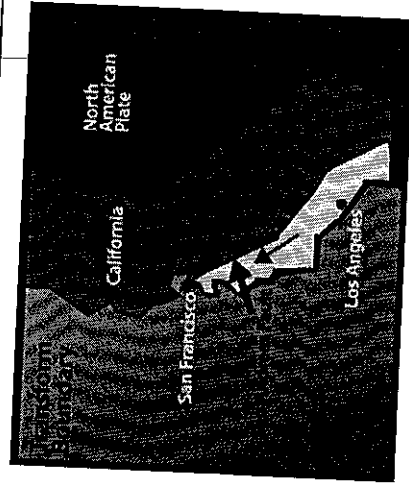


Oceanic-oceanic convergence

What happens at Transform boundaries?

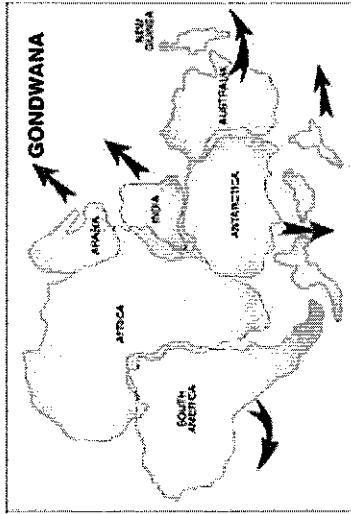
Edges of tectonic plates are \_\_\_\_\_ one another.

Example: San Andreas Fault in \_\_\_\_\_



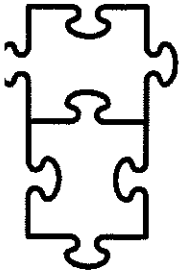
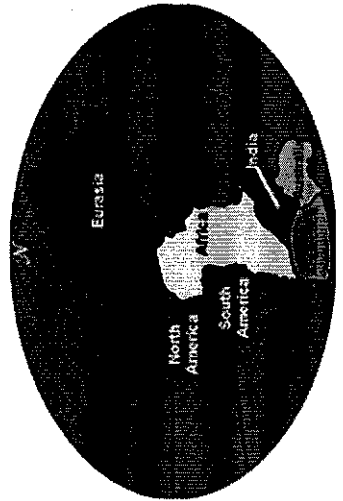
### History of Continental Drift

- Abraham Ortelius - \_\_\_\_\_ : thought that North & South America were \_\_\_\_\_ from Europe and Africa by floods and earthquakes.
- Eduard Suess—1800's: believed Southern continents were once joined together as a single landmass, called \_\_\_\_\_
- Alfred Wegener—1912: proposed the theory of continental drift, but it was \_\_\_\_\_ by the scientific community



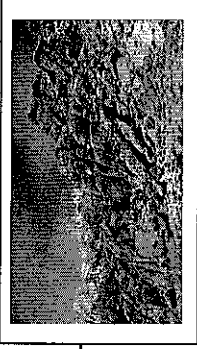
### Wegener's theory & Pangaea

- Earth's continents were \_\_\_\_\_ as a single landmass.
- Called it \_\_\_\_\_, which means "all the Earth".
- It \_\_\_\_\_ apart \_\_\_\_\_ years ago
- Continents have been drifting to their current positions.



### Evidence for Continental Drift

- 1. FIT OF THE COASTLINES
- the coasts of South America and Africa fit together like \_\_\_\_\_ in the Atlantic Ocean
- 2. SIMILAR \_\_\_\_\_
- Rocks in areas that were once joined have the same age and structure, such as the Appalachian Mountains and mountains in Greenland and Europe.



3. \_\_\_\_\_

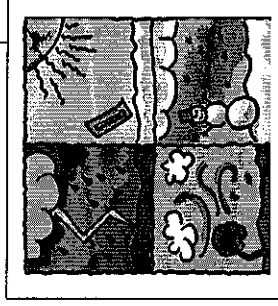
- Fossils of land animals and plants were found in widely \_\_\_\_\_ These fossils are all the same age, \_\_\_\_\_ which suggests that all land was once joined



- Glossopteris (an ancient fern-like \_\_\_\_\_)
- Mesosaurus (a small aquatic reptile)

### 4. CLIMATE EVIDENCE

- \_\_\_\_\_ were found in polar regions
- \_\_\_\_\_ were found in tropical and temperate regions



### Why was Wegener's hypothesis rejected?

- 1. Wegener could \_\_\_\_\_ what was causing the continents to move.

### What is theory is currently accepted?

- \_\_\_\_\_ :
- Earth broken into shifting \_\_\_\_\_
- The plates move by a hot mantle up to a few inches a year.

### Folds, Faults, & Mountains

Stress is a force that can \_\_\_\_\_

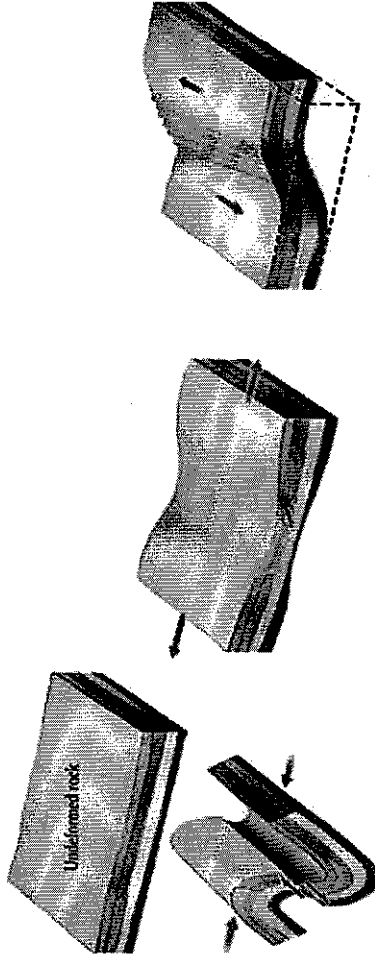
Three types of stress:

- Compression
- \_\_\_\_\_
- Shear

### Types of Stress

Tension: pulling an object in \_\_\_\_\_: opposing forces directed inward

Compression: pushing an object in \_\_\_\_\_: opposing stress is created by two plates moving in opposite directions

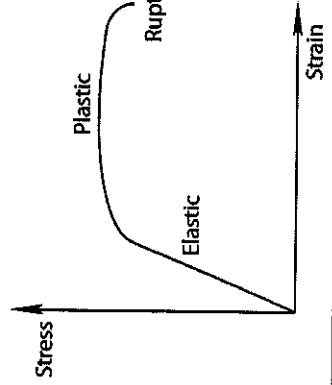


(a) Compression

(b) Tension

(c) Shearing stress

### How does stress affect rocks?



\_\_\_\_\_ : rock stretches without breaking, returns to original shape after stress is removed.

Plastic: slow stretch \_\_\_\_\_ to original shape

Rupture: \_\_\_\_\_ in the rock.

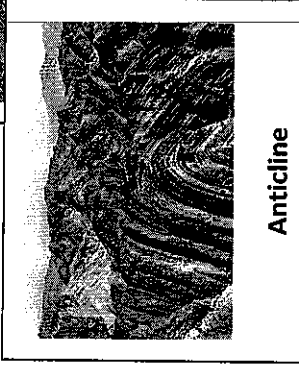
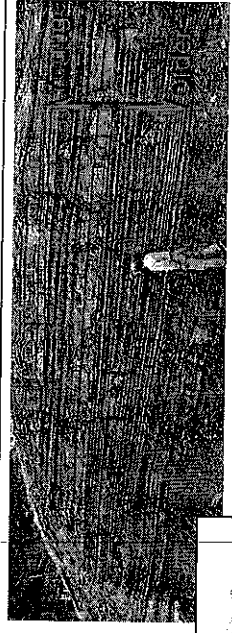
### Folds & Rock Layers

Rock is layered down in nature in \_\_\_\_\_

A fold is a \_\_\_\_\_ of the Earth's crust.

Types of folds:

- \_\_\_\_\_
- Syncline



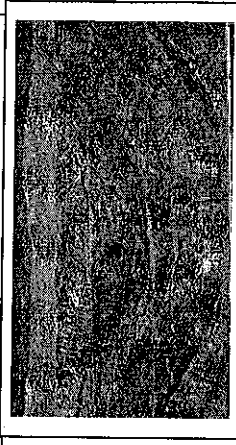
Anticline

Anticline

If the fold is \_\_\_\_\_ rocks on inside

Syncline

If the fold is \_\_\_\_\_ Older rocks on \_\_\_\_\_



### Faults & Rock Layers

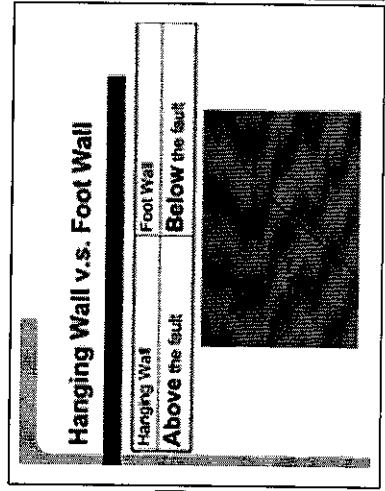
Occurs when large stress builds up in the crust.

Types of Faults:

- \_\_\_\_\_
- Reverse
- \_\_\_\_\_

Hanging Wall = \_\_\_\_\_

Foot Wall= \_\_\_\_\_

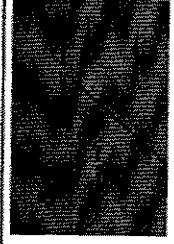


Hanging Wall v.s. Foot Wall

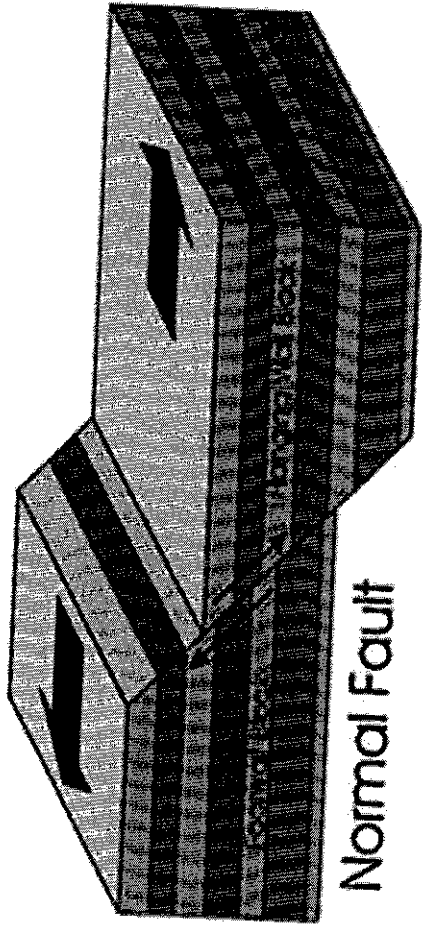
Hanging Wall Above the fault

Foot Wall

Below the fault

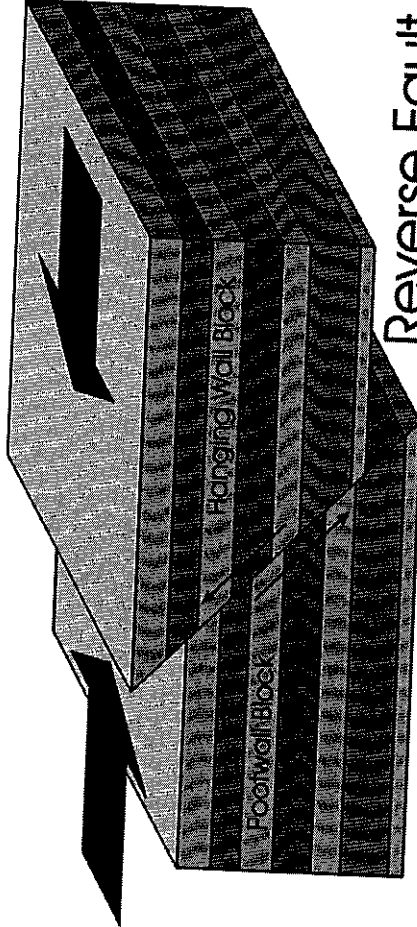


Normal Fault: Hanging wall moved \_\_\_\_\_ relative to footwall.



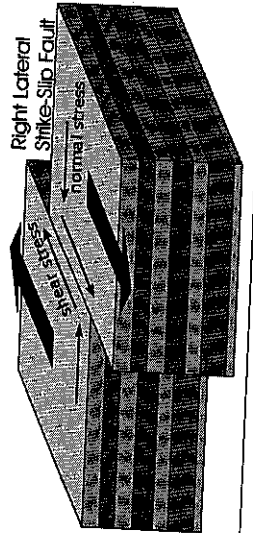
**Normal Fault**

Reverse Fault: Hanging wall \_\_\_\_\_ to the footwall.  
 \_\_\_\_\_ of a normal fault

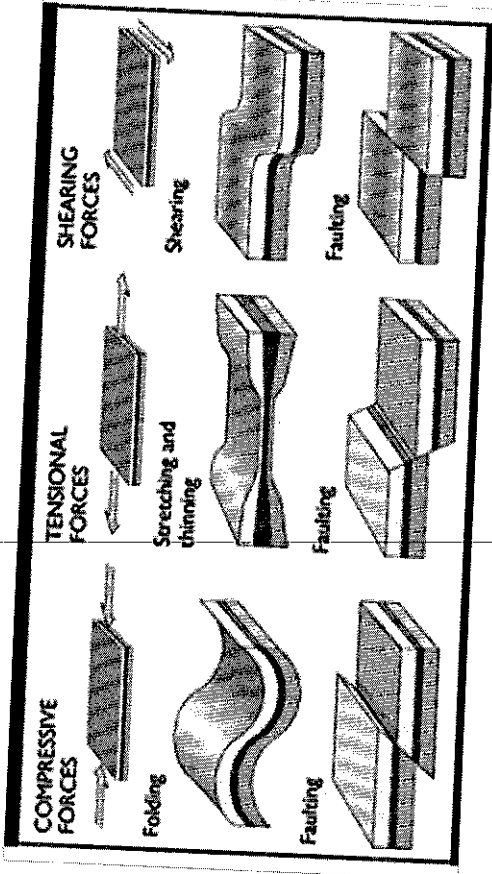


**Reverse Fault**

Strike-slip Fault: A vertical fracture where the blocks have \_\_\_\_\_



**Folds, Faults, Mountains Overview**



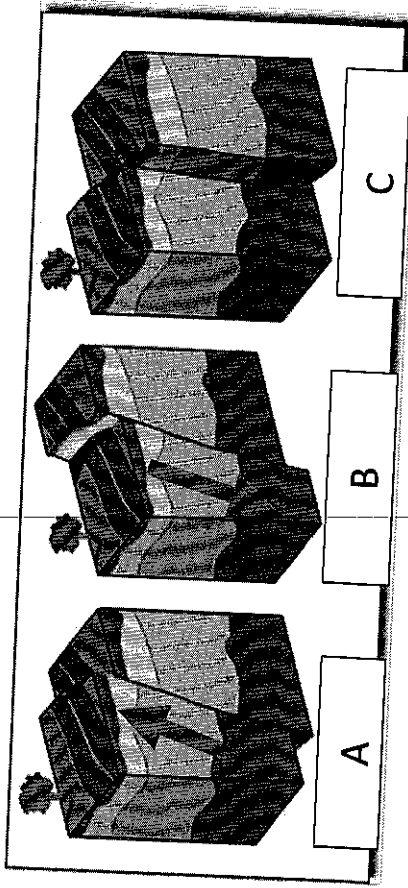
**Earthquakes & Plate Tectonics**

Earthquake: stored energy is movement along a fault.

\_\_\_\_\_ through a

Fault: is a \_\_\_\_\_ normally associated with, or form the boundaries between Earth's tectonic plates.

**Review Types of Faults...**

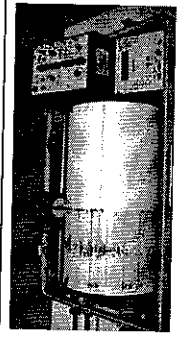


A: \_\_\_\_\_  
 B: \_\_\_\_\_  
 C: \_\_\_\_\_

### How do we detect earthquakes?

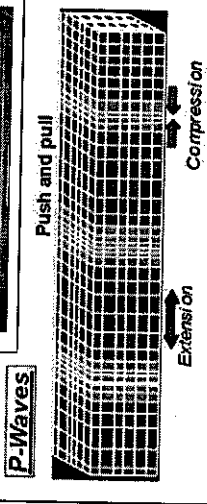
\_\_\_\_\_ are machines that record seismic waves

Seismic waves: vibrations that travel through the Earth



### What are the types of Seismic Waves?

- P waves
- S waves
- \_\_\_\_\_



1. P waves: P stands for primary

These waves arrive \_\_\_\_\_

Move with a \_\_\_\_\_ motion

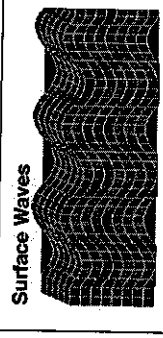
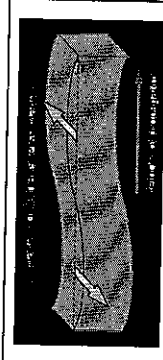
2. S waves: S stands for \_\_\_\_\_

These waves \_\_\_\_\_

Move with a \_\_\_\_\_ motion

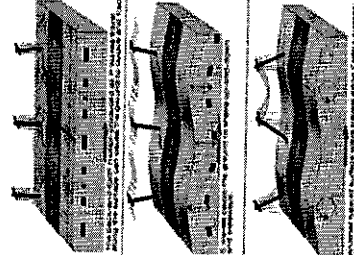
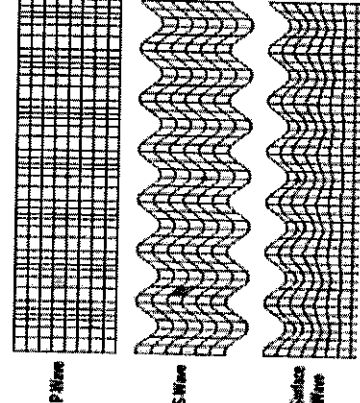
3. Surface waves - \_\_\_\_\_

Cause the \_\_\_\_\_



Move with an up and down and side-to-side motion

Direction of earthquake \_\_\_\_\_



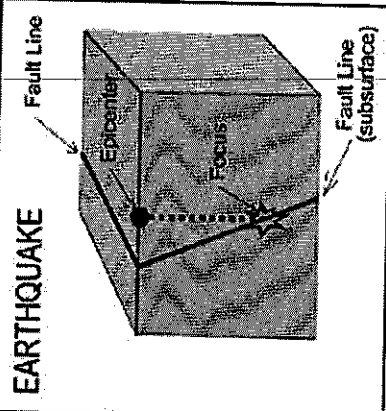
### Epicenter versus Focus

\_\_\_\_\_ : a point on Earth's surface that is directly above the focus of an earthquake.

Where shaking is strongest → \_\_\_\_\_

Focus: \_\_\_\_\_ the earthquake

Where rock breaks along a fault and energy is released.



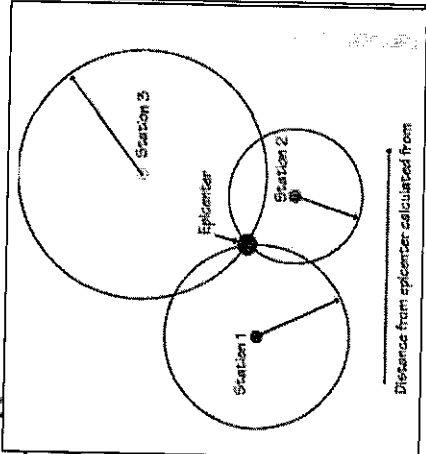
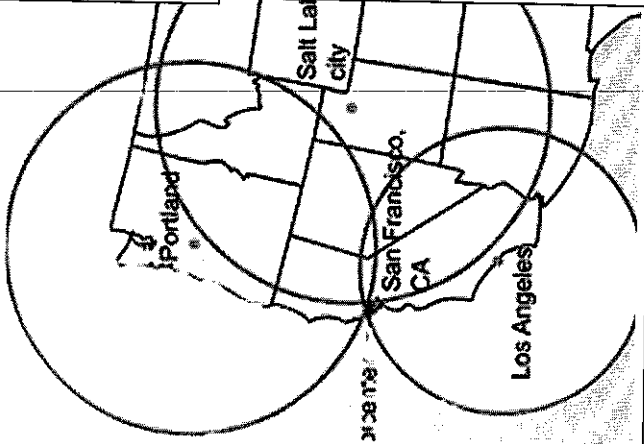
### How do you locate an epicenter?

You need at least \_\_\_\_\_ stations to locate an epicenter.

Where all three \_\_\_\_\_ is the location of the epicenter.

P and S wave can help determine where the \_\_\_\_\_ is located.

The farther you are the epicenter, the greater the S-P interval (\_\_\_\_\_ hits)



### How do we determine the size of an Earthquake?

\_\_\_\_\_ : Quantitative measurement of the size of an earthquake from its source.

The \_\_\_\_\_ is used to determine magnitude of an earthquake.

### Understanding the Richter Scale:

Richter Magnitude	Feels like KG of TNT	Extra Information
0-1	0.6-20 kilograms of dynamite	We can not feel these
2	600 kilograms of dynamite	Smallest Quake people can normally feel
3	20,000 kilograms of dynamite	People near the epicenter feel this quake
4	60,000 kilograms of dynamite	This will cause damage around the epicenter. It is the same as a small fission bomb
5	20,000,000 kilograms of dynamite	Damage done to weak buildings in the area of the epicenter
6	60,000,000 kilograms of dynamite	Can cause great damage around the epicenter
7	20 billion kilograms of dynamite	Creates enough energy to heat New York city for one year. Can be detected all over the world. Causes serious damage
8	20 billion kilograms of dynamite	Causes death and major destruction. Destroyed San Francisco in 1906
9	20 trillion kilograms of dynamite	Rare, but would cause unbelievable damage!

### What is a Tsunami?

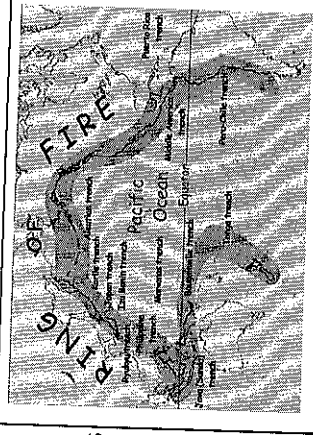
Tsunami: Destructive \_\_\_\_\_ that is caused by an \_\_\_\_\_.

### Where do tsunamis occur?

\_\_\_\_\_ occur within the Pacific Ocean's

"Ring of Fire": Active area where

Volcanoes & earthquake are common



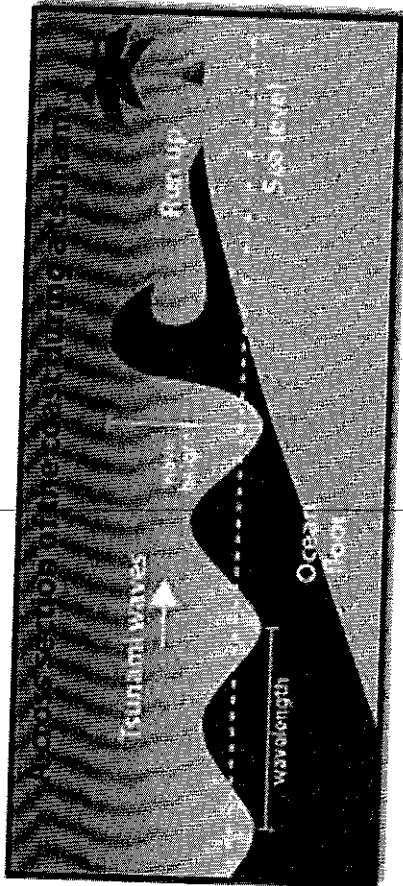
### How do tsunamis move?

Caused by \_\_\_\_\_ landslide, or volcanic eruption.

The tectonic movement causes the ocean water to move about \_\_\_\_\_

\_\_\_\_\_ an hour across the ocean.

As they approach the coastline, they slow down and \_\_\_\_\_ and energy.

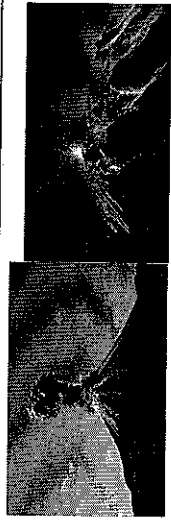


### What happens when it hits land?

A tsunami produces a vacuum effect that sucks coastal water out into the ocean.



- Causes the \_\_\_\_\_ right before it strikes land.
- Occurs about 5 minutes before it hits [ ] this is a warning sign to leave the beach.



**What are volcanoes?**

Volcanoes are a place on Earth's surface where \_\_\_\_\_ (called magma) breaks through.

\_\_\_\_\_ erupt or show seismic (earthquake) activity.

Dormant volcanoes have not erupted for a \_\_\_\_\_, but could erupt again one day.

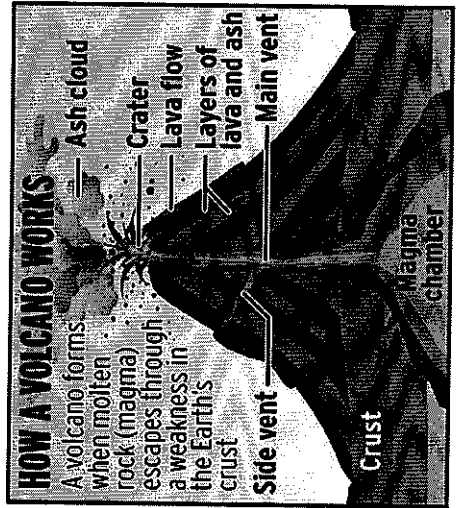
Extinct volcanoes will \_\_\_\_\_ again.

**Why do volcanoes erupt?**

Lower density of magma relative to surrounding rocks \_\_\_\_\_ (like air bubbles in syrup).

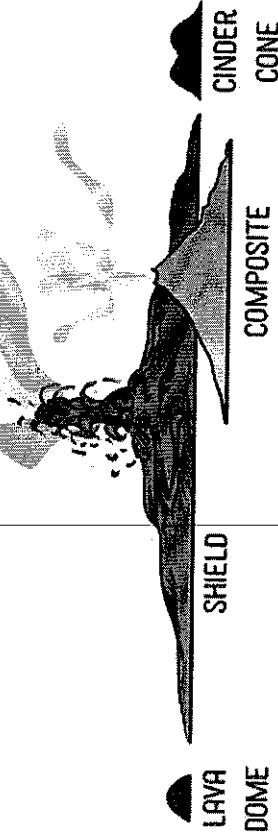
The \_\_\_\_\_ in the magma dissolve and create large amounts of \_\_\_\_\_.

This pressure brings magma to the surface and forces it into the air.



**Types of Volcanoes**

# 4 TYPES OF VOLCANOES



**Cinder Cone Volcano**

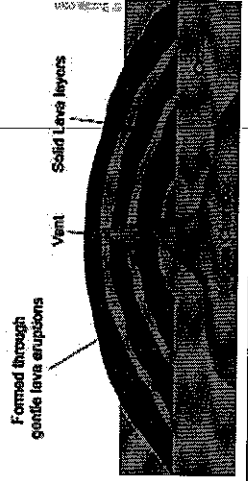
- \_\_\_\_\_ volcanoes (< 300 m tall) with no layers.
- Steep \_\_\_\_\_ of volcanic debris and \_\_\_\_\_ on top.
- \_\_\_\_\_ eruption.



**Shield Volcanoes**

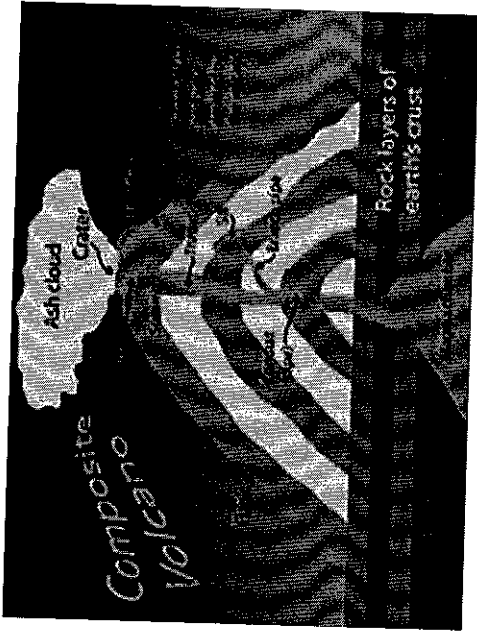
- \_\_\_\_\_ (10s of kms wide) volcanoes built mostly from fluid lava vents.
- \_\_\_\_\_ eruptions
- Looks like a warriors shield from the sky.
- These types of volcanoes make up the \_\_\_\_\_.

**The Anatomy of a Shield Volcano**



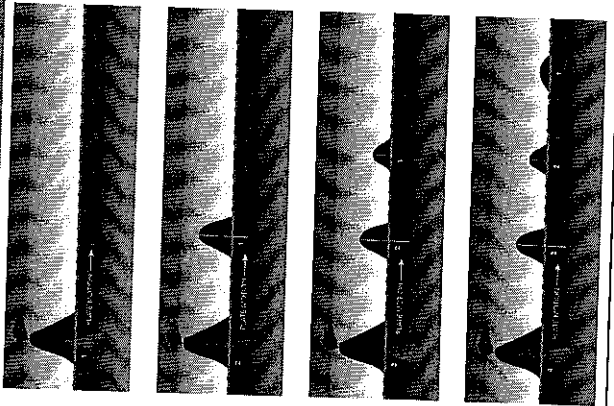
### Composite Volcano (Stratovolcano)

- Large (1-10 km wide)
- \_\_\_\_\_ of solid lava mixed with layers of rocks.
- \_\_\_\_\_ eruption



### What is a hot spot?

#### Hot Spot Volcano Formation



Mantle plumes are areas of \_\_\_\_\_.

A hot spot \_\_\_\_\_ as magma rises through the lithospheric plate producing a volcano.

As the plates move, oceanic volcanoes \_\_\_\_\_

\_\_\_\_\_, cool and subside, and produce island. Eventually they become extinct volcanoes.

What is an example of hot spot?

The \_\_\_\_\_ were created from a hot spot within the Pacific Plate.

This hot spot created 3,750 miles of volcanic chain of islands.

