Earth Science

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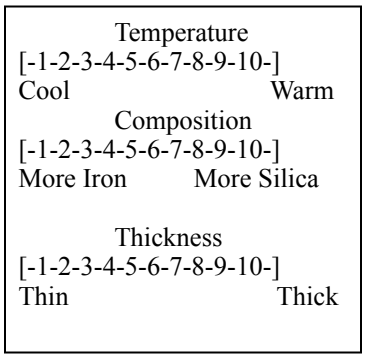
Plate Tectonics Simulation

Getting Started

1. Click this link: https://phet.colorado.edu/en/simulation/plate-tectonics
2. Click on the grey "Play" button in the center of the screen.
3. When Chrome says "This type of file can harm your computer. Do you want to keep plate-tectonics_en.jnlp anyway?" click "Keep".
4. On the bottom of the browser there should be a downloaded program button that reads "plate-tectonics_en.jnlp", click on it to open the simulation.
5. If there are any other security windows or pop-ups that follow, let the teacher know, otherwise the program should open to the Plate Tectonics simulation.

Crust

1. The first page that opens up should have a tab with the headline "Crust".
2. What are the three variables that can be changed in this simulation?
   a.
   b.
   c.
3. Try to duplicate the continental crust as accurately as possible. On the diagram below, write the number where you set each variable:

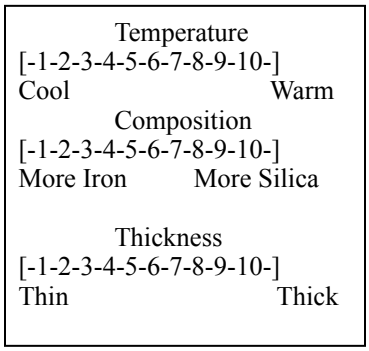


Temperature: _____

Composition:_____

Thickness:_____

4. Try to duplicate the oceanic crust as accurately as possible. On the diagram below, write the number where you set each variable:



Temperature:_____

Composition: _____

Thickness:_____

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5. In terms of the three variables you have investigated, describe how continental crust differs from oceanic crust.

_____
_____
_____
_____
_____
_____

6. On the left side of the frame there is a slab of oceanic crust, and on the right side there is a slab of continental crust. Drag the **Density** meter from the **Toolbox** onto the oceanic crust so that the arrow at the bottom of the meter points to the light gray section of the oceanic crust. Observe the reading on the density meter. Now move the density meter over to the continental crust on the far right of the frame and check the density on the light gray section of the crust.
    - Is there a difference in the density reading between the oceanic and continental crust? _____
    - Which type of crust is denser? _____
    - Why is it denser?

      _____
      _____
      _____
      _____
      _____

7. Drag the density meter over the middle slab of crust that is not labeled and drop the density meter on the light gray section. The small arrow at the bottom of the density meter should be pointing to the light gray area. At the top center of the frame there is a box labeled “My Crust” with three slide rules (Temperature, Composition, Thickness). These slides will allow you to change and manipulate the middle section of the crust that is not labeled. Increase the iron content of the crust by sliding the **Composition** rule all the way to the left.
    - What happens to the density when you add more iron to the crust?

      _____
      _____
    - If you change the composition by adding more silica to the crust (sliding the rule to the right), what happens to the density?

      _____
      _____

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- Click the yellow “Reset All” button at the bottom. Drag and drop the density meter on the middle slab of crust again. If you add heat to the crust by sliding the **Temperature** rule to the right, what happens to the density of the material?

  _____
  _____

- What happens to the density of the material if you make the crust cooler by taking away heat? (Slide Temperature rule to the left)

  _____
  _____

Plate Motion

1. Click on the second tab at the top of the frame labeled “Plate Motion”.
2. In the bottom right hand corner of the frame there should be a box with three different types of crust (Continental, Young Oceanic, Old Oceanic). Click on the **Continental** crust and drag it over the dashed outline of the crust on the left hand side. Drop the continental crust when the dashed outline turns yellow/green.
3. Drag and drop the **Old Oceanic** crust on the right hand side of the crust.
4. In the box labeled “View”, check the option “Show Seawater” by clicking on the box next to the option.
5. Click and hold the green arrow until the plates stop moving and write down what you observe happening:

   _____
   _____
   _____
   _____
   _____
   _____

   - What type of plate boundary is this?

     _____

   - What stress force is being applied?

     _____

   - What do you see forming at these boundaries?

     _____

6. Click the yellow “Reset All” button.
7. Drag and drop **Old Oceanic** crust on the left hand side of the plate boundary.
8. Drag and drop **New Oceanic** crust on the right hand side of the plate boundary.
9. Check the box labeled “Show Seawater”.
10. Click and hold the green arrow until the plates stop moving.

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- What forms at this boundary?

  _____

  _____

  _____

- How many years did it take for this to form?

  _____

- If both plates were made of oceanic crust, how is it possible for one of the plates to slide under the other? Explain.

  _____

  _____

  _____

  _____

  _____

11. Click the yellow "Reset All" button.
12. Drag and drop **Continental** crust on the left hand side of the boundary.
13. Drag and drop **Continental** crust on the right hand side of the boundary.
14. Click and hold the green arrow until the plates no longer move.
    - What forms at this boundary?

      _____

    - Where on our planet can we see this happening? (Hint: Think Mt. Everest)

      _____

      _____

    - Why are there no subduction zones at this boundary?

      _____

      _____

      _____

      _____
15. Click the yellow "Reset All" button.
16. Drag and drop **Continental** crust on the left hand side of the boundary.
17. Drag and drop **Continental** crust on the right hand side of the boundary.
18. Check the box next to the label "Show Seawater".
19. Click and hold the red arrow until the plates no longer move.
    - What type of plate boundary is this?

      _____

    - What stress force is being applied?

      _____

    - What is created at this type of boundary?

      _____

      _____

      _____

    - Where on our planet can we find this type of boundary? (Hint: Think oceans)

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_____

_____

- Name and describe the process that is occurring underneath the crust that allows new crust to form.

  _____

  _____

  _____

  _____

20. Click the yellow "Reset All" button.
21. Drag and drop **Continental** crust on the left hand side of the boundary.
22. Drag and drop **Continental** crust on the right hand side of the boundary.
23. Click and hold the blue arrow until the plates no longer move.
    - What type of boundary is this?

      _____

    - Movement of the plates at this boundary causes what type of natural phenomenon?

      _____

      ___

    - Where on our planet can you find this type of boundary? (Hint: Think faults)

      _____

      _____

*EXTRA CREDIT: When you are finished, if there is enough time remaining in class, visit this website: http://www.learner.org/interactives/dynamicearth/testskills.html
Type your name in the box, follow the instructions, and take the online test to review the material on the layers of the earth and plate tectonics. If you are able to score
__75%__ or higher, you will earn ____ extra credit points on your next unit test. Have a teacher check your score at the end and initial for proof.

Teacher's Initials: _____