Moving heat

Grade: «grade»
Subject: «subject»
Date: «date»

You have learned that solar radiation hit near the earth's equator.

A map of temperatures shows that it is always hot at the equator.

Yet that part of earth doesn't keep getting hotter and hotter.

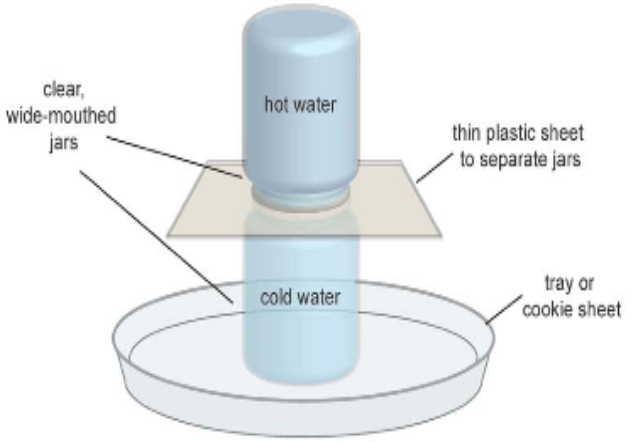
Where does the heat from the equator go?

How does this heat move to different parts of earth?

Figure 3: Cars in the Sun. Objects like cars get hot when they sit
What parts of earth are always "sitting in the Sun"?

Let's do an investigation to study how heat moves between liquids that are different temperatures.

Later, you will see how heat moving in these systems relates to heat moving in the atmosphere and oceans.



Experiment #1

Materials:
2 Snapple bottles
1 index card or piece of thin plastic
warm water (colored red)
icy cold water (clear)
plastic tub and tray to contain spills

Procedure:
Listen to the teacher's directions.
Place the warm water above the cold water.
Predict what will happen- with your table group and then in writing in your notes.
Show me your prediction before continuing

a.Place one bottle in the tub. Fill it with icy cold water to exactly the top.

b. Fill the second bottle with hot water (red) to the top. Cover with the plastic sheet

c. Carefully flip the jar of hot water. Place it exactly on top of the the bottle of cold water.

d. Carefully slip the plastic sheet between the bottles. As you do this, keep a hard contact between the bottles. No water should leak out.

e. Observe what happens. Draw a picture of this.

1 Our team predicted…..

2 We observed……

Investigation 2
Your team will place a bottle of icy cold water above a bottle of hot water.

What do you think will happen?

Write your prediction.

Show it to me before you start.

a. Place one bottle in the tub on a tray. Fill with hot water exactly to the top.

b. Fill the other bottle with icy cold water (clear) to the top.Cover it with the plastic sheet or index card.

c.Carefully flip the bottle of cold water. Place it exactly on top of the jar of warm water.

d. Carefully slip out the card between the bottles

e. Observe what happens. Draw a picture of this.

Use arrows in your picture to show what happens

3 Our team predicted...

4 We observed...

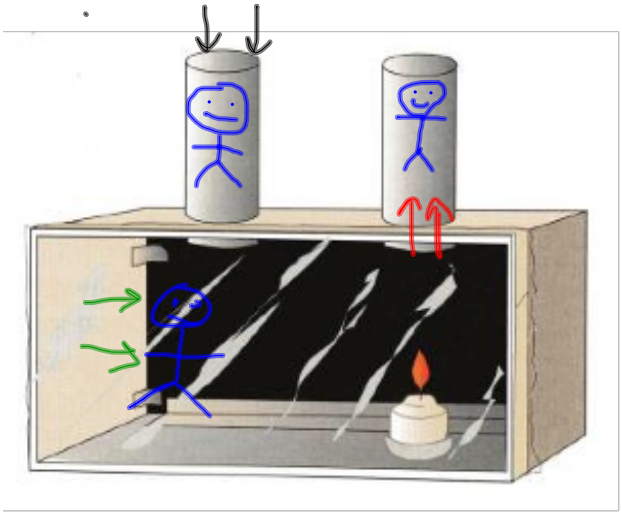
Compare your pictures from the two investigations.

Write a statement in your notes about how heat moves in fluids at different temperatures.

You saw heat moving in water. Hot water moved heat up through cold water. Does this also occur in gases, like air? How does air move when it is at different temperatures?

Imagine that you've had a long, hot day at school.
You arrive home from school feeling exhausted and thirsty.
You go to the refrigerator to find something cold to drink.
When you open the refrigerator door, you notice something odd.
What did you notice?

In the next activity, you'll explore how air moves when it is at different temperatures.



The air movement that you have investigated is part of a **convection cell**. In a convection cell, **hot** air moves heat upward. Cold air moves down to fill the "space".

For earth, **one cause of uneven heating is latitude**. Near the equator, solar radiation strikes earth directly from above. The radiation is strong. At high latitudes, solar radiation strikes at an angle. The radiation is less strong.

Due to this difference, heat builds up much faster at the equator than at the poles.

Uneven heating can also occur in different materials. These can absorb heat at different rates. This controls how their temperature changes.

You'll explore further how uneven heating and convection are related in this unit.

Imagine that a convection box is as **big as your classroom**. The candle is as large as a table. Diagram the movement of air in this box.

a. Draw a large diagram in your notes. *Start by drawing a large rectangle. Then draw the tube and a candle.*

b. Imagine that you are in the tube above the candle. Which way is the air flowing? Add to your diagram an arrow to show this.

c. Imagine that you are in the other tube. Which way is the air flowing here? Add an arrow in your diagram to show this.

d. Imagine that you are standing between the tubes. Draw an arrow for the direction of air flow at this position.

Diagrams like this might also include things like a title, legend (or key), scale, or colors.

1 How did the smoke help you observe how the air was moving?

The smoke became part of the _____, and helped to see the upward and downward flow of air in the convection box.

2 If you were outside, what would you call air that moves?

3 What evidence would you have that air was moving outside?

4 Where would you find rising air? A or B

A Above a warm area of earth's surface

B Above a cool area of earth's surface

5 Hot smoke above a forest fire is an example of convection

Yes No