

Name: _____

Period: _____

Date: _____

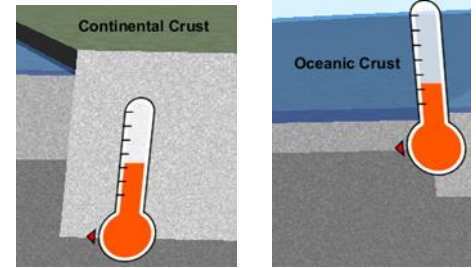
Plate Tectonics Simulation

LT: I can use a simulation to describe the differences in oceanic and continental crust and explain how movement at different tectonic plate boundaries results in different geologic features/events. _____

★ Part 1: Describing differences between oceanic and continental plates

1. Open the Plate Tectonics simulation by going to “Useful Links” on Ms. VH’s website (or going to this address: <https://phet.colorado.edu/en/simulation/legacy/plate-tectonics>)
2. Play with the sim (**both tabs**) for 5 minutes. *Move all dials and buttons!*

****The items in the Toolbox can be dragged out to take readings on different parts of the simulation (like the pictures on the right)****



★ Crust Tab

1. Look at the pictures on the right. Which type of crust is hotter at its base?
2. Why would the base of that type of crust be hotter?
3. Drag the density meter over the middle crust that is not labeled and drop it in the light gray area. Use the adjustments in the “My Crust” box to try the following:
 - a. What happens to the density when you add more iron to the crust? _____
 - b. If you change the composition by adding more silica to the crust (sliding the rule to the right), what happens to the density? _____

Click the yellow “Reset All” button at the bottom.

 - c. Put the density meter on the middle crust again. If you add heat to the crust, what happens to the density of the material? _____
 - d. What happens to the density of the material if you make the crust cooler by taking away heat? (Slide Temperature rule to the left) _____
4. Use the density meter to compare the oceanic and continental crusts. Which is more dense and why might it be more dense (look back at your results from parts a-c)? _____

5. List all the ways you can find to change oceanic crust into continental crust using the sliders.

Three Main Types of Plate Boundaries

| Type of Margin | Divergent | Convergent | Transform |
|--------------------|---|--|--|
| Motion | Spreading | Subduction | Lateral sliding |
| Effect | Constructive (oceanic lithosphere created) | Destructive (oceanic lithosphere destroyed) | Conservative (lithosphere neither created or destroyed) |
| Topography | Ridge/Rift | Trench | No major effect |
| Volcanic activity? | Yes | Yes | No |

The diagrams are labeled (a), (b), and (c). Diagram (a) shows a divergent boundary with a ridge and magma rising. Diagram (b) shows a convergent boundary with a trench, volcanoes, and earthquakes. Diagram (c) shows a transform boundary with earthquakes within the crust. Labels include Ridge, Trench, Volcanoes (volcanic arc), Earthquakes, Lithosphere, and Asthenosphere.

Image source: http://www.age-of-the-sage.org/tectonic_plates/boundaries_boundary_types.html

★ Plate Motion Tab

Always view “Both”, “Show Labels”, and “Show Seawater” (when possible).



Click on “Manual Mode”.

Complete the table below using only Manual Mode.

***Note:** To see the same action happen again click “Rewind.” To start over click “New Crust.”

Example 1: Drag 1 oceanic crust (either young or old) & 1 continental crust onto the screen. Drag the plate in the direction of the GREEN arrow.

| | | |
|----------|---|--|
| Draw it! | Type of Boundary? <input type="checkbox"/> Divergent <input type="checkbox"/> Convergent <input type="checkbox"/> Transform | What is the effect/outcome of this plate movement? |
|----------|---|--|

Example 2: Drag 2 old oceanic crusts onto the screen. Drag the plate in the direction of the RED arrow.

| | | |
|----------|---|--|
| Draw it! | Type of Boundary? <input type="checkbox"/> Divergent <input type="checkbox"/> Convergent <input type="checkbox"/> Transform | What is the effect/outcome of this plate movement? |
|----------|---|--|

Example 3: Drag 2 continental crusts onto the screen. Drag the plate in the direction of the GREEN arrow.

| | | |
|----------|---|--|
| Draw it! | Type of Boundary? <input type="checkbox"/> Divergent <input type="checkbox"/> Convergent <input type="checkbox"/> Transform | What is the effect/outcome of this plate movement? |
|----------|---|--|

1. Find a way to create a volcano on a continent.

- Volcanoes form when _____
- What type of plate boundary is this? _____
- Use the ruler: How many kilometers (km) below Earth's surface does oceanic crust begin to melt and form magma that rises to the surface? _____
- When oceanic crust sinks under continental crust it is called **SUBDUCTION** (this occurred in the rock cycle game).
- *Critical Thinking*: What causes the oceanic crust to melt and rise to the surface? _____
- **Circle one**: Oceanic crust has a (higher / lower) density than continental crust.
- **Circle one**: This allows oceanic crust to (sink underneath / float on top of) continental crust.
- *Critical Thinking*: Why do you think you aren't able to make a divergent oceanic/continental boundary?

2. Find a way to create mountains in the middle of land.

- What type of crust is needed to form these mountains? _____ and _____
- What type of plate boundary is this? _____
- *Critical Thinking*: Why would a volcano NOT be likely to form underneath these mountains? _____

3. Find a way to create islands in the ocean.

- What two types of crust are needed to form these islands? _____ and _____
- What causes the islands to form? Be as detailed as possible. _____

4. Find a way to make new crust form in the middle of an ocean.

- What type of plate boundary is this? _____
- **Circle one**: The oldest crust is (nearest / farthest away from) the boundary where the two plates meet.

5. Click the yellow "Reset All" button.

- Drag and drop **Old Oceanic** crust on the left and **Young Oceanic** crust on the right side of the plate boundary.
- Check the box labeled "Show Seawater".
- Click and hold the green arrow until the plates stop moving.
- a. What forms at this boundary? _____
- b. How many years did it take for this to form? _____
- c. If both plates were made of oceanic crust, how is it possible for one of the plates to slide under the other?

6. Click the yellow “Reset All” button.

- Drag and drop **Continental** crust on **both** sides of the boundary.
- Check the box next to the label “Show Seawater”.
- Click and hold the red arrow until the plates no longer move.

- a. What type of plate boundary is this? _____
- b. What geographical features are created at this type of boundary? _____
- c. Describe the process that is occurring underneath the crust that allows new crust to form. _____

7. Click the yellow “Reset All” button.

- Drag and drop **Continental** crust on **both** sides of the boundary.
- Click and drag the blue arrow until the plates no longer move.

- a. What type of boundary is this? _____
- b. Movement of the plates at this boundary causes what type of natural phenomenon? _____

8. Click “Automatic Mode”. Create at least three plate boundaries and timelines as you wish!

Record interesting combinations and observations here: