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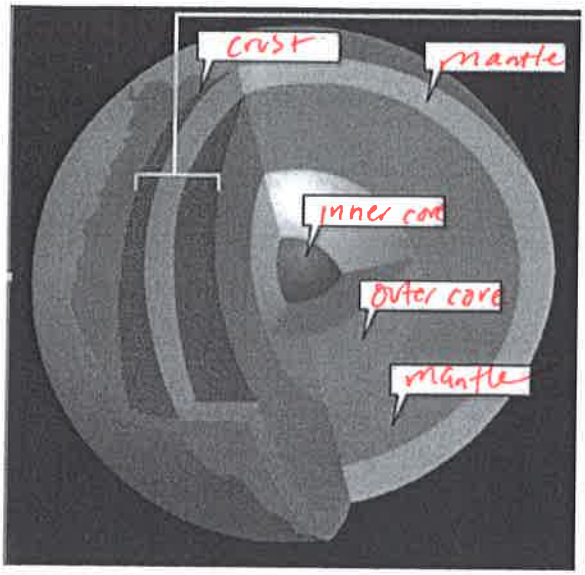
Plate Tectonics Web-Quest

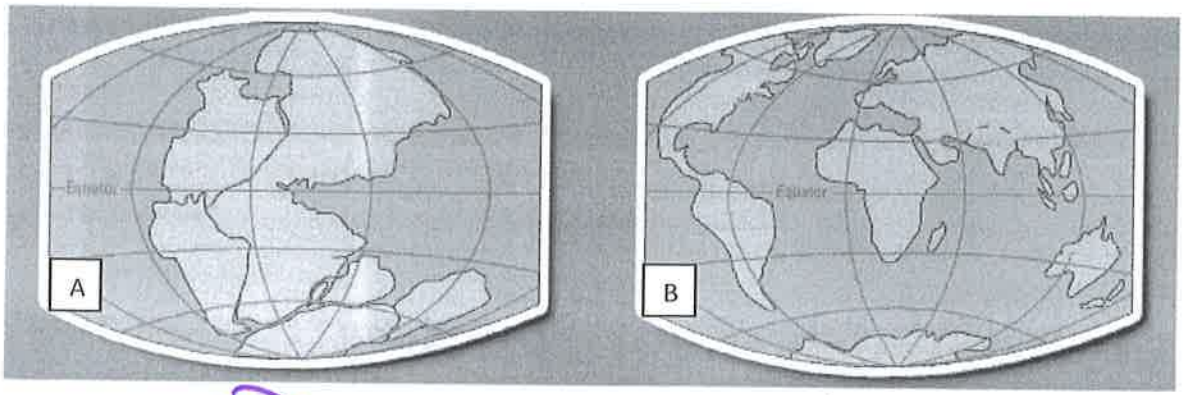
Part I: Earth's Structure. Use the following link to find these answers:
http://www.learner.org/interactives/dynamicearth/structure.html

1. Label the layers of Earth in the diagram below.



2. The lithosphere is made up of the crust and a tiny bit of the upper mantle.
3. The plates of the lithosphere move (or float) on this hot, malleable semi liquid zone in the upper mantle, directly underneath the lithosphere. This is known as the Asthenosphere.
4. The layer of Earth that is the only liquid layer is the outer core.

Part II. Plate Tectonics. Use the following link to find these answers:
http://www.learner.org/interactives/dynamicearth/drift.html



1. True or False? Image A depicts what Earth looks like today. (circle the correct answer)

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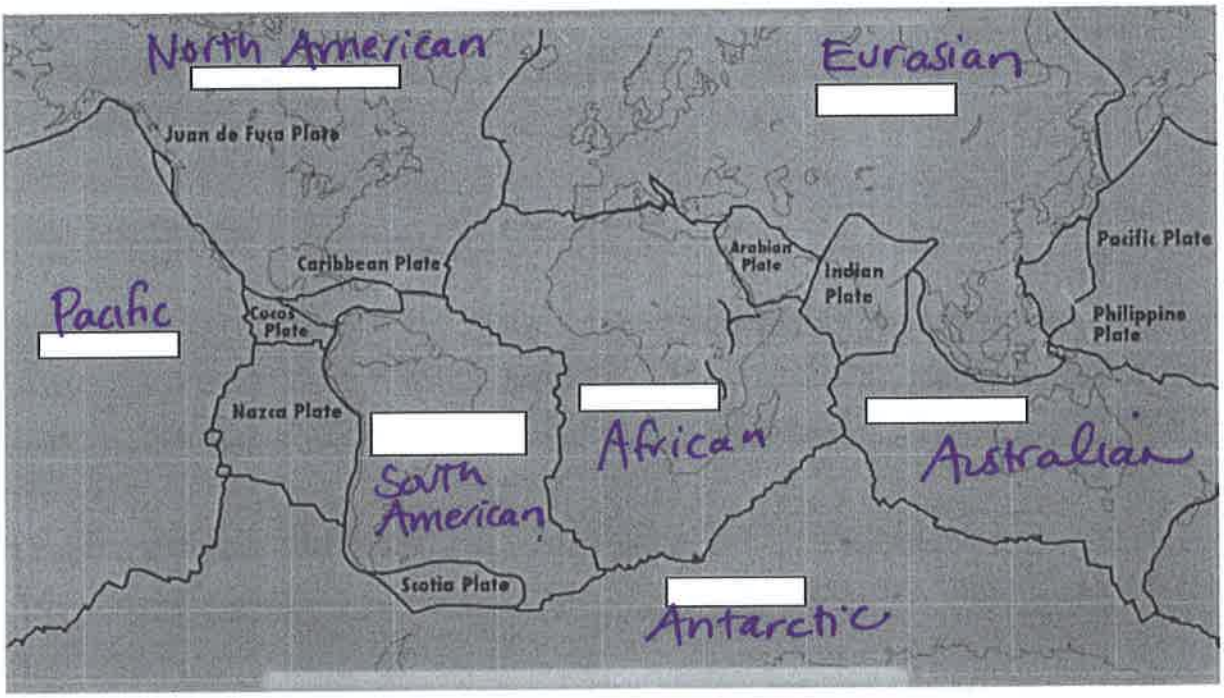
2. What did Earth look like 250 million years ago? The continents of Earth were clustered together in formation that a scientist named Pangaea. The scientist that named "Pangaea" was a German scientist by the name of Alfred Wegener. He theorized that "Pangaea" split apart and the different landmasses, or continents, drifted to their current locations on the globe. Wegener's theories of plate movement became the basis for the development of the theory of plate tectonics.

3. Order the images of Earth's plates in order from oldest or earliest (1) to most recent (5).

5 3 2 4 1

Part III. Plates and Boundaries. Use the following link to find these answers:
http://www.learner.org/interactives/dynamicearth/plate.html

1. Name the missing tectonic plates in the blanks on the image below.



2. The place where the two plates meet is called a boundary. Boundaries have different names depending on how the two plates are moving in relationship to each other.
   A. If two plates are pushing towards each other it is called a convergent b.
   B. If two plates are moving apart from each other it is called a divergent b.

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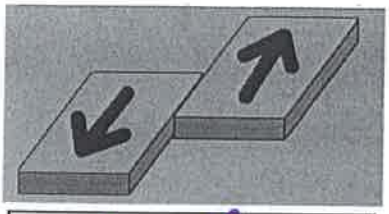
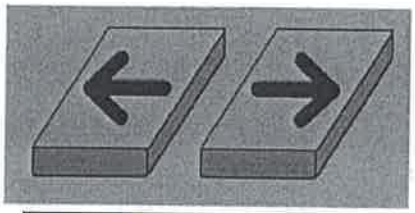
C. If two plates are sliding past each other it is a called a transform.

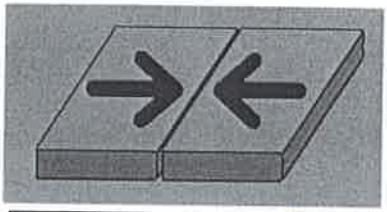
3. Label the type of boundary depicted in each image below.



transform



divergent



convergent

4. Plates and Boundaries Challenge. Follow directions for the challenge. Record your results below:

Part I. Number of correctly placed plates = _____

Part II. Number of boundary types correctly labeled = _____

Part IV. Slip, Slide, and Collide. Use the following link to find these answers:
http://www.learner.org/interactives/dynamicearth/slip.html

1. At **convergent boundaries**, tectonic plates collide with each other. The events that occur at these boundaries are linked to the types of plates (oceanic or continental that are interacting.

Subduction Zones and Volcanoes

At some convergent boundaries, an oceanic plate collides with a continental plate. Oceanic crust tends to be denser and thinner than continental crust, so the denser oceanic crust gets bent and pulled under, or subducted, beneath the lighter and thicker continental crust. This forms what is called a **subduction zone**. As the oceanic crust sinks, a deep oceanic trench, or valley, is formed at the edge of the continent. The crust continues to be forced deeper into the earth, where high heat and pressure cause trapped water and other gasses to be released from it. This, in turn, makes the base of the crust melt, forming magma. The magma formed at a subduction zone rises up toward the earth's surface and builds up in magma chambers, where it feeds and creates volcanoes on the overriding plate. When this magma finds its way to

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the surface through a vent in the crust, the volcano erupts, expelling ash and lava. An example of this is the band of active volcanoes that encircle the Pacific Ocean, often referred to as the Ring of Fire.

Roll your mouse over the image to find the definitions of the words below:

Subduction Zone – area where 1 plate is being pulled under edge of another.

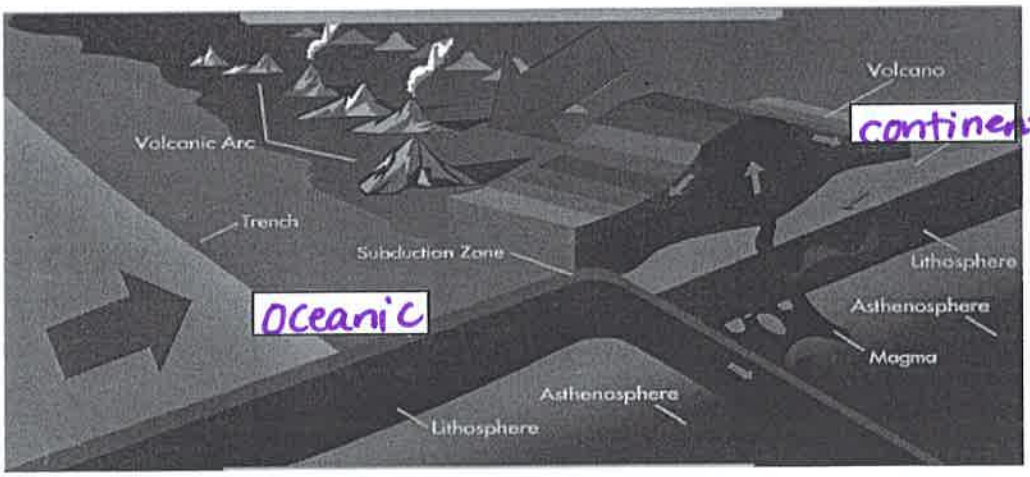
Magma - molten rock, gases, + solid crystals + minerals

Trench - steep sided depression in the ocean floor

Volcano - vent in earth's surface through which magma + gases erupt.

Volcanic Arc - arc shaped chain of volcanoes formed above a subduction zone

Fill in the type of crust converging in the image below.



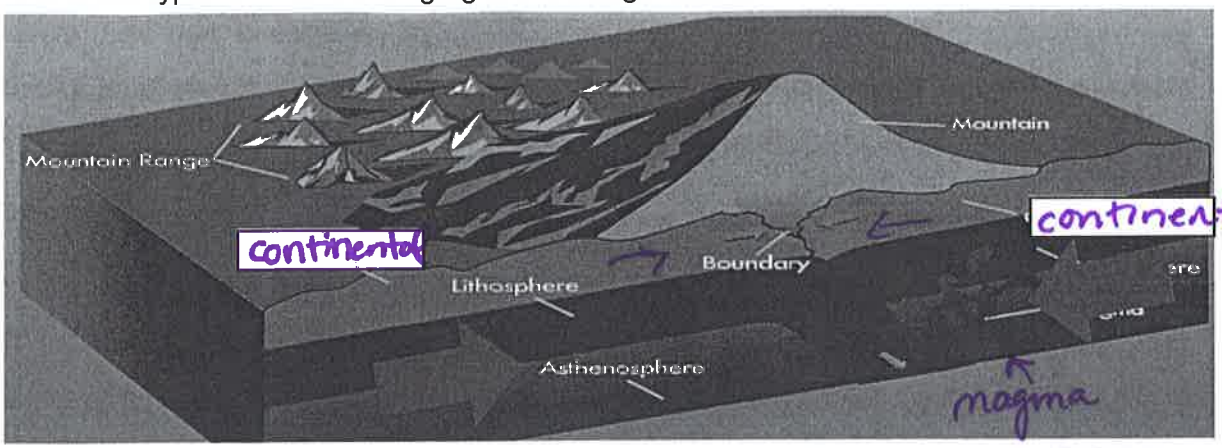
A subduction zone is also generated when two oceanic plates collide — the older plate is forced under the younger one, and it leads to the formation of chains of volcanic islands known as island arcs.

Collision Zones and Mountains

What happens when two continental plates collide? Because the rock making up continental plates is generally lighter and less dense than oceanic rock, it is too light to get pulled under the earth and turned into magma. Instead, a collision between two continental plates crunches and folds the rock at the boundary, lifting it up and leading to the formation of mountains + mtn ranges

Name _____ Date _____ Period ____

Fill in the type of crust converging in the image below.



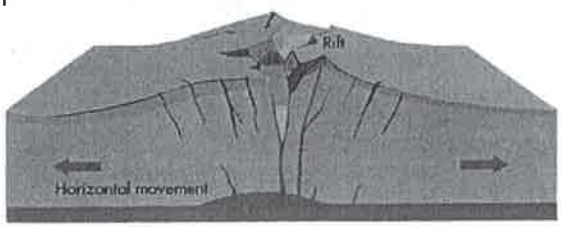
Roll your mouse over the image to find the definitions of the words below:

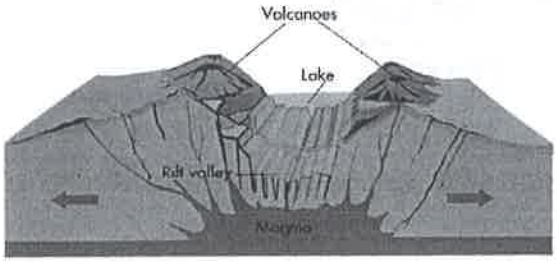
Continental Crust - earth's crust that makes up the continents

Mountain - high, large mass of earth + rock that rises above the earth's surface w/ steep or sloping sides.

2. At **divergent boundaries**, tectonic plates are moving away from each other. One result of huge masses of crust moving apart is sea floor spreading. This occurs when two plates made of oceanic crust pull apart. A crack in the ocean floor appears and then magma oozes up from the mantle to fill in the space between the plates, forming a raised ridge called a Mid-ocean ridge. The magma also spreads outward, forming new ocean floor and new oceanic crust.

When two continental plates diverge, a valley-like rift develops. This rift is a dropped zone where the plates are pulling apart. As the crust widens and thins, valleys form in and around the area, as do volcanoes, which may become increasingly active. Early in the rift formation, streams and rivers flow into the low valleys and long, narrow lakes can be created. Eventually, the widening crust along the divergent boundary may become thin enough that a piece of the continent breaks off, forming a new tectonic plate.





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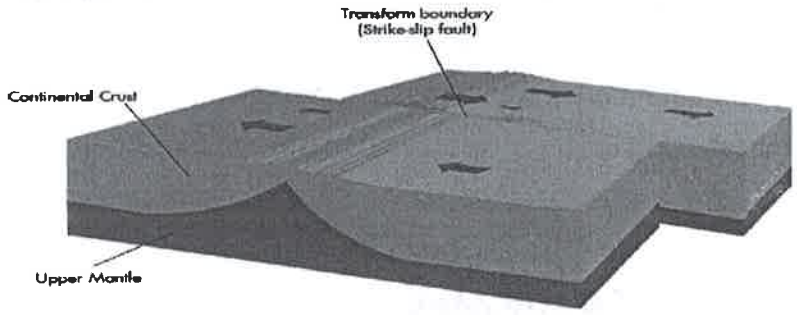
3. At **transform boundaries**, tectonic plates are not moving directly toward or directly away from each other. Instead, two tectonic plates grind past each other in a horizontal direction. This kind of boundary results in a fault. A fault is a crack or fracture in the earth's crust that is associated with this movement.

   Transform boundaries and the resulting faults produce many earthquakes because edges of tectonic plates are jagged rather than smooth. As the plates grind past each other, the jagged edges strike each other, catch, and stick, "locking" the plates in place for a time. Because the plates are locked together without moving, a lot of stress builds up at the fault line. This stress is released in quick bursts when the plates suddenly slip into new positions. The sudden movement is what we feel as the shaking and trembling of an earthquake.

   The motion of the plates at a transform boundary has given this type of fault another name, a strike - slip fault. The best-studied strike-slip fault is the San Andreas Fault in California.



4. Complete the Plate Interactions Challenge and Test Skills questions.

   My score for Plate Interactions Challenge = _____

   My score for Test Skills questions = _____ out of 30 or _____ %

↙ subducted - creates Andes. Volcanoes.
Nazca & SA Plates converg.
Chili Peru eqs eruptions

NZ South Island Transform Boundary
EQ. Fault.
Big EQ may occur in next 40 yr

great rift valley Africa
will split E Africa from africa!

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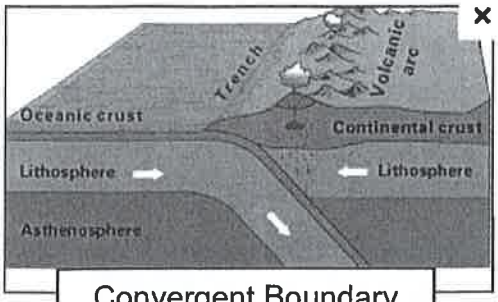
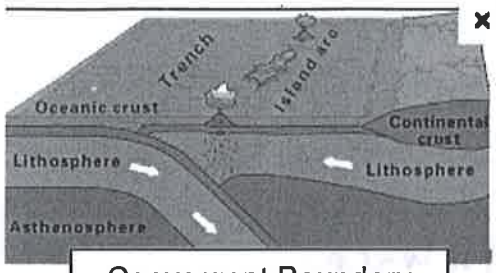
Part V. Questions you should be able to answer now that you completed this webquest.

Note - you may go back to the website and review to assist in answering the following questions.



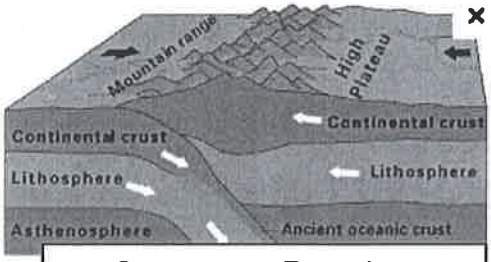
Convergent Boundary (ocean – continental)

1. Deep-ocean trenches and volcanoes are created by convergent boundaries of ocean and continental crust.



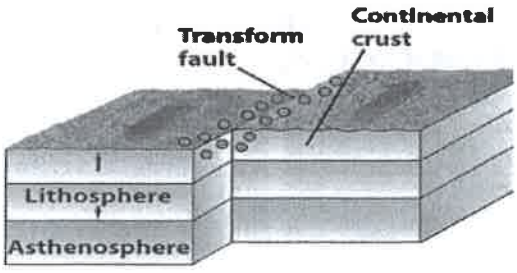
Convergent Boundary (ocean – ocean)

2. Deep-ocean trenches, volcanoes, and Island arcs are created by convergent boundaries of ocean and ocean crust.



Convergent Boundary (continental – continental)

3. Mountains are created by convergent boundaries of continental and continental crust.



TRANSFORM FAULT BOUNDARY

4. Another type of boundary neither creates nor consumes crust. This type of boundary is called a transform boundary because two plates move against each other, building up tension, then release the tension is a sudden jerk of land called an earthquake.

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4. Circle the correct type of boundary for each description below:

A. The boundary where two plates meet and trenches are formed.

Divergent **Convergent** **Transform**

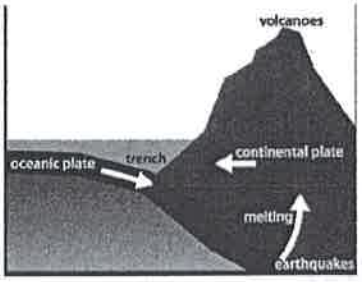
B. The plates move away from each other allowing magma to create new ocean crust.

Divergent **Convergent** **Transform**

C. The plates move in opposite directions building up tension until they slip causing earthquakes.

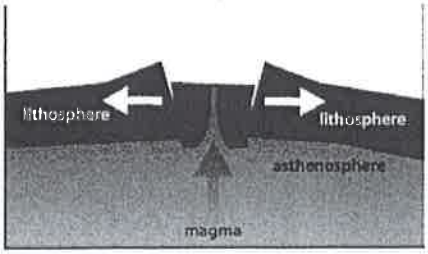
Divergent **Convergent** **Transform**

5. Label each type of boundary as either: **Divergent, Convergent, or Transform Boundary**:



A. Convergent

B. transform



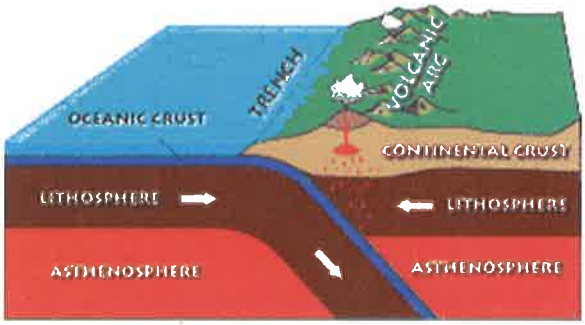
C. Divergent

The end. Please take a minute and look over your web-quest to make sure you answered all questions and completed all tasks. Make sure your name is on the front and turn it in.

Convergent plate boundaries

Convergent plate boundaries come in several flavors, but they share one thing in common - plate collisions! Take a look at the differences between the three examples on this page.

Continental vs. Oceanic Plate Convergence



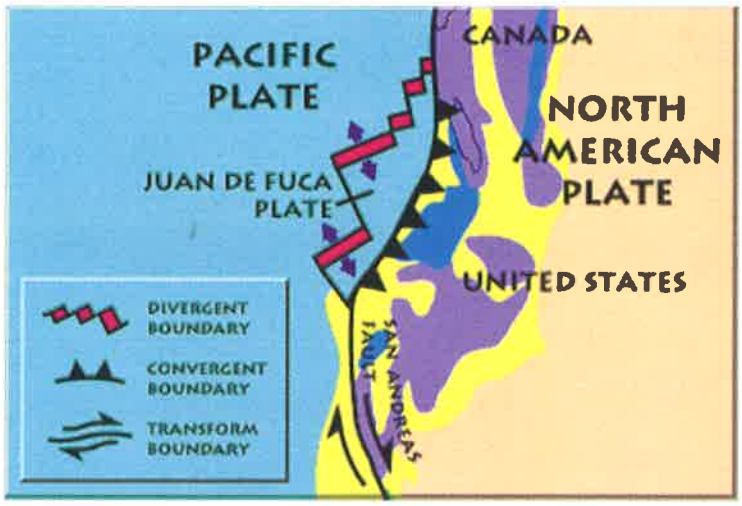
In a contest between a dense oceanic plate and a less dense, buoyant continental plate, guess which one will sink? The dense, leading edge of the oceanic plate actually *pulls* the rest of the plate into the flowing asthenosphere and a **subduction zone** is born! Where the two plates intersect, a deep **trench** forms.

Geologists aren't sure how deep the oceanic plate sinks before it completely melts, but we ***do*** know that it remains solid far beyond depths of 100 km beneath the Earth's surface.

When the subducting oceanic plate sinks deeper than 100 kilometers, huge temperature and pressure increases make the plate 'sweat'. Well, not exactly, but the uncomfortable conditions force minerals in the subducting plate to release trapped water and other gasses. The gaseous sweat works its way upward, causing a chain of chemical reactions that melt the mantle above the subducting plate.

This hot, freshly melted liquid rock (magma) makes its way toward the surface. Most of the molten rock cools and solidifies in huge sponge-like magma chambers far below the Earth's surface. Large intrusive rock bodies that form the backbones of great mountain ranges such as the Sierra Nevada form by this process.

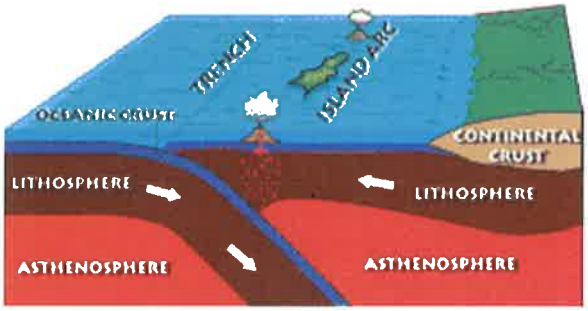
Some molten rock may break through the Earth's surface, instantly releasing the huge pressure built up in the gas-rich magma chambers below. Gasses, lava and ash explode out from the breached surface. Over time, layer upon layer of erupting lava and ash build volcanic mountain ranges above the simmering cauldrons below.



An example of this kind of convergence produces the spectacular volcanic landscape of the Northwest. Off the coast of Oregon, Washington, Alaska and Canada a small plate, the Juan de Fuca, dives beneath North America. This type of convergent plate boundary, called a **subduction zone**, is known for producing historic earthquakes of great magnitudes.

Look for curved volcanic mountain ranges with deep trenches alongside and it's a safe bet that you're looking at a subduction zone.

Oceanic vs. oceanic plate convergence



In a contest between a dense oceanic plate and a less dense, buoyant continental plate, you know that it's the dense oceanic plate that sinks.

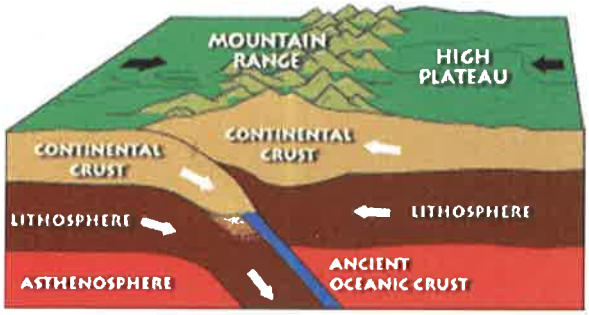
What happens when two dense oceanic plates collide? Once again, density is the key!

Remember that oceanic plates are born at midocean ridges where molten rock rises from the mantle, cools and solidifies. Little by little, as new molten rock erupts at the mid-ocean ridge, the newly created oceanic plate moves away from the ridge where it was created. The farther the plate gets from the ridge that created it, the colder and denser ('heavier') it gets.

When two oceanic plates collide, the plate that is older, therefore colder and denser, is the one that will sink.

The rest of the story is a lot like the continental vs. oceanic plate collision we described above. Once again, a subduction zone forms and a curved volcanic mountain chain forms above the subducting plate. Of course, this time the volcanoes rise out of the ocean, so we call these volcanic mountain

chains **island arcs**. The Aleutian Peninsula of Alaska is an excellent example of a very volcanically-active island arc.



Continental vs. continental plate convergence

By this time, you understand enough about plates to guess that when the massive bulk of two buoyant continental plates collide there is bound to be trouble!

The Himalayan mountain range provides a spectacular example of continent vs. continent collision. When two huge masses of continental lithosphere meet head-on, neither one can sink because both plates are too buoyant.

It is here that the highest mountains in the world grow. At these boundaries solid rock is crumpled and faulted. Huge slivers of rock, many kilometers wide are thrust on top of one another, forming a towering mountain range. The pressure here is so great that an enormous piece of Asia is being wedged sideways, slipping out of the way like a watermelon seed squeezed between your fingers.