Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period:\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_

**Mantle Convection Inquiry Lab**

**BACKGROUND INFORMATION:**

The movement of heat from a warmer object or area to a cooler object or area is called heat transfer. Convection is heat transfer that takes place as the result of currents. Convection takes place within a fluid. Large amounts of heat are transferred through Earth via convection currents. Some of these currents are in Earth’s liquid outer core. Other convection currents are present in the mantle.

Convection currents in the mantle form and transfer heat as rock slowly rises toward the top of the mantle. The rock is still hard, but it flows very slowly like a fluid. As the rock rises, it cools and sinks back down into the mantle. As with all convection currents, convection in Earth’s mantle is the result of three things: heating and cooling of rock material, changes in the rock’s density, and the force of gravity.

Because it is not possible to directly observe the mantle, scientists sometimes make models to study how this part of Earth moves. Based on their findings, they make inferences and draw conclusions.

**Objectives:**

1. Students will make a representation of the effects of convection currents in Earth’s mantle.
2. Students will summarize what was learned from this experiment and apply that knowledge to an understanding of the effects of mantle convection currents on tectonic plates.
3. Students will develop a testable hypothesis that explains how convection currents in the Earth’s mantle affect the movement of tectonic plates.

**Pre Lab Questions:**

1. What is the difference between conduction and convection?
2. What mechanism drives plate movement?
3. Where does Earth get its internal heat from?

**Procedure:**

1. Imagine you are an Earth Science teacher who is trying to show students what causes the movement of Earth’s tectonic plates. You decide to make a model of the process. Hypothesize how convection in Earth’s mantle might affect the movement of tectonic plates.

State your hypothesis here: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Work with your group to design a setup that will model convection currents and how these currents affect materials floating on the surface. Use the materials provided. As you design your experiment, consider the following:

* Your model will need to represent fluids of different temperatures plus “tectonic plates” floating on the surface of the fluids.
* Tap water can be used as a source of both hot and cold water
* Food coloring provides a good way to visualize how water of different temperatures moves.
* Remember that your model should show movement that is caused only by temperature differences, so the water should be as still as possible.

1. Describe your setup below and provide a detailed procedure.
2. Have ME approve your setup and procedure. Then, carry out your experiment.

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**Analysis During Lab:**

1. What part of your model represents tectonic plates? What part represents Earth’s mantle?

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1. Describe what happened to the water in your model. Draw a picture of the convection currents.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What happened to the model tectonic plates? Did they all move together or apart? Did some move together and some move apart? How do you explain these movements?

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1. What made the fluids move the way they did?

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**Post Lab Conclusion:**

1. How did your hypothesis compare with what actually happened to the water and model tectonic plates?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. How well do you think this lab modeled the movement of Earth’s plates? What similarities exist between this model and actual plate movement? What factors were you not able to model in this lab? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. How would you design a model that would better reproduce the effects of convection currents on Earth’s crust? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Explain what mechanism drives plate movement.

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1. Draw your model and be sure to show the movement of the water using arrows.