**Weather Fronts Lab:**

**Name: Date: Period:**

**Background Reading:**

Temperature is one factor that affects the density of a fluid (a liquid or a gas). The same fluid is less dense at a higher temperature than it is at a lower temperature. For example, hot air is less dense than cold air; a hot air balloon rises because the hot air inside it is less dense than the cooler air of the atmosphere around it.

When a substance is heated, its volume usually increases. The kinetic energy of the atoms or molecules that make up the substance increases, causing them to collide more forcefully. They push each other farther apart, and the substance expands. The same number of atoms or molecules now take up more space. Therefore, there are fewer atoms or molecules per cubic measure. Fewer molecules equal lower density.

Air masses moving out of the area where they were formed come in contact with other air masses having different characteristics (temperature, humidity, pressure). The boundary between two different air masses is called a front. ACold front is the leading edge of an advancing cold air mass. Because this cold air is denser than the warm air on the other side of the front, it replaces the warm air. The edge of an advancing mass of warm air is called a warm front. The warm air overtakes the cold air but, since the warm air cannot dislodge the denser cold air, it is forced to rise up over the wedge formed by the cold air.

**Materials:**

* 1 water tank
* 1 beaker, containing red food coloring
* 1 beaker, containing blue food coloring
* Hot and Cold water
* Dropper

**Part I: Thermoclines**

1. Add 250 mL cold water to the beaker containing blue food color.
2. Add 250 mL hot water to the beaker containing red food color.
3. Make sure the divider in the middle of the water tank is pushed firmly to the bottom of the tank.
4. Have one group member pour hot water into one side, while someone pours cold water into the other side.
5. Wait a few seconds until the water in the tank stops moving. Have a group member slowly and carefully remove the divider. Watch the movement of the water in the tank.
6. Describe what happened when the divider between the hot water and the cold water was pulled out. Why did this happen?

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1. Use a clean dropper to carefully put 1-2 drops of hot red water from the beaker into the tank. Explain what happened when hot water was dropped into the tank.

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1. Use a clean dropper to carefully put 1-2 drops of cold blue water from the beaker into the tank. Explain what happened when cold water was dropped into the tank.

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1. Disturbing the water as little as possible, have each member of your group, one at a time, slide a finger slowly down into the water. Describe how your finger felt when you slid it down to the bottom of the tank.

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1. Carefully put the divider back into the tank and, using the appropriate dropper, stir the water in only one side of the tank. Now, there is hot and cold water on one side and warm water on the other side. Predict what will happen when the divider separating the layers of hot and cold water from the warm water is removed from the tank.

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1. Slowly and carefully remove the divider from the tank. Was your prediction correct? If you prediction was not correct, describe what really happened.

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**Analysis Questions:**

1. Why is hot air less dense than cold air?

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1. Describe what happened (as scientifically as possible) when you initially pulled up the divider for the first time.

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1. The initial time you pulled up the divider, assume that instead of water, they were a warm and cold front. Explain what is occurring once you pulled the divider. Be sure to explain why it is occurring as well.

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