

Tectonics NOTES

OBJECTIVES

Correctly define: Asthenosphere, convergent, divergent, epicenter, focus, strata, p-waves, s-waves, tectonics, tsunami

Explain that most earthquakes and volcanoes are located at or near plate boundaries.

EARTHQUAKES:

Demonstrate how to find the epicenter of an earthquake based on data from three seismographs.

Calculate the difference in arrival times between p- and s-waves.

Calculate the distance from the epicenter of an earthquake based on the arrival times of p- and s-waves.

Calculate the distance from the epicenter of an earthquake based on the difference in arrival time of p- and s-waves.

Explain how Earth's interior properties can be inferred from seismic data.

Explain how damage could be minimized in the event of an earthquake.

Explain the concept of the Richter scale.

PLATE TECTONICS:

Explain the difference between plate tectonics and continental drift.

Give three observations which support continental drift.

Identify that oceanic crust is thinner and denser than continental crust.

Identify the key rock types that compose the oceanic and continental crusts.

Name the three types of plate boundaries and give an example for each.

Explain the relative age of oceanic crust in relation to its distance from a rift.

Identify that convection cells and radioactive decay are the driving forces behind plate movement.

Vocabulary

Asthenosphere:

Convergent:

Divergent:

Epicenter:

Focus:

P-waves:

S-waves:

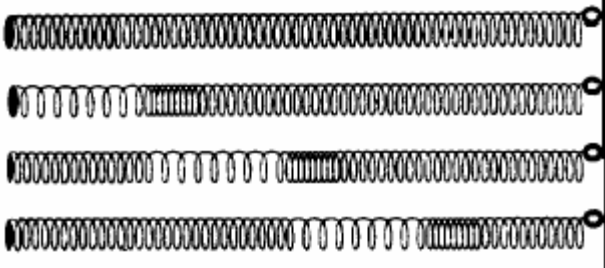
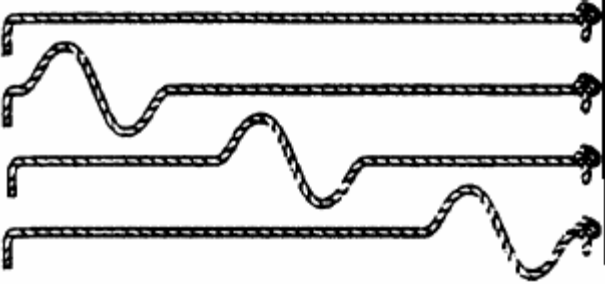
Strata:

Tectonics:

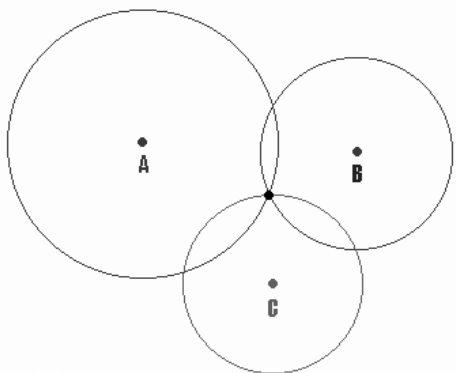
Tsunami:

Key Concepts & Questions

- What is the driving force behind crustal movement? **convection currents in the mantle**
- What provides the energy for this force? **radioactive decay**
- What are the different types of earthquake waves? And how do they travel?

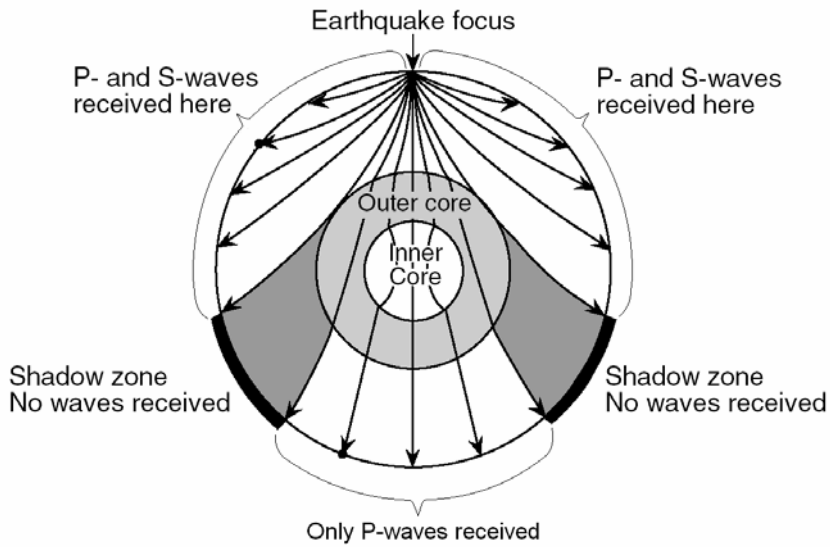
p-waves (push-pull waves)	s-waves (shear waves)
Also called:	Also called:
	
<p style="text-align: center;">Can Travel Through anything</p>	<p style="text-align: center;">Can Travel Through only through solids</p>

- Where can most earthquake epicenters and volcanoes be found? **along plate boundaries**
- To find an earthquake's epicenter a seismologist must have data from at least how many locations?



at least three locations

➤ **How can scientists infer the properties of Earth's interior?**



by observing earthquake waves

➤ **How do scientists know that Earth's inner core is solid?**

by the refraction of p-waves

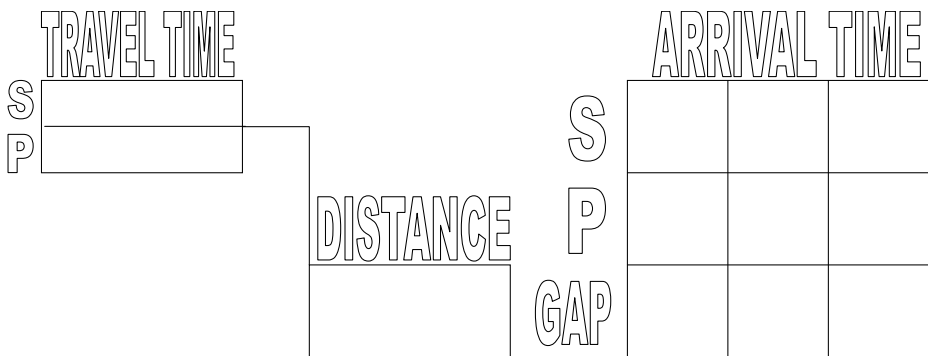
Earthquakes

➤ What can people do to protect themselves during an earthquake?

get under a desk/table, stand against an interior wall, stay away from windows

➤ What is the Richter scale and how is it used?

What it is	How it is used
a measure of earthquake strength	used to describe expected damage



Teachers:

I use this with my students to show them how to solve all of the types of questions associated with the earthquake chart.

For example: If they have a travel time, they would go over and down to find the distance. If they had the distance, they would go up and over to find the s- or p-wave arrival time.

If they have the p- and s-wave arrival times, they would need to find the GAP (subtract). I teach them that GAP stands for "Get a Piece of Paper". They mark off the time on the edge of their paper and then find the "gap" between the two lines.

Be able to answer these types of questions:

1. If a p-wave arrives five minutes before the s-wave arrives, how many kilometers from the epicenter is a location? **3600 kilometers**
2. If a p-wave arrives at 12:10:00 and the s-wave arrives at 12:16:20, how many kilometers from the epicenter is a location? **4800 kilometers**
3. An earthquake epicenter is 2600 kilometers from a location. If the p-wave arrives at 9:00:20, what time will the s-wave arrive? **9:04:20**
4. An earthquake epicenter is 5200 kilometers from a location. If the s-wave arrives at 1:20:20, what time did the p-wave arrive? **1:13:20**
5. If a p-wave arrives 6 mins after an earthquake occurs, how many kilometers is the location from the epicenter? How long after the p-wave arrives will the s-wave arrive?
3200 kilometers, 4:40 later

Plate Tectonics

- What is the Theory of Continental Drift? What evidence supports this theory?

The Theory	The Evidence
<p>Alfred Wegner, 1915 the continents were once a supercontinent called Pangea,</p> <p>the continents are plowing through the ocean crust---most people didn't believe</p>	<p>Africa and South America appear like they could fit together</p> <p>there are similar fossils, rocks and glacial striations on multiple continents</p>

- What is the Theory of Plate Tectonics? What evidence supports this theory?

The Theory	The Evidence
<p>the Earth's crust is made of plates that ride on top of the asthenosphere</p> <p>the plates move due to convection currents in the mantle</p>	<p>the distribution of earthquakes and volcanoes</p> <p>sea-floor spreading</p>

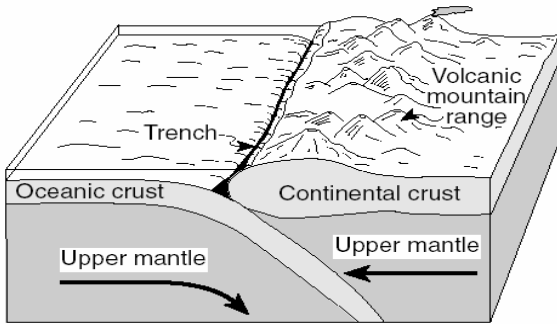
- How do oceanic and continental crust compare with regard to thickness and density?

	continental	oceanic
density	low density	high density
thickness	thick	thin

- What are the primary rocks which make up the continental and oceanic crusts?

continental crust	oceanic crust
<p>Low-density, light-colored, coarse-grained, felsic, igneous rock</p>	<p>High density, dark-colored, fine-grained, mafic, igneous rock</p>
granite	basalt

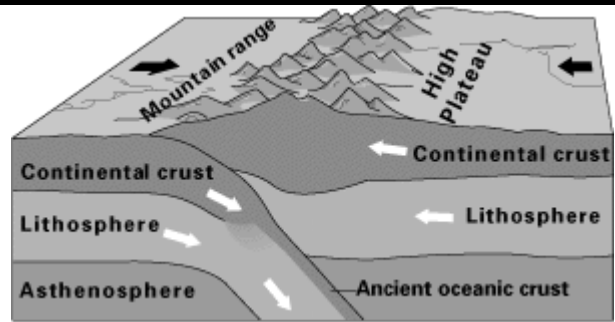
- What are these types of plate boundaries? What are the key characteristics for each?
- Give an example where each can be found in the world.



Type: **oceanic-continental convergent**

Key Characteristics: **trenches, volcanoes, deep earthquakes**

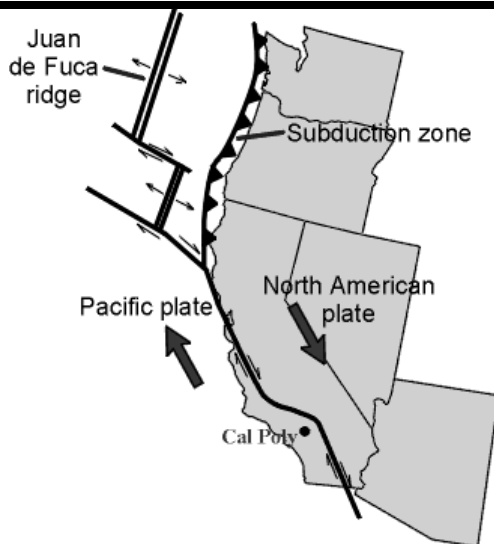
Example: **Peru-Chile Trench**



Type: **continental-continental convergent**

Key Characteristics: **mountain building**

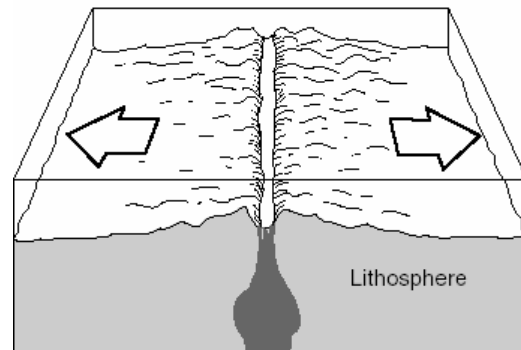
Example: **Himalayas**



Type: **transform fault**

Key Characteristics: **slide past one another, shallow earthquakes**

Example: **San Andreas Fault**



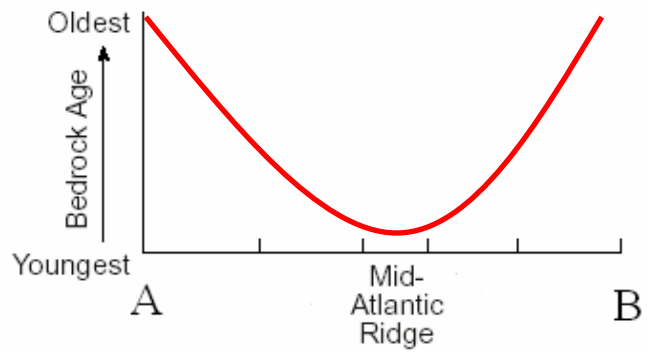
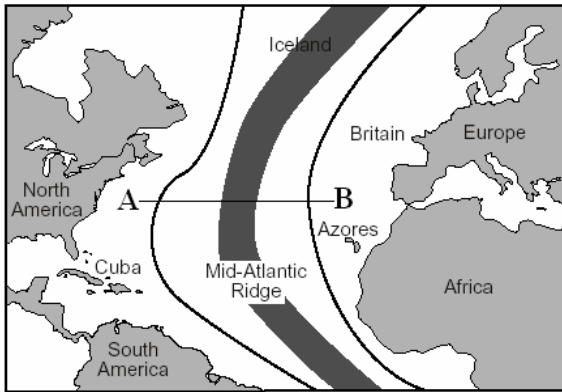
Type: **divergent plate boundary**

Key Characteristics: **new crust is made**

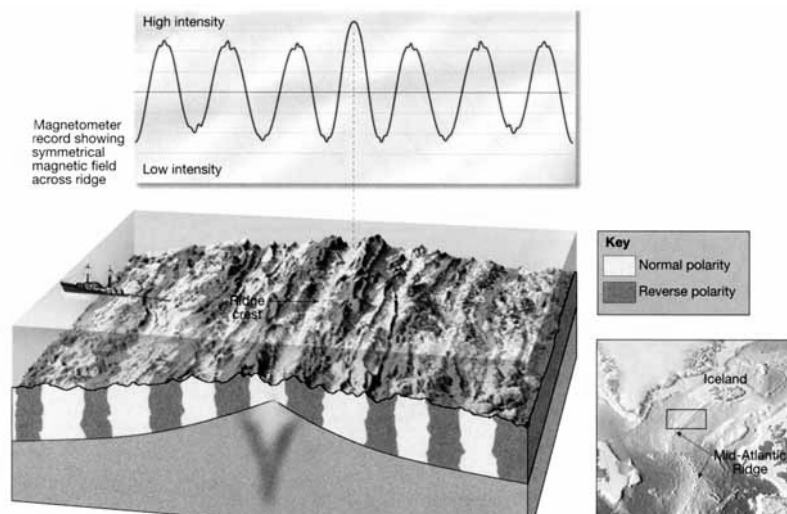
Example: **Mid-Atlantic Ridge**

➤ What happens to the age of oceanic crust as distance increases from a ridge?

it gets older



➤ Explain how magnetic data can be used to show that oceanic crust is diverging at ridges. Use the diagram below to help explain your answer.



as new crust is made at ridges, the ferrous minerals (Fe) align according to where the magnetic poles are located
same pattern on opposite sides of the ridge
proves sea-floor spreading