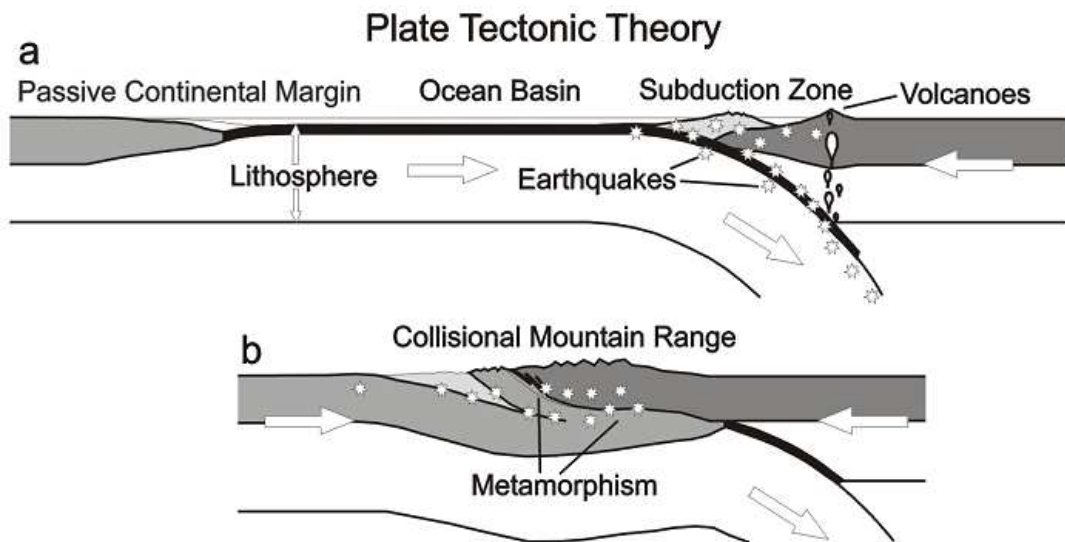


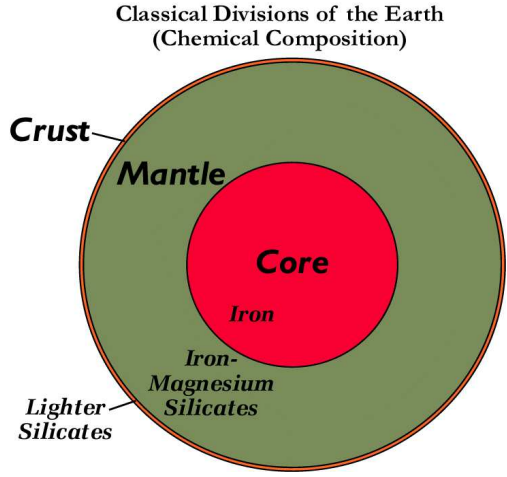
Q. What is the concept of plate tectonics theory?

- It is a scientific theory which describes the large scale motion of Earth’s lithosphere. The theory builds on the older concepts of continental drift developed by Alfred Wegner and seafloor spreading. Where the plates are relatively moving towards each others and changing their sizes and shapes. The theory also explain the global distribution of seismicity, volcanism, continental drift, and mountain building in terms of the formation, destruction, movement, and interaction of the earth's lithospheric plates. Tectonic plates are able to move because the Earth's lithosphere has a higher strength and lower density than the underlying asthenosphere. Their movement is driven by heat dissipation from the mantle “convection”. The theory describe that the Earth's lithosphere (the crust and upper portion of the mantle) is divided into about (12) large plates and several small ones that float on and travel independently over the asthenosphere. The majority of the earthquakes and volcanoes on the Earth's surface occur along the margins of tectonic plates. The interior of a plate moves as a rigid body, with only minor flexing, few earthquakes, and relatively little volcanic activity.



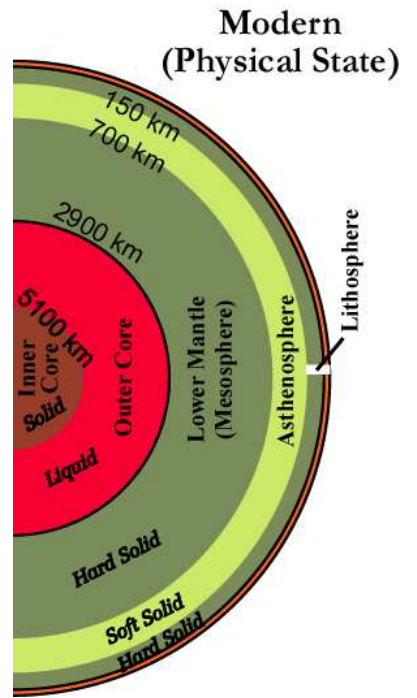
Q. What are the classical “chemical” divisions of earth?

Layer	Rock types	Thickness
Crust	Igneous, metamorphic, and sedimentary	Continental (35-40 km) Oceanic (5-10 km)
Mantle	Igneous rocks “peridotite”	2900 km
Core	Iron-nickel	3400 km



Q. What are the modern “physical” divisions of earth?

Layer	Thickness	Remarks
Lithosphere	200 km (continental & oceanic)	Hard solid
Asthenosphere	600 km (low velocity zone)	Soft and weak with high T & P
Mesosphere	660 – 2900 km (high velocity & density)	Rocks are very hot and flow (hard solid)
Outer core	2270 km (magnetic field)	liquid
Inner core	3486 km (stronger than outer core)	Behave like a solid



Q. What is the significance of earth's layers?

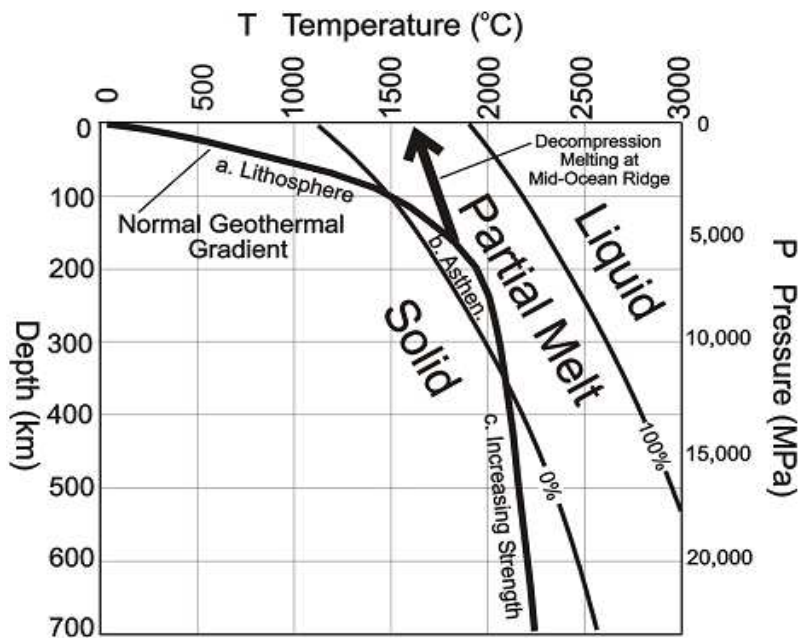
- Without these layers, there would be no plate tectonics. And as a result, there would be no mountains, valleys, earthquakes, volcanoes etc. And the earth will be perfectly covered by water.

Q. Why earth has creamy layer “asthenosphere”?

- Because of: the composition of the mantle, temperature change with depth, and pressure change with depth.

Q. Draw the partial melt occurring at the “asthenosphere”?

- In layer b (from 100-350 km), the temperature is higher than the melting point of some of the minerals in peridotite which explains the weakness of the asthenosphere.

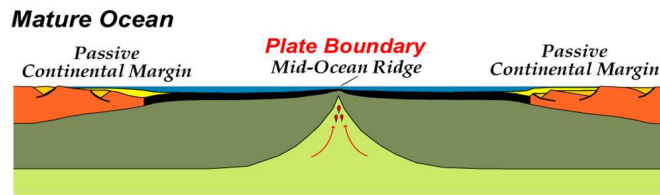
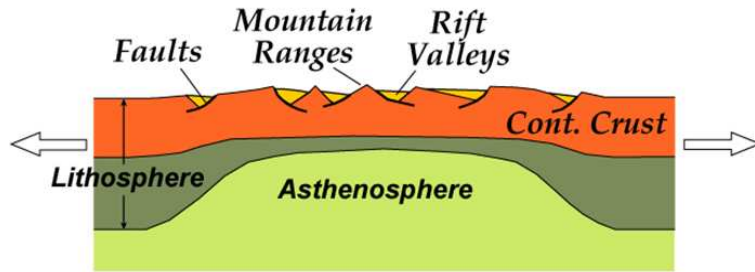


Q. What are the driving forces that control plate motion?

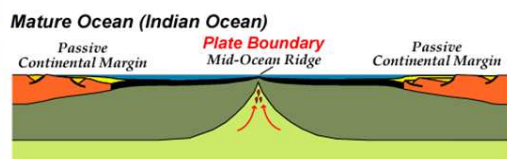
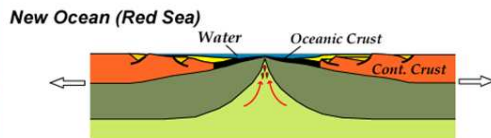
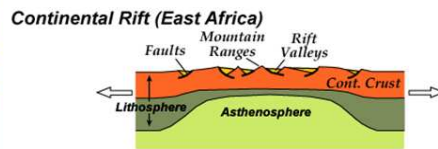
- They are: convection, slab pull, and ridge push.

Q. What are the types of plate boundaries?

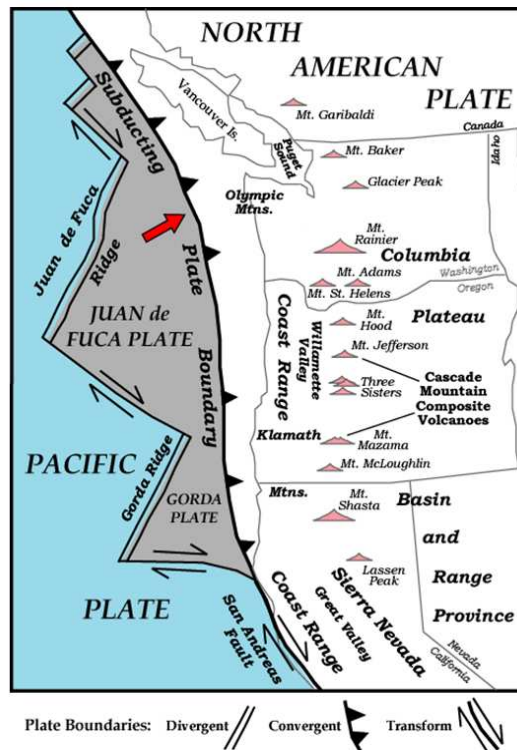
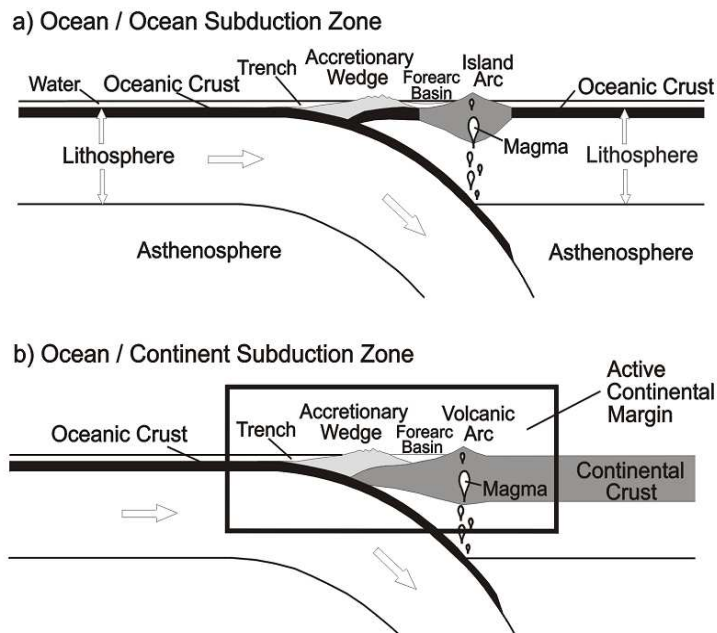
1. Divergent (construction margins): the direction of motion is perpendicular to the boundary. Major currently active continental rifts: Baikal (Russia), East African, Rio Grande (US), Rhine Graben (Europe), Shanxi Graben (China), and Red Sea. The Basin and Range Province and Rio Grande Rift Display Active Continental Rifting



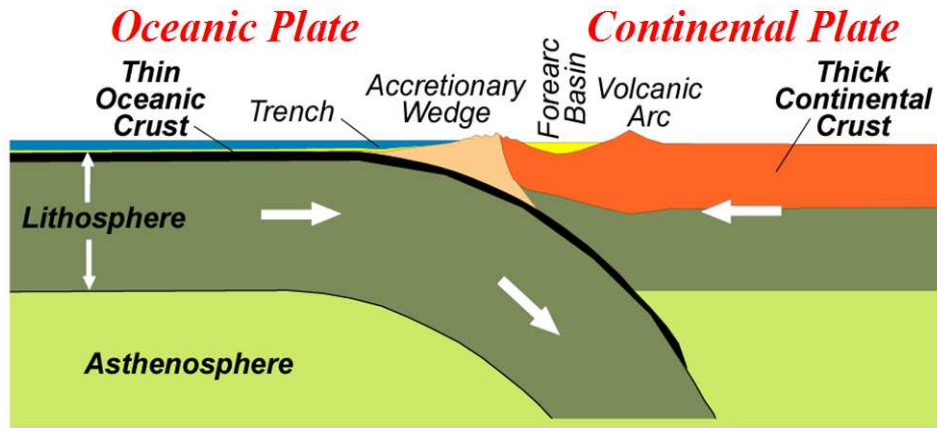
THREE STAGES OF DIVERGENT PLATE BOUNDARY DEVELOPMENT



2. Convergent (destruction): the direction of motion is at right angles of the trench as in Nazca, The Himalayas, and S. America. Example: is the subduction of the Juan de Fuca Plate forms the Coastal Ranges and Cascade Volcanoes



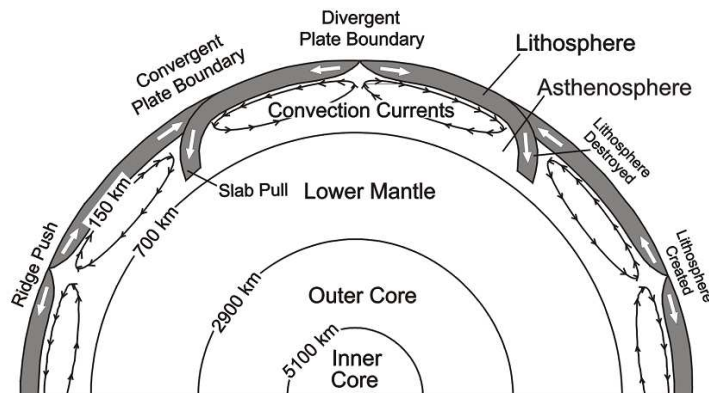
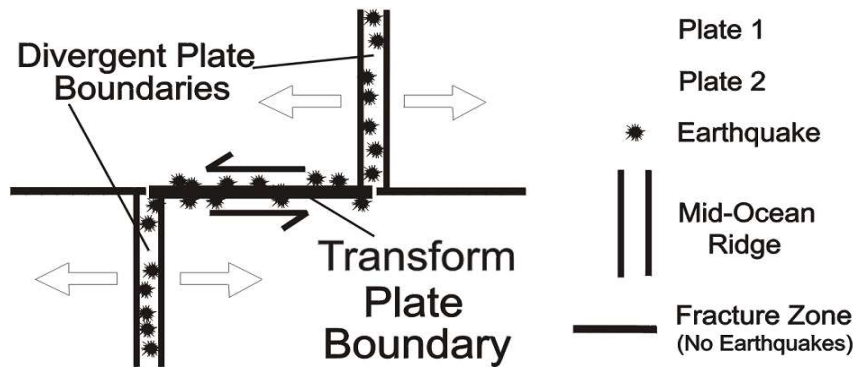
Ocean/Continent Subduction Zone



Why does an oceanic plate subduct beneath a continental plate?

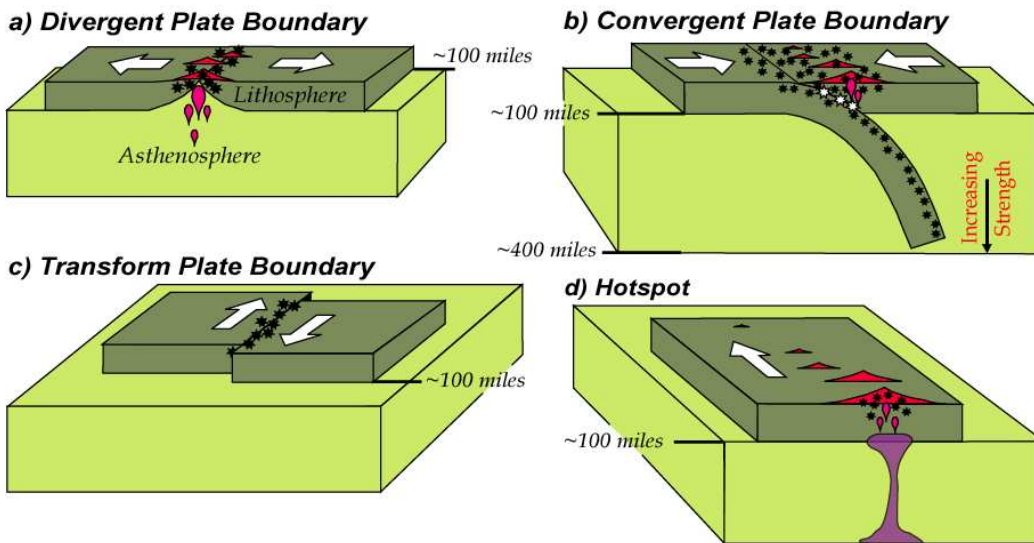
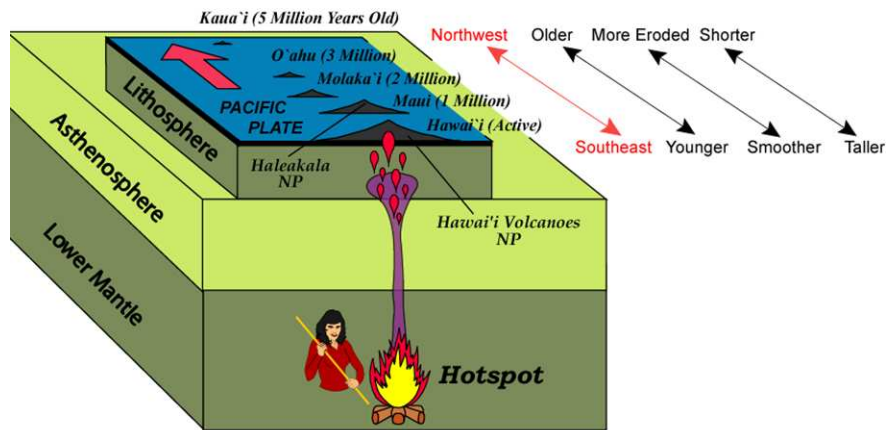
Parks and Plates
©2005 Robert J. Lillie

3. Transform (construction): the relative motion is parallel to the fault as in San Andreas Fault.



Q. What is hotspot?

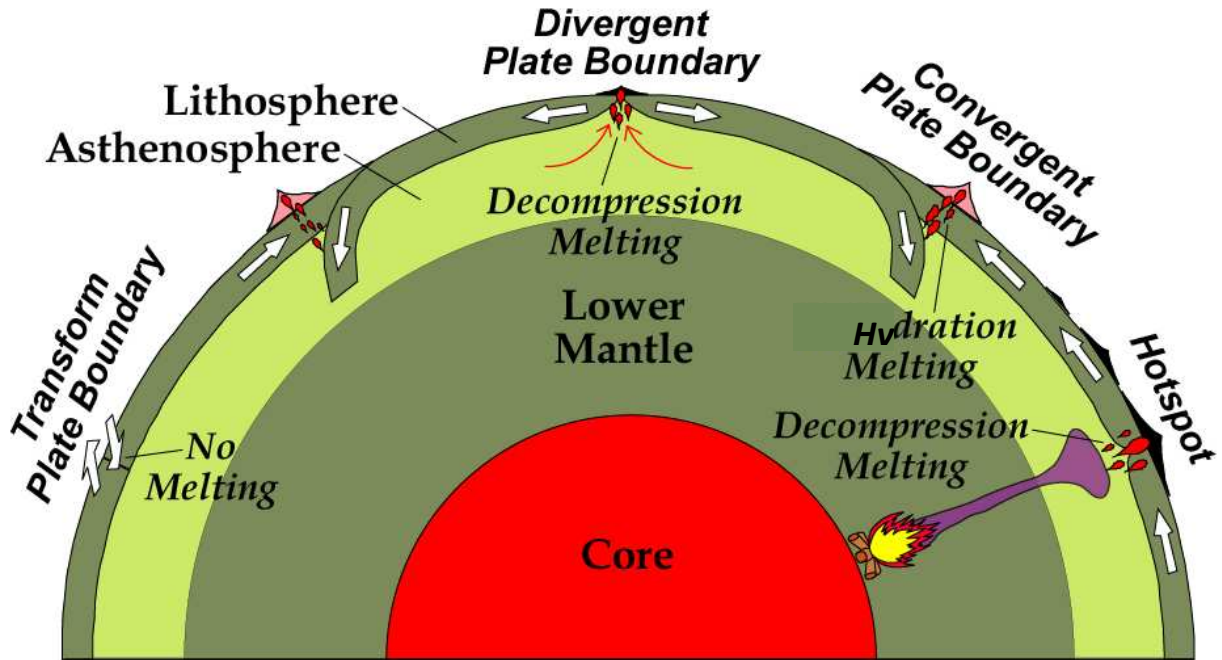
- Hotspot occurs where the convection of the Earth's mantle creates a column of hot material that rises until it reaches the crust, which tends to be thinner than in other areas of the Earth. The Hawaiian Islands are thought to be formed in such a manner, as well as the Snake River Plain, with the Yellowstone Caldera being the part of the North American plate currently above the hot spot.



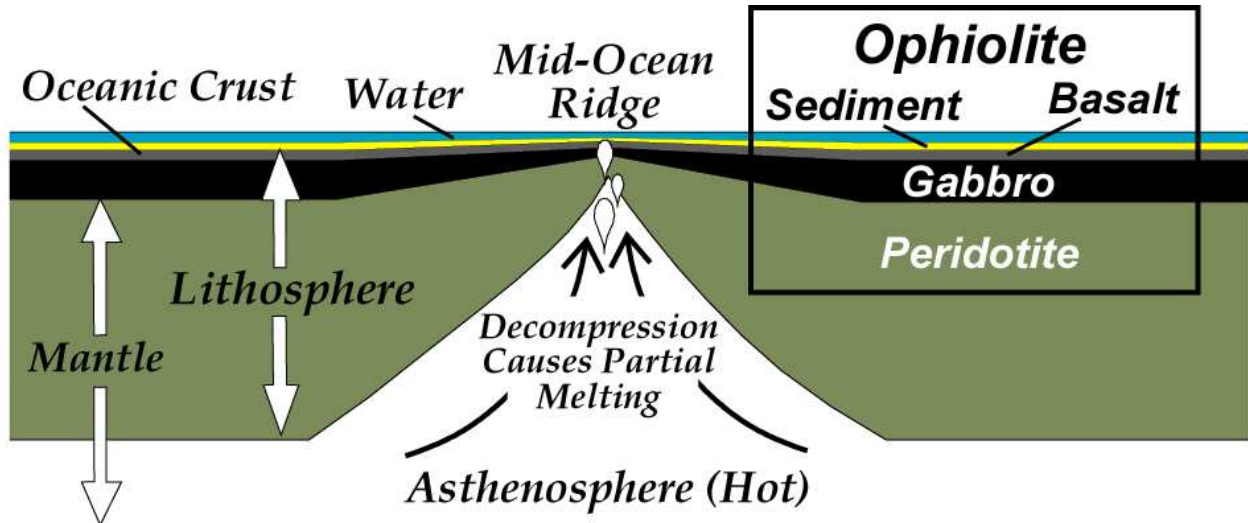
Volcanoes  **Earthquakes**  Small to Moderate Size  Very Large

Q. Where do volcanisms occur?

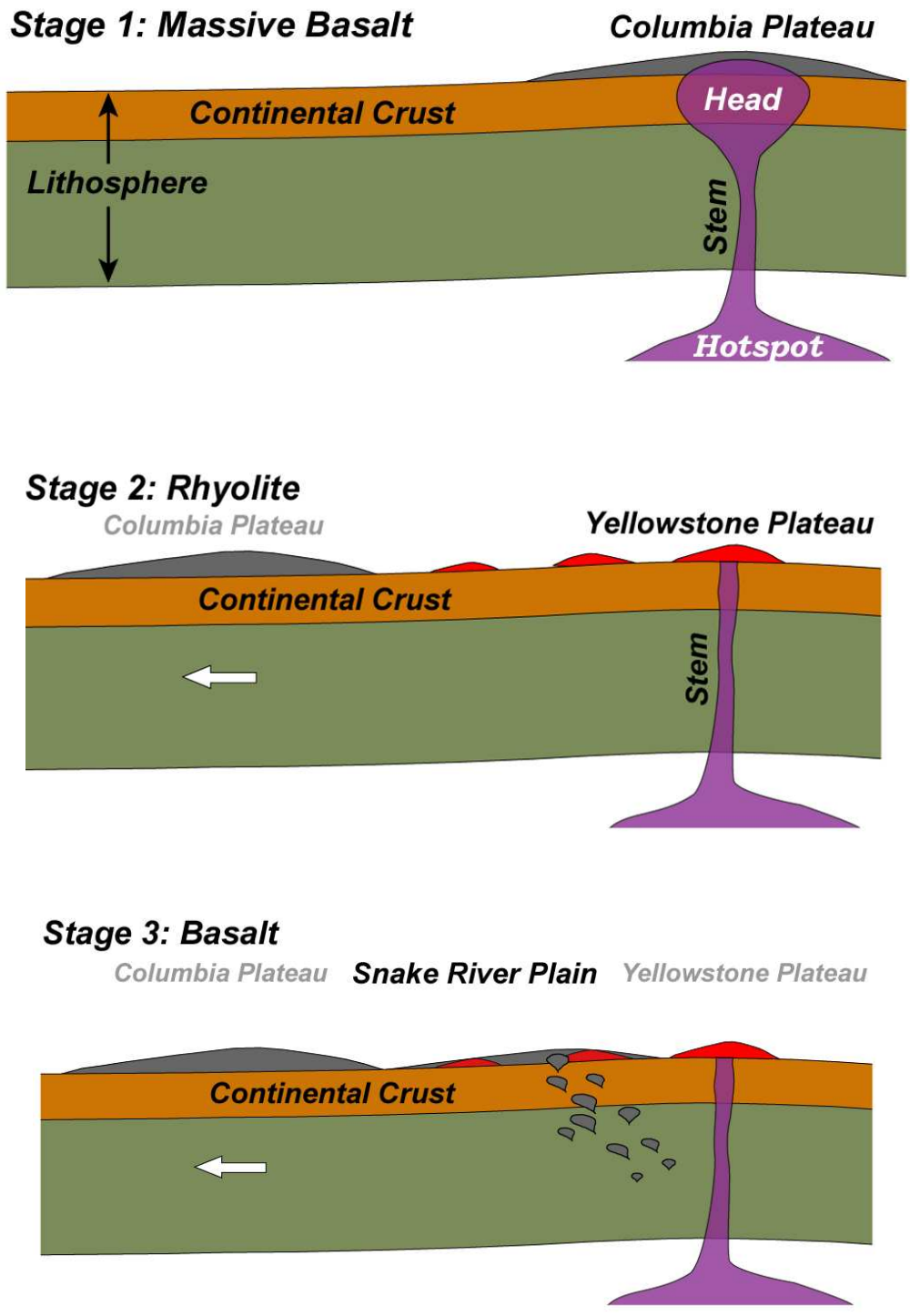
- It occurs at the divergent and convergent plate boundaries, slab pull areas, and hotspot areas.



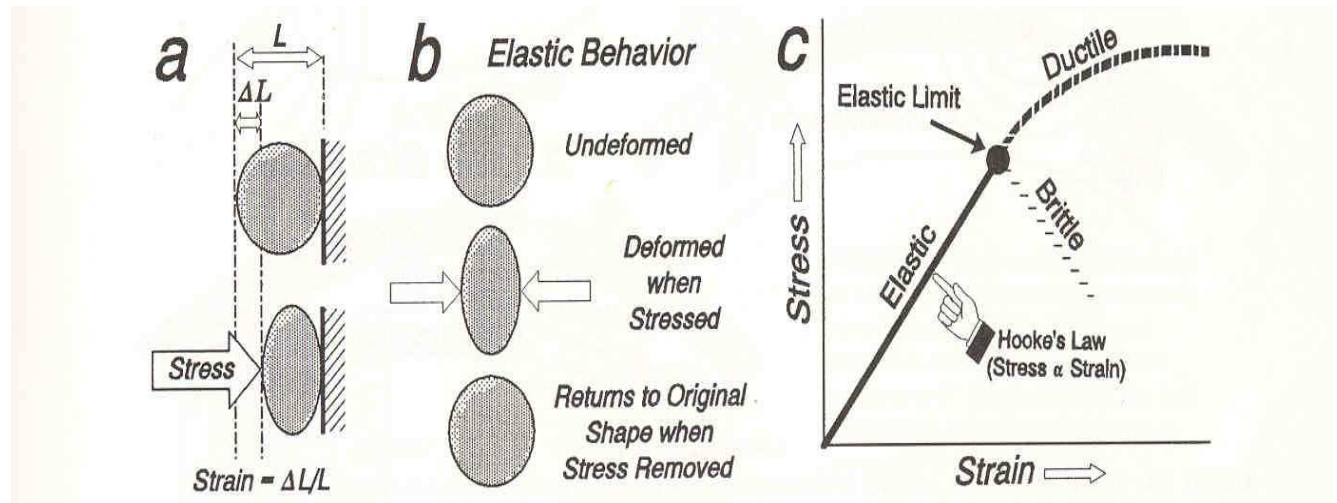
Q. Draw the formation of an oceanic crust?



Q. Draw the three stages that creat Yellowstone Plateau?



Q. Draw the curve relationship between stress and strain?



Q. What are the differences between stress and strain?

Stress:

1. Force acting in unit area (F/A).
2. Unit in Pascal = 1 N/m^2
3. Types:
 1. Normal "tensional": when stress tend to stretch a rock unit perpendicular to the face of the rock.
 2. Shear "differential": when stress is applied unequally in different directions parallel to the face of a rock.

Strain:

1. The resulting deformation of stress. When a solid is stressed, it becomes strained.
2. Rocks move relative to each other without any change in size or shape.
3. Types:
 1. Elastic: Deformations which are recovered after the external forces have been removed. Seismology focus on this type.
 2. Plastic: When deformation remain after removing the external forces. Rupture occurs.

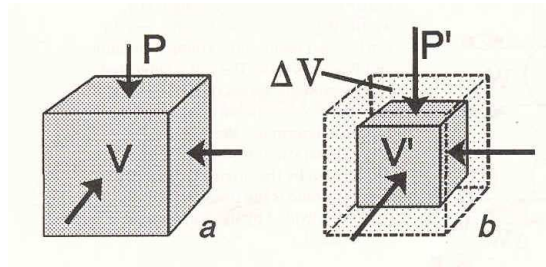
Q. What do elastic constants describe?

- They describe the strain of a material due to applied stress.

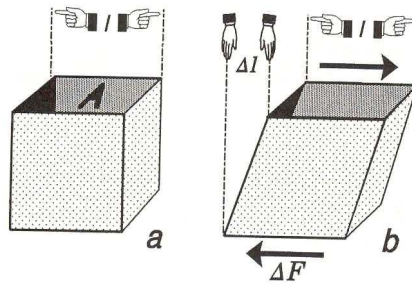
Q. How can you measure the strength of a material? Explain?

- Strength of a material can be measured by one of the elastic modulus: Bulk Modulus, Shear Modulus, Young's Modulus, and Poisson's ratio.

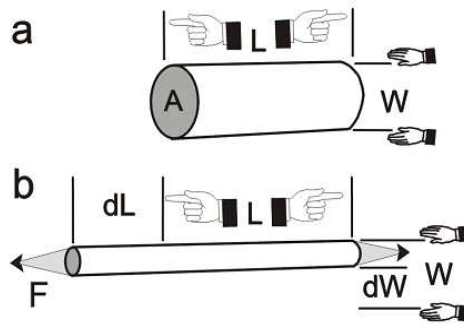
Bulk Modulus: It is defined as the pressure increase needed to cause a given relative decrease in volume. Its base unit is Pascal. The material will be smaller by applying more force.



Shear Modulus: It is defined as the ratio of shear stress to the shear strain. Shear modulus is usually measured in GPa.

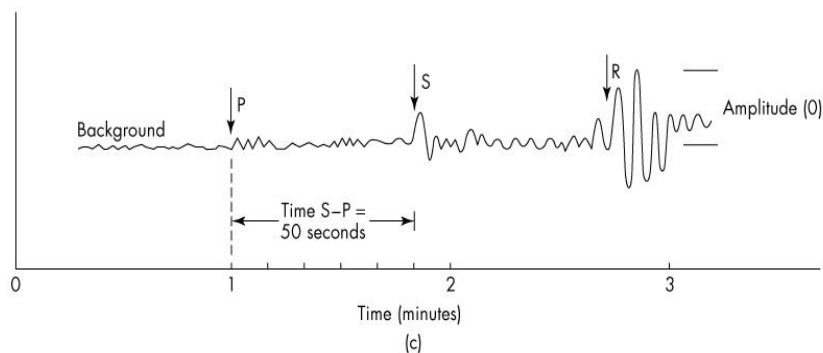
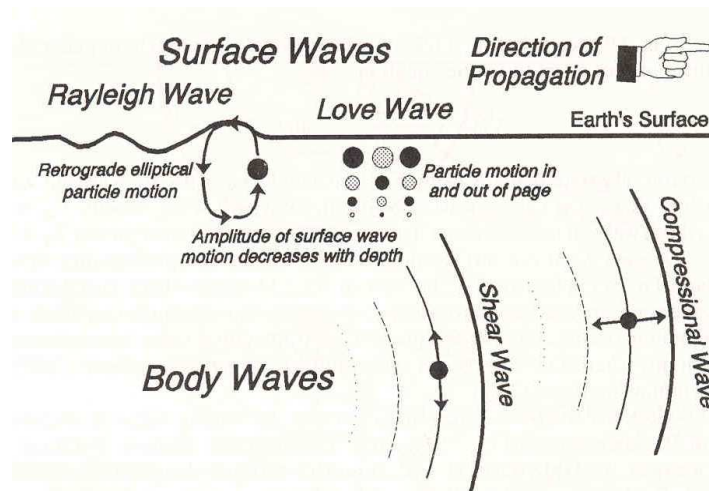


Young's Modulus: It is defined as the ratio uniaxial stress to the uniaxial strain. Young's modulus has the unit of pressure (Pascal).

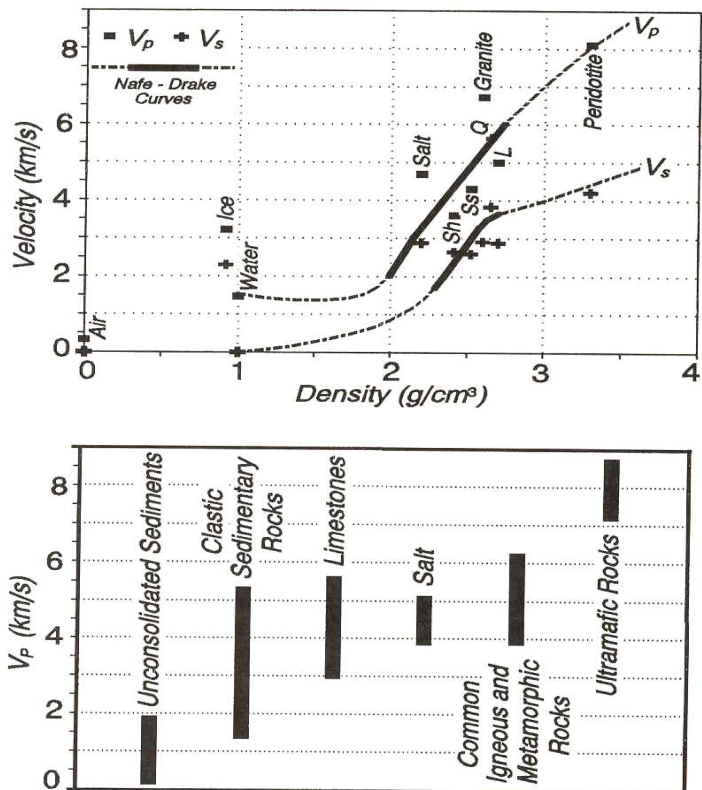


Q. What are the most important types of seismic waves?

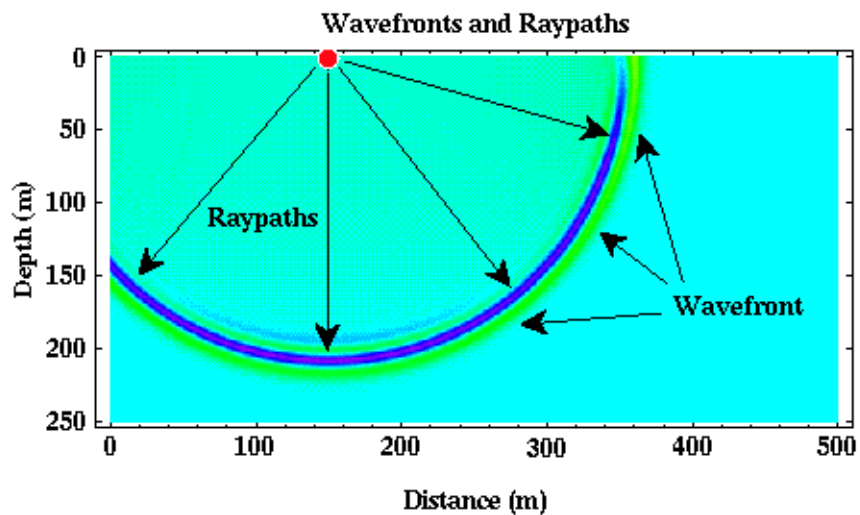
Body wave		Surface wave	
P-wave	S-wave	Rayleigh	Love
Compressional wave	Shear wave “no volume change”	Motion dies down with depth	Perpendicular to the wave propagation direction “no vertical movement”
Particles moves at the same directions as the wave’s propagation direction	Particles move parallel to the wave’s propagation direction	Amplitude decrease with depth	No vertical movement
Used for oil “shallow” exploration	Travel half of the speed of V_p	No volume change because of shear stress	Surface wave are noise waves



Q. Draw a figure showing the various of V_p & V_s for rock types?



Q. Draw the raypaths for a wave?

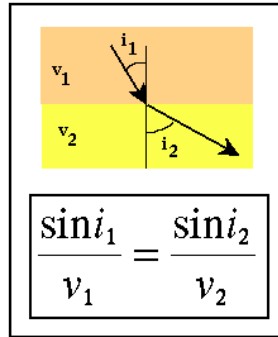


Q. Describe the following: Huygens' Principle, Fermat's Principle, and Snell's Law?

Huygens' Principle: every point on an advancing wave front of elastic wave energy is the source of new elastic wave energy that also travels out as an expanding sphere of energy.

Fermat's Principle: states the first arrival of elastic wave energy (at a recording station/geophone) travels the shortest time path.

Snell's Law: describes how elastic waves are reflected and refracted across a boundary separating layers of differing velocity.

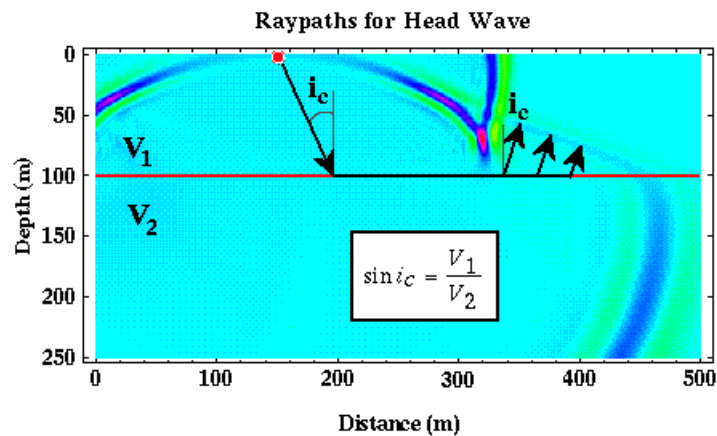


$$\frac{\sin \theta_1}{V_1} = \frac{\sin \theta_2}{V_2}$$

where:

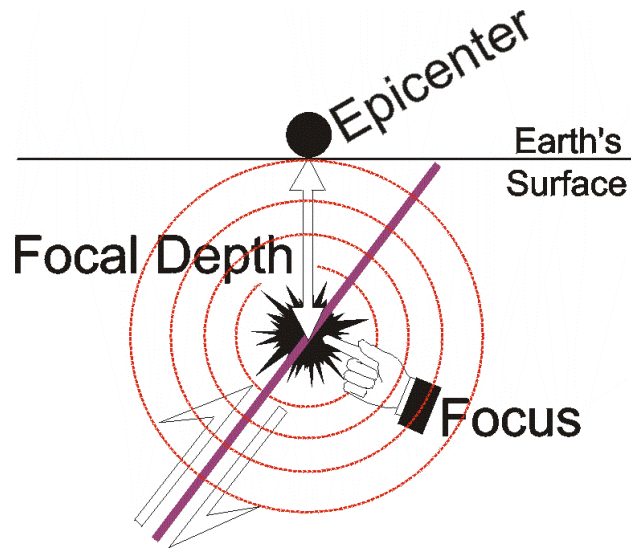
- θ_1 = angle of incidence
- θ_2 = angle of refraction
- V_1 = seismic velocity of incident medium
- V_2 = seismic velocity of refracting medium.

Q. What is the critical angle?



- i_c is called the critical angle, and it describes the angle that the incident raypath, i_1 , must assume for i_2 to be equal to 90 degrees.

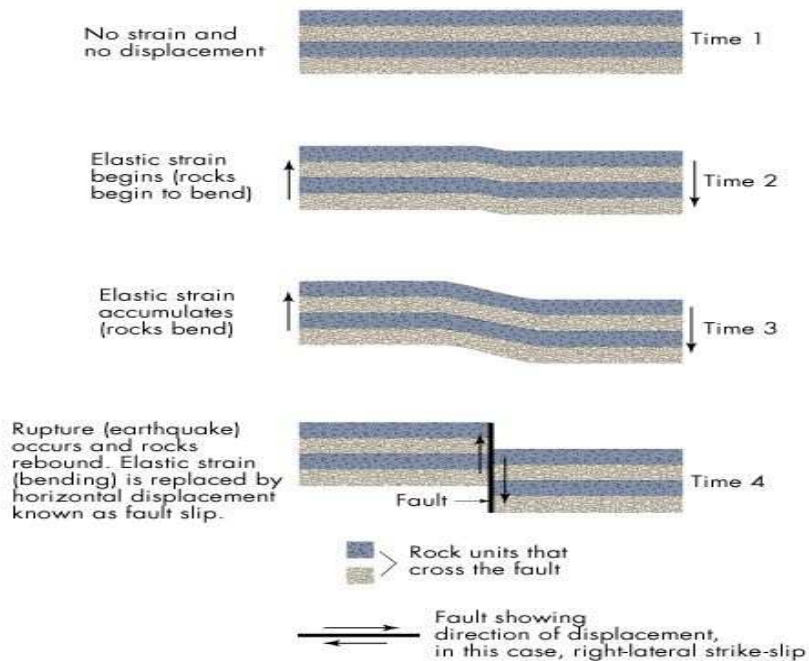
Q. Draw a figure of epicenter and focus?



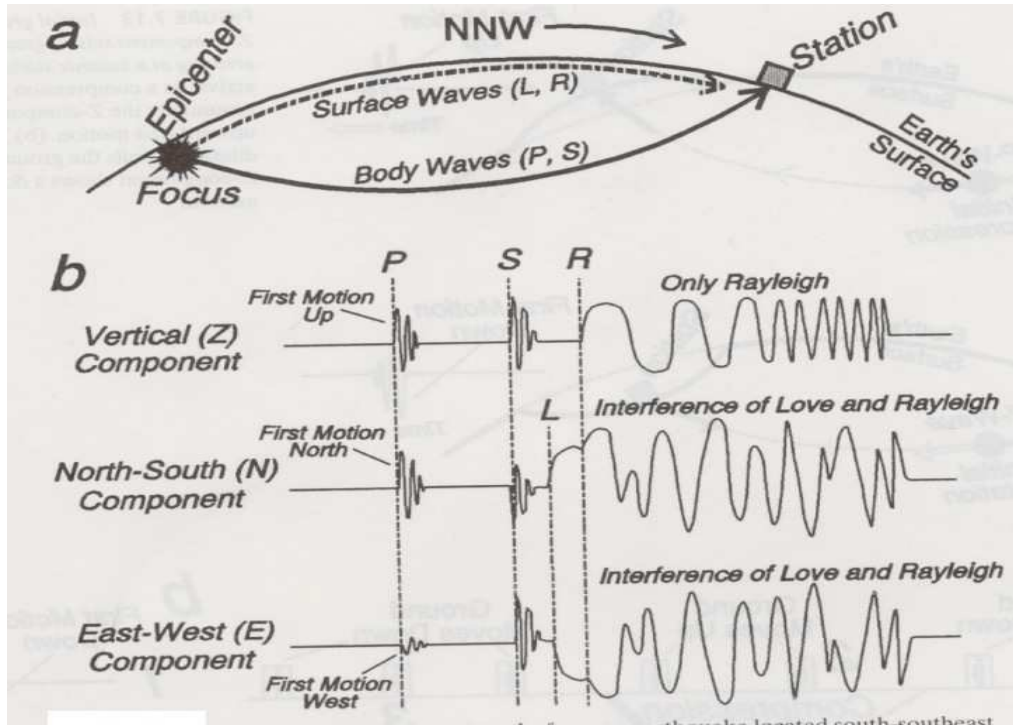
Q. What are the focal depth ranges?

1. Shallow: 0-70 km occurs in all plate boundaries.
2. Intermediate: 70-300 km occurs in convergent plates.
3. Deep: 300-700 km occurs in convergent plates.

Q. Draw the mechanism of earth generation?

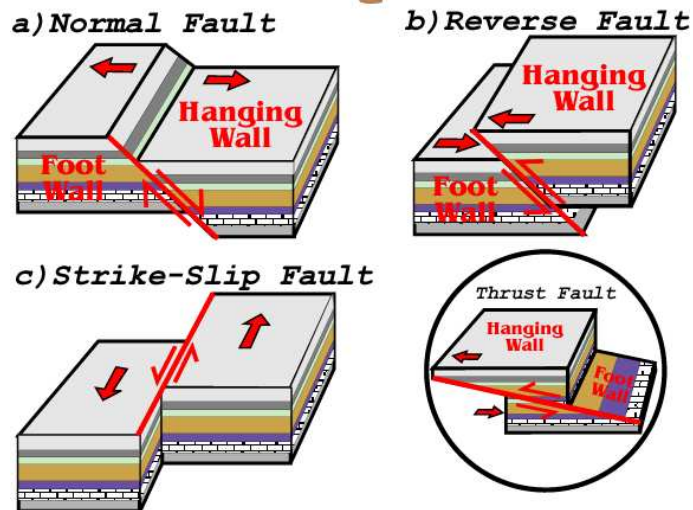


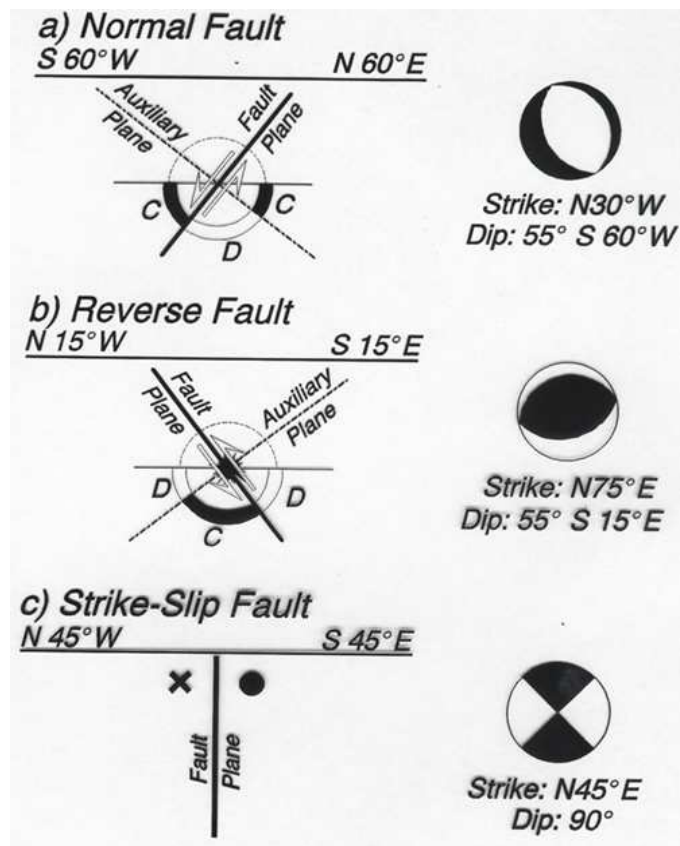
Q. Draw the seismic wave generated from an earthquake?



Q. Draw types of faults?

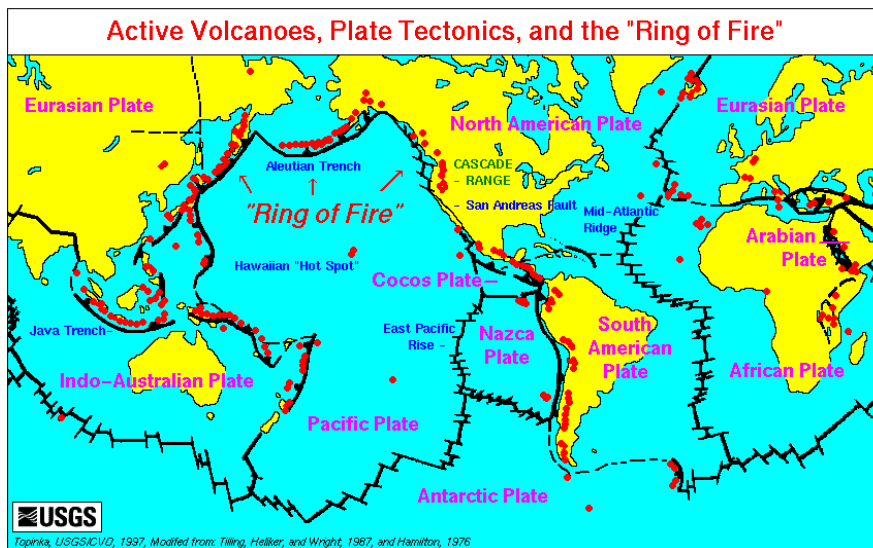
1. Normal: hanging wall moves away for foot wall.
2. Reverse: hanging wall moves towards foot wall.
3. Strike-Slip: moves parallel to each others.





Q. What are the major & minor plates? And their ages?

- Earth seven major plates: continents: African (3 Ga), Antarctic, Australian, Eurasian, Indian, S. American, N. American (4 Ga). Oceanic: Pacific (180 Ma) and Atlantic (85 Ma). Earth minor plates: Arabian, Caribbean, Coco, and Nazca

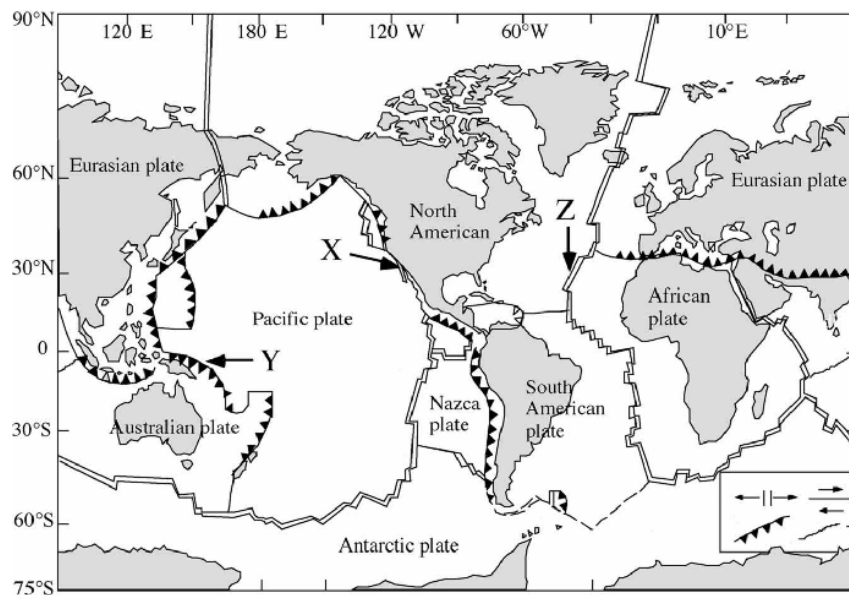


Q. How many continental & oceanic crusts are there?

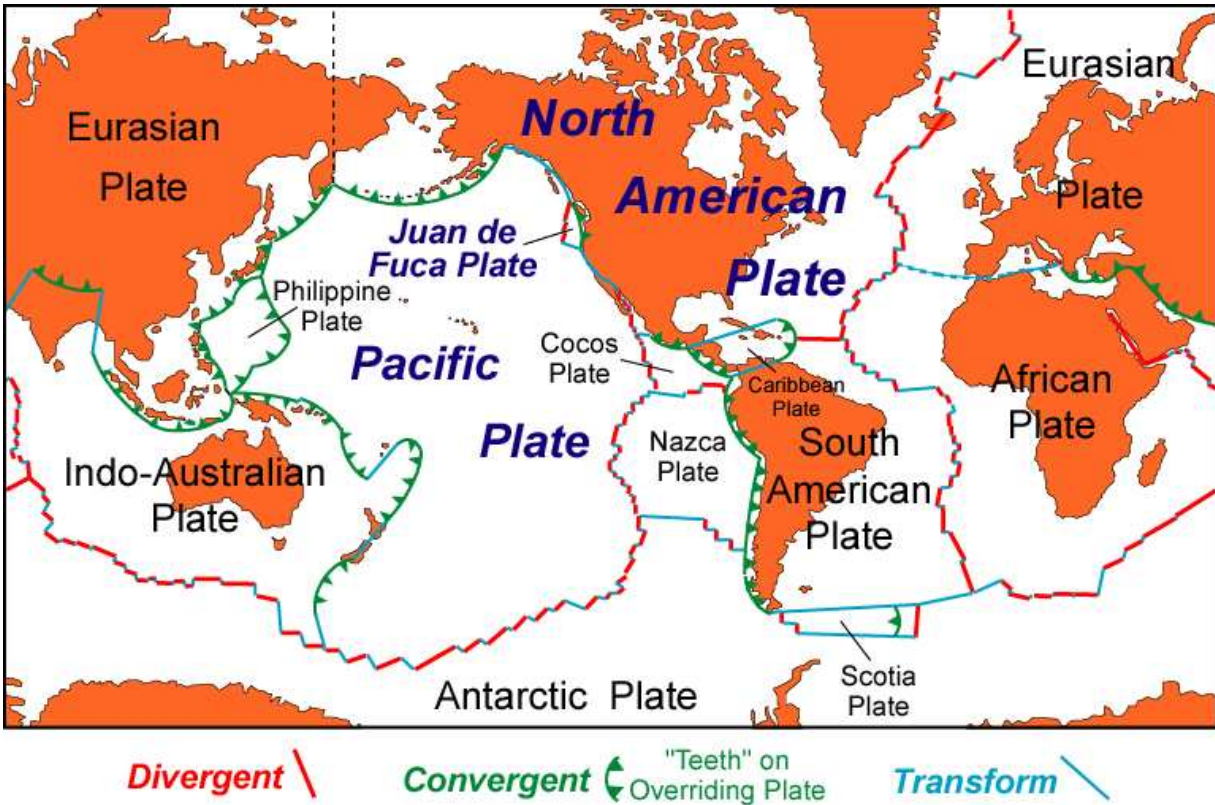
- Continents: African (3 Ga), Antarctic, Australian, Eurasian, Indian, S. American, N. American (4 Ga). Oceanic: Pacific (180 Ma) and Atlantic (85 Ma)

Q. What is subduction zone? Locate them in the world? Name the ones inside and near the US boarded?

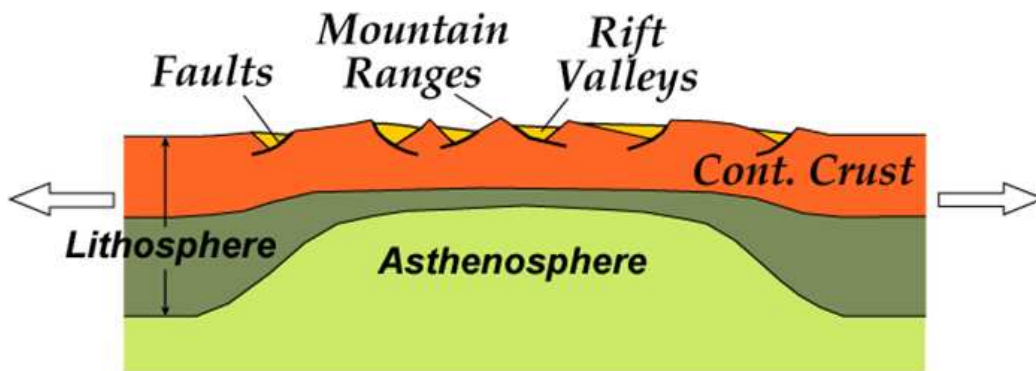
- A subduction zone is an area on earth where two tectonic plates move towards one another and subduction occurs. Rates of subduction are typically measured in centimeters per year, with the average rate of convergence being approximately 2 to 8 centimeters per year



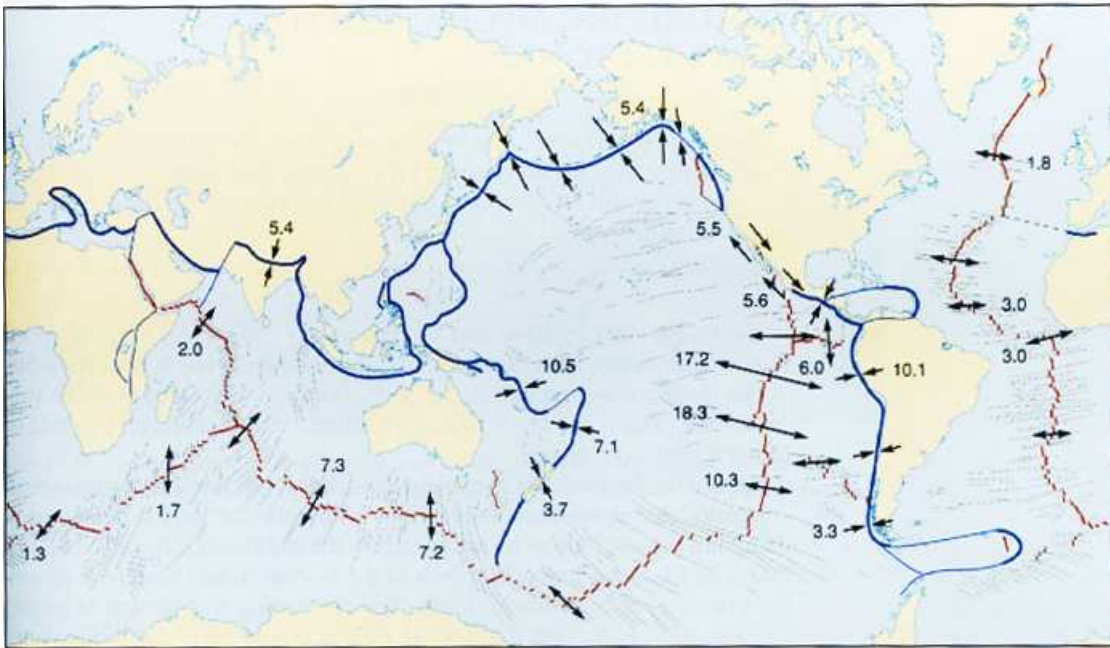
Q. What are plate boundaries collision types? Give examples?



Q. Draw the major aspects of plate collisions forming mid-oceanic ridge and rifting areas?

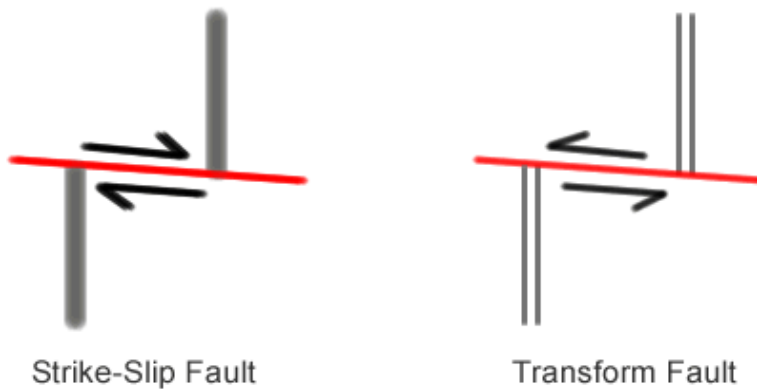


Q. What are the plate motion rates in the global? Which one is the fastest and the slowest ones?



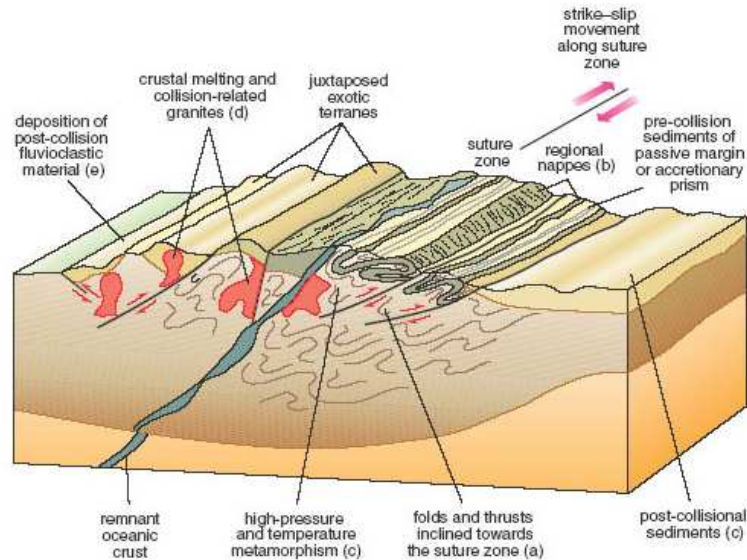
Q. What are the differences between strike-slip and transform faults?

- Transform faults can be distinguished from the typical strike-slip faults because the sense of movement is in the opposite direction. A strike-slip fault is a simple offset, however, a transform fault is formed between two different plates, each moving away from the spreading center of a divergent plate boundary. When you look at the transform fault diagram above, imagine the double line as a divergent plate boundary and visualize which way the diverging plates would be moving.



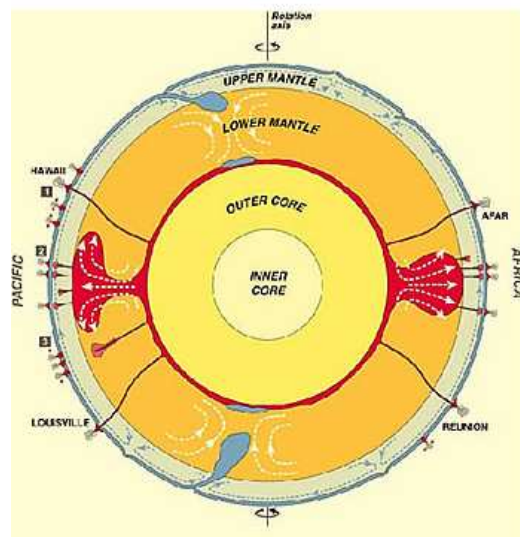
Q. What is the suture zone?

- The area where two continental plates have joined together through continental collision. Suture zones are marked by extremely high mountain ranges, such as the Himalayas and the Alps.



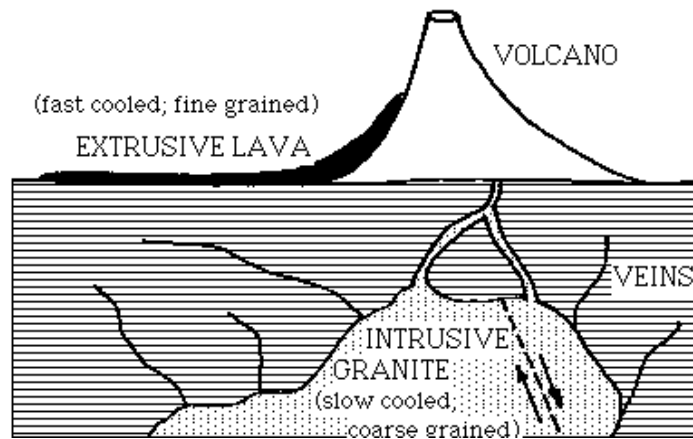
Q. What is mantle plume? Draw a figure of it and give examples?

- It is an upwelling magma that rises from the mantle into the crust. It erupts as lavas when reach the surface. It produces volcanic rocks when it's remains below surface. It produces volcanoes, hotspots, and flood basalt. Examples are Africa and Pacific. A mantle plume is a secondary way that Earth loses heat, much less important in this regard than is heat loss at plate margins.



Q. What are the differences between Intrusive and extrusive rocks?

- Intrusive rocks formed by the crystallization of magma at a depth within the Earth are called intrusive rocks. Intrusive rocks are characterized by large crystal sizes. Examples are diorite, gabbro and granite.
- Extrusive rocks formed by the crystallization of magma at the surface of the Earth are called extrusive rocks. They are characterized by fine-grained textures because their rapid cooling at or near the surface did not provide enough time for large crystals to grow. Examples are basalt and rhyolite.



Q. What are the differences between gabbro and basalt rocks?

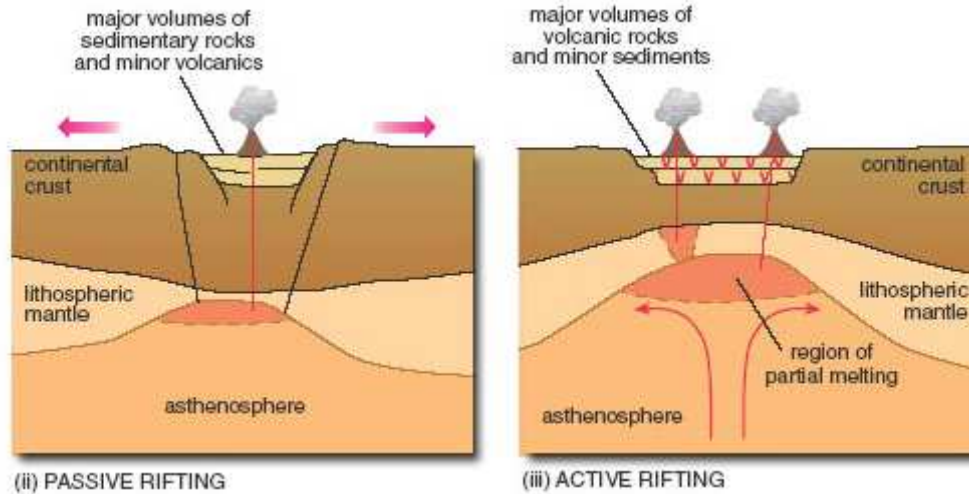
IGNEOUS ROCK CLASSIFICATION				
COLOR	LIGHT COLORED	MEDIUM COLOR	DARK COLOR	
CHEMISTRY	FELSIC	INTERMEDIATE	MAFIC	ULTRA MAFIC
COARSE GRAINED	GRANITE	DIORITE	GABBRO	PERIDOTITE
FINE GRAINED	RHYOLITE	ANDESITE	BASALT	KOMATIITE

Q. What is the concept of gravity?

The outer core is not under enough pressure to be solid, so it is liquid even though it has a composition similar to that of the inner core

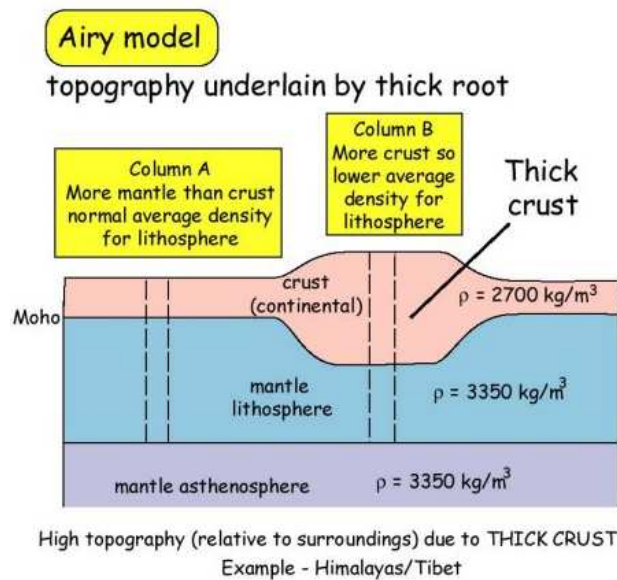
Q. What are the differences between passive and active rifting?

1. Active: results from local tension and drive by mantle plume.
2. Passive: response to regional far field stress drive by slab pull.

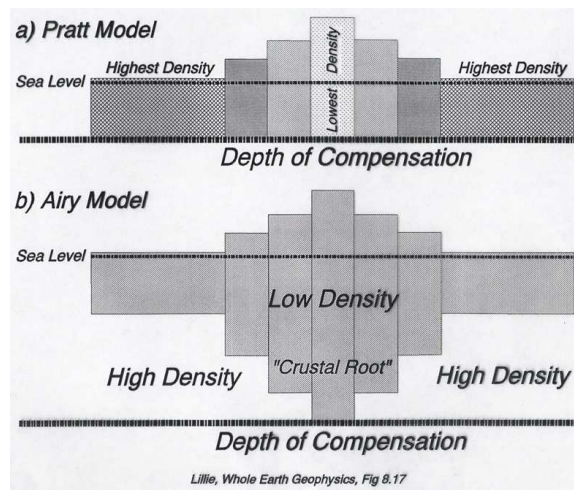
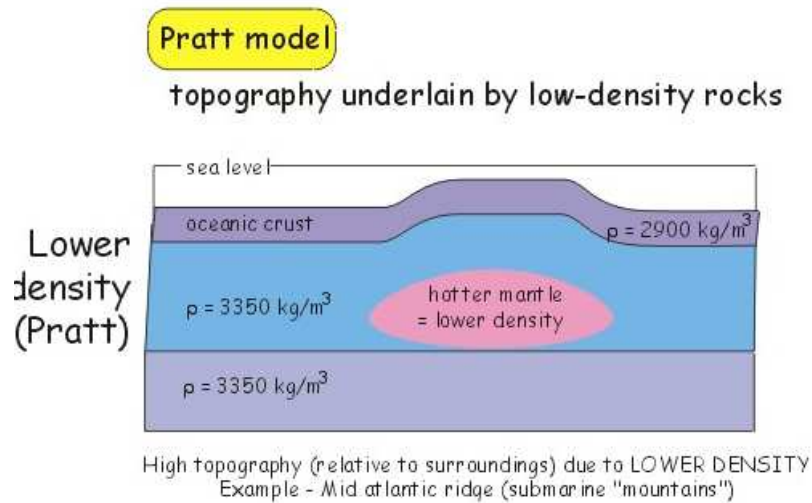


Q. What are the differences between Airy and Pratt's models?

- **Airy model** is a model to account for isostasy which in the lithosphere assumes a constant density ($\rho_c = 2670 \text{ kg/m}^3$), but in which topographic elevations (h) are compensated by the presence of 'roots' replacing high-density mantle rocks ($\rho_m = 3300 \text{ kg/m}^3$) by lower-density lithospheric rocks. The depth of the root (d) is equal to $h\rho_c/(\rho - \rho_c)$.



- **Pratt model** is a model for the lithosphere that accounts for isostatic anomalies by assuming there is a level of compensation that lies at a constant depth everywhere. Below the level of compensation all rocks have the same density, but above it density decreases as topographic elevation increases. For a column of material anywhere on Earth, the mass lying above the level of compensation will be the same, and $\rho_c h$ a constant, where ρ_c is the density of the crust and h the topographic elevation. If the rocks are on the sea bed, then $\rho_c h + \rho_w d$ is a constant, where ρ_w is the density and d the depth, of sea water.



The principle of isostasy: The weight of rock columns of the same horizontal crust section area must be the same above the depth of compensation. Beneath a mountain, there are two ways to reach isostatic balance: 1). A flat "Moho" and different crustal density ("Pratt's model"). 2). A varying "Moho" and same crustal density ("Airy's model"). Note: Airy model is more realistic on the Earth

Q. What are the differences between Bouguer gravity and air-free gravity?

- **Bouguer anomaly** is computed from a free-air anomaly by computationally removing from it the attraction of the terrain, the Bouguer reduction. Bouguer = expected value of gravity (location) - actual value. It corrects the observed gravity value.

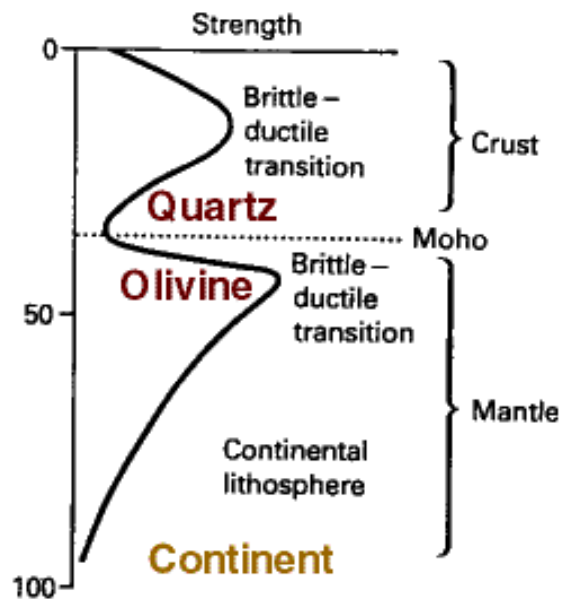
- **Free-air gravity anomaly**, often simply called the free-air anomaly, is the measured gravity after a free-air correction is applied to correct for the elevation at which a measurement is made. The free-air correction does so by adjusting these measurements of gravity by what would have been measured at sea level. Free-air = observed gravity - theoretical gravity. It measures the increase/decrease in mass within the earth.

Q. Explain the strength profile for continental and oceanic lithosphere?

Strength of lithosphere is the strength of the lithosphere (i.e. the total force per unit width necessary to deform a lithospheric section at a given strain rate) is a function of composition, crustal thickness, and geotherm.

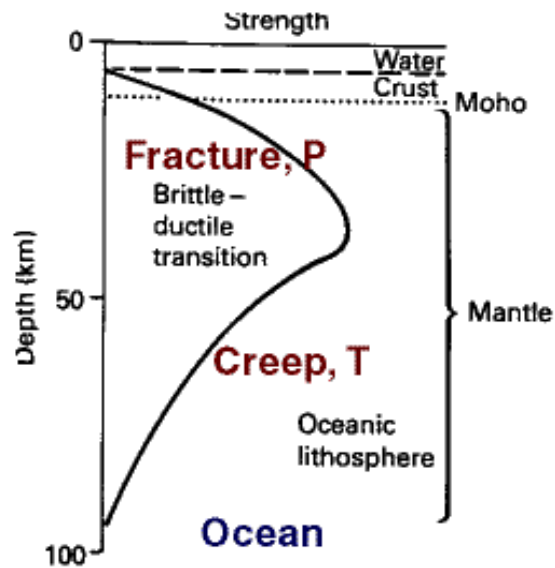
Strength of continental lithosphere:

1. The limit of continental lithosphere strength depends on the contents of quartz and olivine.
2. The continental lithosphere is characterized by a layer of weakness at lower crust depth.



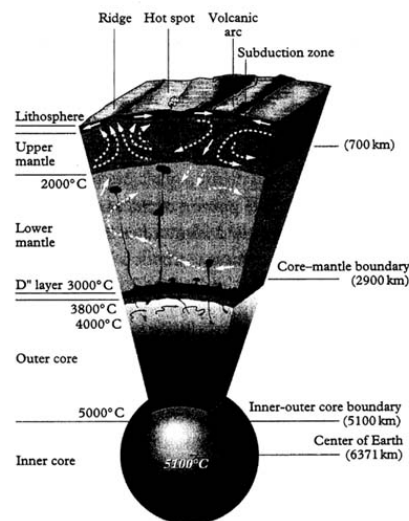
Strength of oceanic lithosphere:

1. The upper brittle crust gives a way to a region of high strength at depth of 20-60 km depending on the temperature gradient.



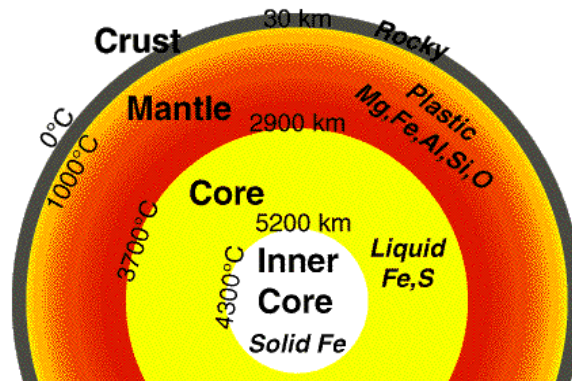
Q. What is “D” layer?

A strong change of density characterizes the core-mantle interface; it looks very abrupt so that this boundary acts as a quite perfect reflector for the seismic waves (200-300 km). There is, additionally, at the bottom of the lower mantle a layer called D" where an important change in the speed of P waves appears. That layer is a thermal and chemical boundary layer showing important lateral variability. (D" layer) is characterized by a decrease in seismic velocity.



Q. What are minerals assemblage for the crust and the mantle?

- Oxygen and Silicon are the two most common elements in the Earth's crust. These two elements bond to create silicates, which are the most abundant minerals in the earth's crust.
- Mantle rocks shallower than about 410 km depth consist mostly of olivine, pyroxenes, spinel-structure minerals, and garnet.



Q. What are the famous rift zones in the US?

- The Great Rift Zone. Other famous examples are the East African Rift and the Baikal Rift Zone.

Q. Explain left and right lateral motion?

- Left lateral is a type of strike-slip fault where the left block moves toward you and the right block moves away.

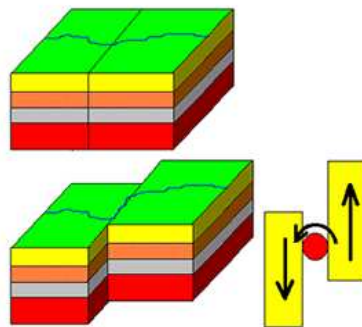
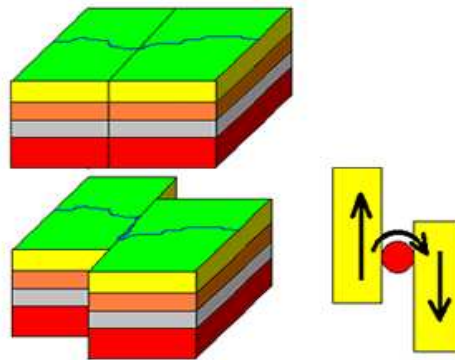


Diagram of left-lateral motion on fault. (Image courtesy of Steven Dutch, University of Wisconsin)

- Right lateral is a type of strike-slip fault where the right block moves toward you and the left block moves away.



(Image courtesy of Steven Dutch, University of Wisconsin)

Q. What are the differences between continental and oceanic crust?

Rock types	Continental	Oceanic
	Sedimentary, igneous and metamorphic	Mafic
layers	Upper: granite (50% silica) Lower: basalt (30 % silica)	1 st : unconsolidated sediments 2 nd : pillow lavas & sheeted dike 3 rd : gabbro
Thickness	35-40 km (exceed 70 km)	Less than 10 km
Density	Low (2.7 gm/cm ³)	High (3.3 gm/cm ³)
Age	4 billion years old	180 million years old

Q. What is the back azimuth?

a. **Back Azimuth.** A back azimuth is the opposite direction of an azimuth. It is comparable to doing "about face." To obtain a back azimuth from an azimuth, add 180 degrees if the azimuth is 180 degrees or less, or subtract 180 degrees if the azimuth is 180 degrees or more (Figure 6-3). The back azimuth of 180 degrees may be stated as 0 degrees or 360 degrees. For mils, if the azimuth is less than 3200 mils, add 3200 mils, if the azimuth is more than 3200 mils, subtract 3200 mils.

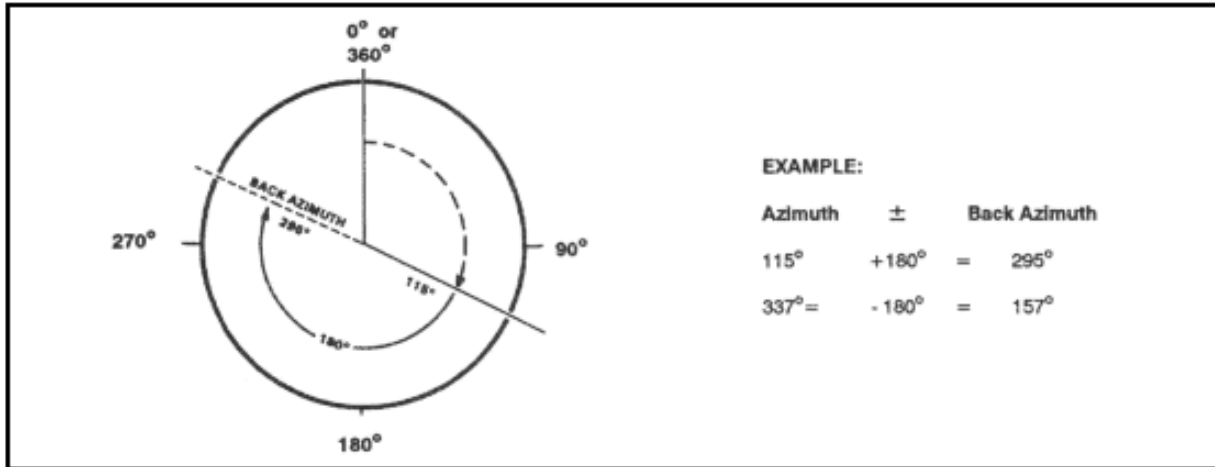


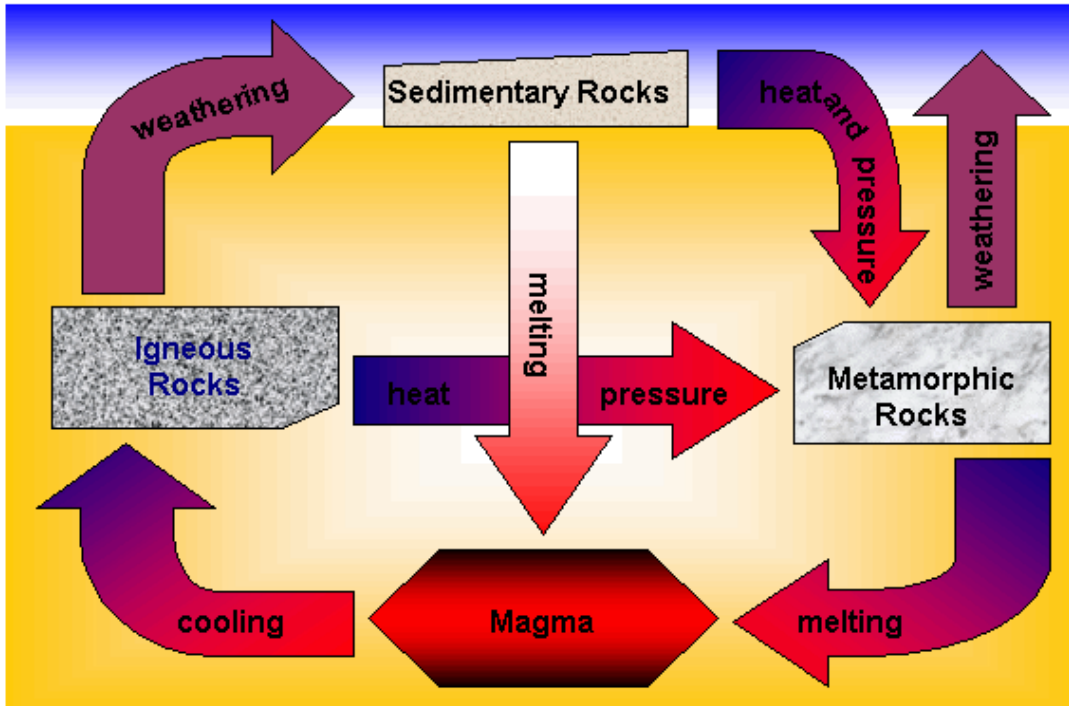
Figure 6-3. Back azimuth.

Q. Why the outer core is liquid?

- The outer core is not under enough pressure to be solid, so it is liquid even though it has a composition similar to that of the inner core

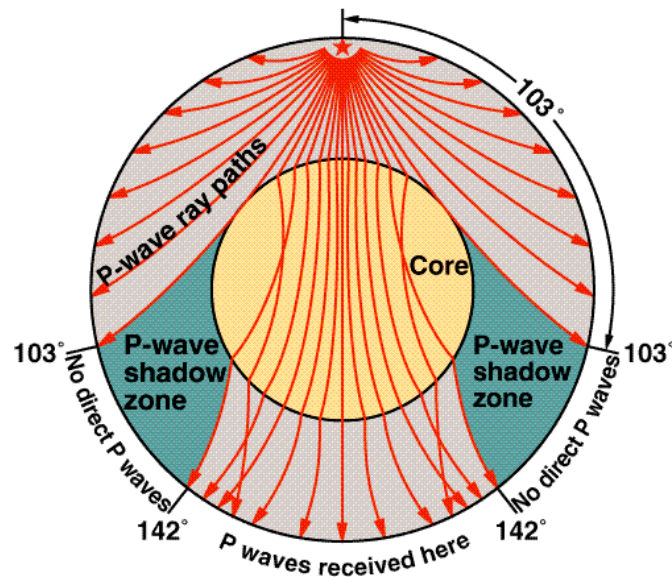
Q. Explain the formation of igneous, sedimentary, and metamorphic rocks?

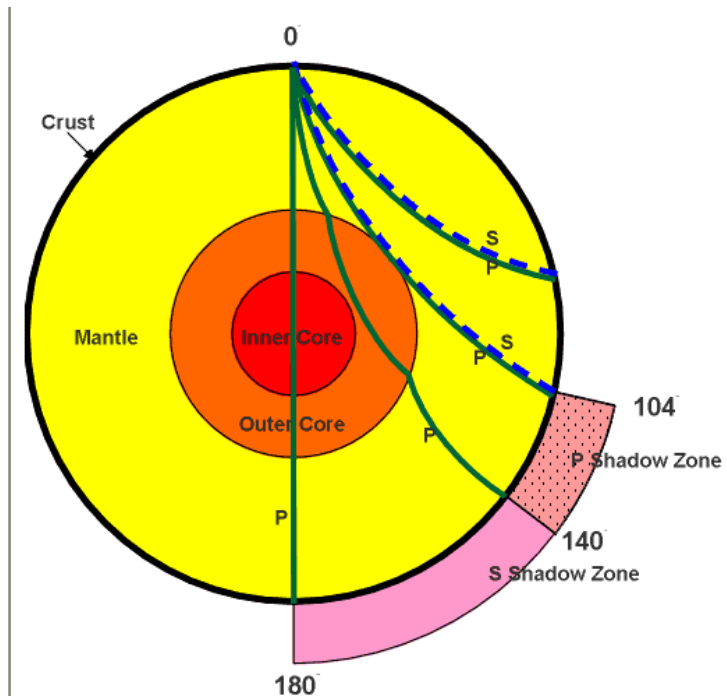
Rock types	Composition	Examples
Igneous	Form as molten rock cools and solidifies	Basalt, gabbro
Sedimentary	The products of mechanical and chemical weathering	Limestone, coal, and quartz
Metamorphic	produced from preexisting igneous, sedimentary, or even other metamorphic rocks	Marbles, schist, and slate



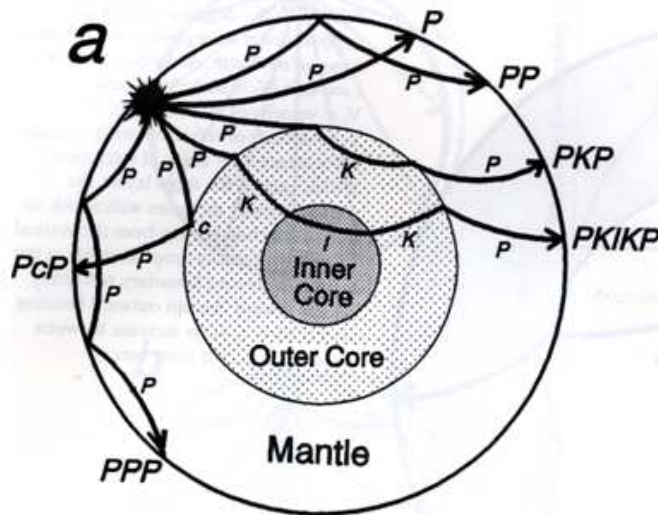
Q. What is the shadow zone?

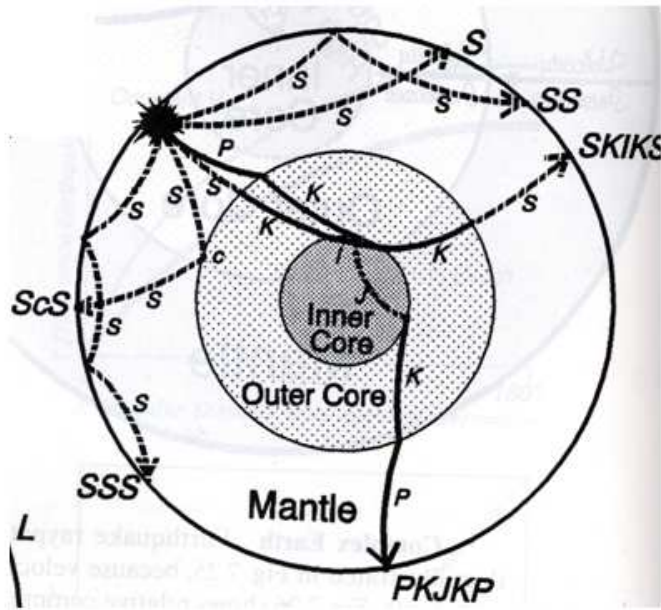
- A shadow zone is an area in which an S-Wave (secondary seismic wave) is not detected due to it not being able to pass through the outer core of the earth due to it being liquid.



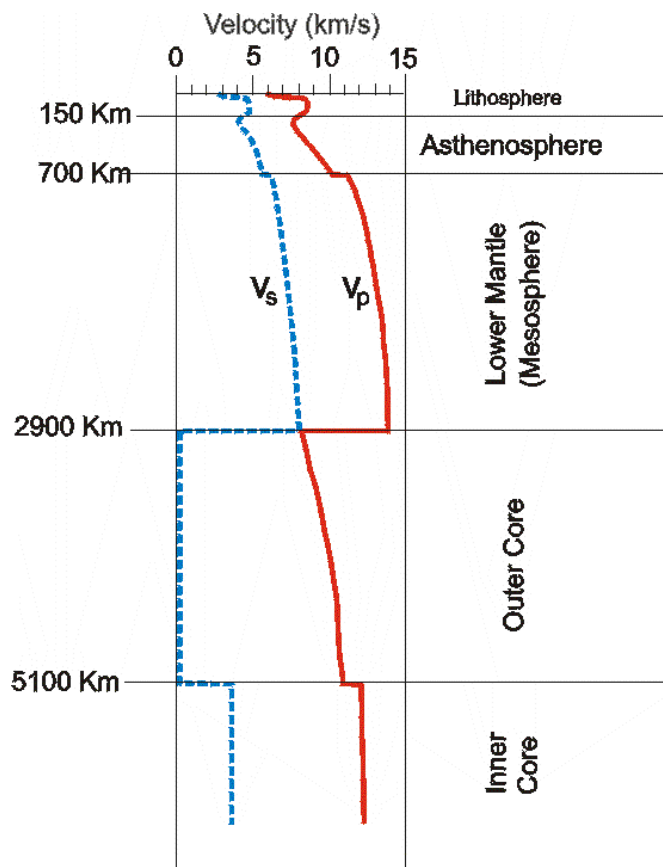


Q. Draw the figure for the converted P and S wave inside the earth body?

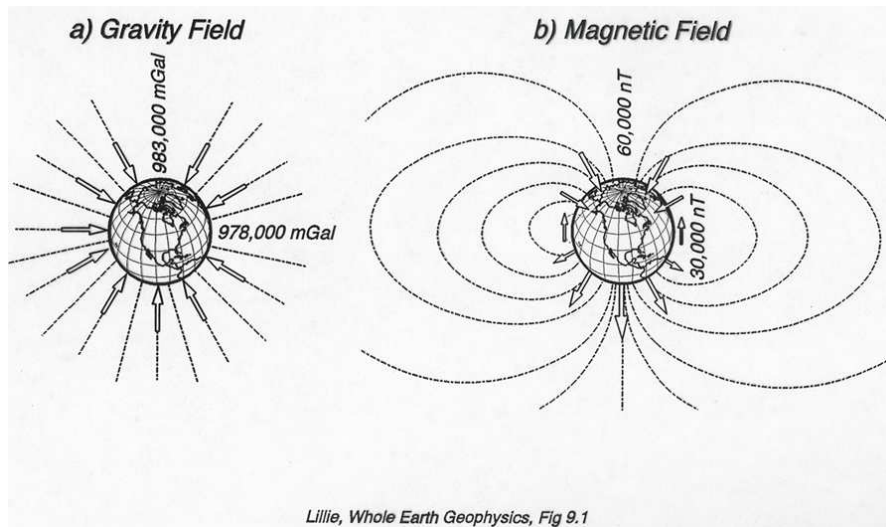




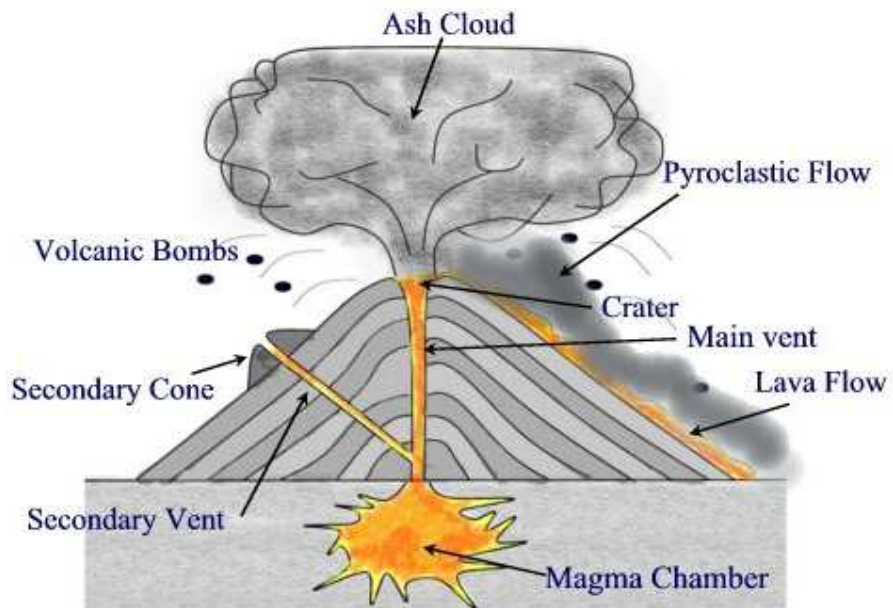
Q. Draw the P and S velocity curve inside the earth body?



Q. Draw gravity and magnetic field of the earth?



Q. Draw a figure showing the main features of a volcano?



Main Features of a Volcano

Q. Why there are no earthquakes beyond 700 km?

1. No convection and slabs deeper than 700 km.
2. The end of subduction zone.

Q. Define density?

Density is defined as material mass per unit volume	
Crust	Mantle
2.7 gm/cm^3 or 3.3 gm/cm^3	4.1 gm/cm^3
Change of density	
Pressure	Temperature
Pressure increase \rightarrow density increase	Temperature increase \rightarrow density increase

Q. What are the differences between the upper and the lower crust?

Type	Upper	Lower
	Felsic	Mafic
Density	Low (2.7 gm/cm^3)	High (3.1 gm/cm^3)
Vp/Vs	Low (1.74)	High (1.84)
Rich in	Quartz	Iron/magnesium
Rock	Granite	Olivine

Q. What are the differences between felsic and mafic rocks?

Color	Felsic	Mafic
	Black/dark brown	Light
Mineral	High % of heavy minerals	Low % of heavy minerals
Eruptions	Gently	Violently
Represent	Deeper materials	Melting materials
Specific gravity	Less than 3.0	Greater than 3.0
Rich in	Quartz	Iron/magnesium
Example	Granite	Olivine

Q. What are the average velocities for P and S waves in the crust and the mantle?

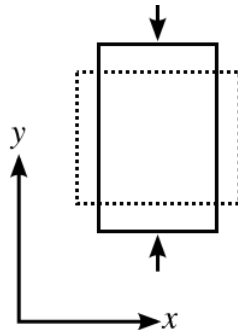
Layer	V_p	V_s
Crust	6.7 km/s	2.9 km/s
Mantle	8.1 km/s	4.2 km/s

Q. What are the differences between seismic refraction and reflection?

	When	Where	Why
Reflection	Changes in V and ρ	Lower crust and Moho.	Oil exploration, cross section, and details structure.
Refraction	Changes in V	Within the crust.	Composition and crustal thickness.
Seismic velocities	Changes in V	Deeper crust.	Compositions and deep layers.
Snell's law	Relation between the angles of incidence and refraction	At the boundary between layers	Determine the direction of refracted ray-path.

Q. Explain Poisson's ratio?

1. It is the changes of the diameter proportional to the change of length.
2. Material is stretched in one direction it tends to get thinner in the other direction.
3. High Poisson's ratio indicates mafic composition of the crust.
4. The range for most materials is from 0-0.5. Continental is 0.256 and oceanic is 0.30.
5. Poisson's ratio can be affected by:
 1. Temperature and pressure: the ratio will increase with increased pressure.
 2. Minerals contents: less heavy minerals will increase the ratio.
 3. Silica contents: more silica will increase the ratio.



Q. What are the earth's major spheres?

1. Hydrosphere "water".
2. Atmosphere "air".
3. Solid earth "rock".
4. Biosphere "life".

Q. Where do subduction zones occur?

- It takes place at the convergent boundaries. The edge of one lithosphere plate is forced below the edge of another. The denser plate will sink down. The plate will generate seismic and volcanic activity in the above plate. Examples: Japan, S. America, and Indonesia.

Q. Define Convection?

- Heat transfer in gas or liquid by circulation of currents from one place to another. When a fluid is heated from below. Convection takes place in a fluid when it is heated from below.

Q. What is deformation?

- Deformation is all changes in the original form, size, and shape of a rock. It also changes in location and orientation of the rock.

Q. What is the Moho?

1. Is the layer that separates the crust from the upper mantle.
2. It is a chemical boundary.
3. Ranges from 5-40 km.
4. The deepest one is 70 km depth beneath Tibetan Plateau.

Q. What does low amplitude of recorded Ps conversion means?

- A weak Moho transition zone.

Q. What is 420 km discontinuity?

1. The zone where velocities changes.
2. The zone where there are changes in the elastic properties of the rocks.

Q. Explain the velocity structure of the earth?

1. Velocities increases with depth because of pressure.
2. Sudden drop of P-wave at the outer core.
3. Sudden change in velocity and density at 670 km.

Q. What are the separation rates for oceanic ridges?

1. Fast: > 9 cm/year as in East Pacific Ridge.
2. Intermediate: 5-9 cm/year as in Northern East Pacific Rise.
3. Slow: 10-50 mm/a as in Atlantic Ridge.

Q. What do seismic velocities depend on?

- Elastic constants (bulk, young's, shear, Poisson's) and density.

Q. What is seafloor spreading hypothesis?

- An upwelling of mantle that creates new seafloor. The old seafloor descends into the mantle.

Q. What is wave coda?

- They are the directed converted phase (Pms), and the multiples waves (PPms and PSmS)

Q. Where do P-to-S contrasts observe?

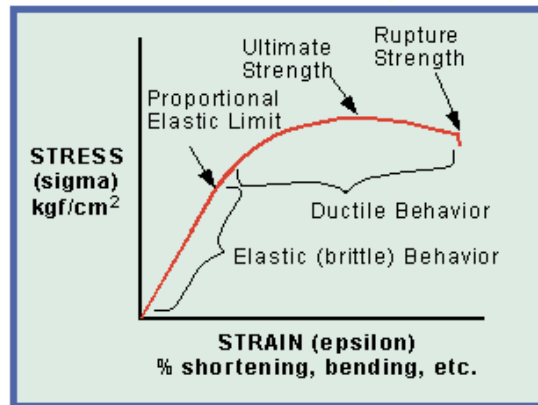
1. At the Moho boundary.
2. At 410-km.
3. At 660-km.

Q. What are the continental rift extension forces?

1. Extensional fault.
2. Lower crustal attenuation.
3. Lower crustal intrusion forming pluton.
4. Example: East African Rift where the entire tectonic plates are in the process of breaking apart to create new plates.

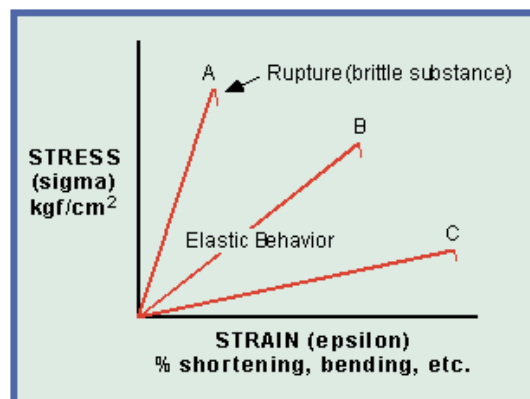
Q. Explain ductile deformation (Plastic)?

1. When rocks bend or flow, like clay, it is called ductile deformation.
2. Most rocks have a very small region of elastic behavior and behave more like a plastic with increased stress (pressure).
3. The strength of the rock depends on temperature, pressure and composition.



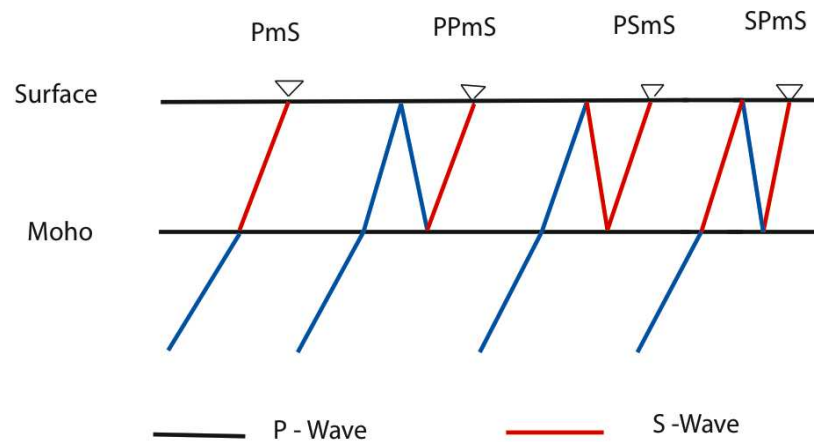
Q. Explain brittle Deformation (Elastic)?

1. When a rock breaks, it is called brittle deformation. Any material that breaks into pieces exhibits brittle behavior.
2. When the magnitude of an applied tensional stress exceeds the tensile strength of the material.
3. The strength of brittle rocks increase with confining pressure but decrease with temperature.



Q. What is receiver functions analysis?

1. Model the structure of the earth.
2. Image the depth to major velocity discontinuities in the crust and the uppermost mantle.
2. Use information from teleseismic earthquakes data recorded at three components seismograms “the first arrival is a refracted P-wave”.
3. Receiver functions calculated by the de-convolving the vertical from the radial and tangential components.



Q. What is seismology? And its importance?

- It is the study of earthquakes and waves produced by them. Seismology is the main tool to explore the Earth’s internal structures.

Q. What is the deepest focal depth of present earthquakes?

- At depth of 700 km.

Q. How many possible locations are there for the epicenter using data from tow station?

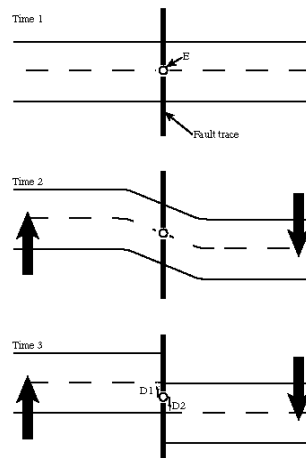
- There will be one or two locations, depending on where the circles intersect.

Q. How many possible locations are there for epicenter using data from 3 stations? Does a fourth station help to further pinpoint the epicenter?

- There is only one location will fits the data from the three stations. Yes, the fourth data set will confirm the location of the epicenter

Q. How do earthquakes occur?

- Earthquakes occur as plates on opposite sides of a fault are subjected to force and shift, they accumulate energy and slowly deform until their internal strength is exceeded. At that time, a sudden movement occurs along the fault, releasing the accumulated energy, and the rocks snap back to their original undeformed shape.

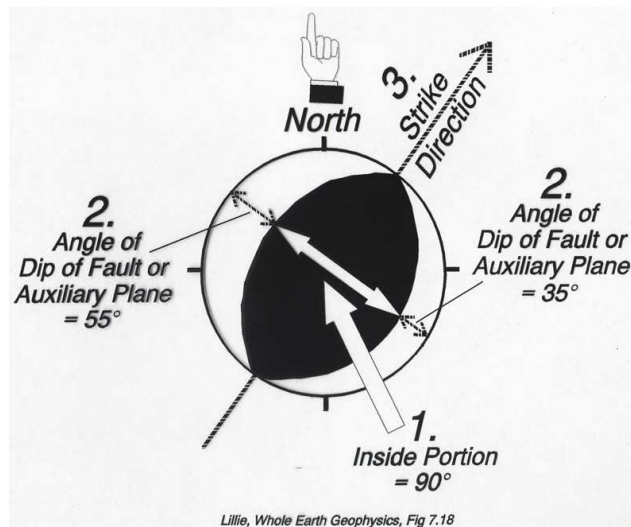


Q. What is earthquake cycle?

- Earthquakes most often occur along existing faults whenever the frictional forces on the fault surfaces are exceeded. The processes repeat over time and called earthquake cycle.

Q. What is focal mechanism of an earthquake?

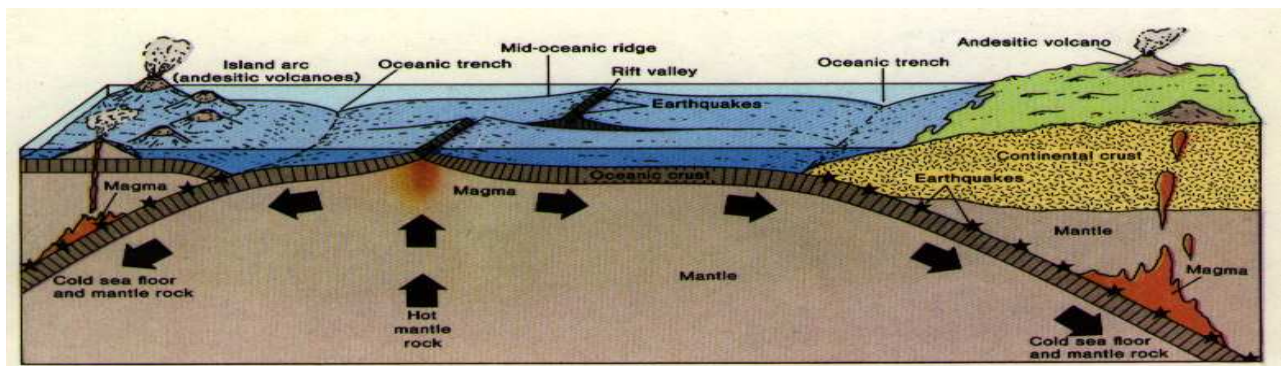
- The focal mechanism of an earthquake describes the inelastic deformation in the source region that generates the seismic waves. In the case of a fault-related event it refers to the orientation of the fault plane that slipped and the slip vector and is also known as a fault-plane solution. Focal mechanisms are derived from a solution of the moment tensor for the earthquake, which itself is estimated by an analysis of observed seismic waveforms.



Q. What is crustal delamination?

- In areas with thickened crust, the combination of pressure and temperature will turn the rocks in the “normal” lower crust to eclogite, which is heavier than the upper mantle. This instability will cause the sinking of the lower crust to the mantle and lead to delamination.

Q. Draw a figure of an oceanic trench?



Q. Draw a figure of mantle convection currents?

