

Convection Currents

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PAGE(Adapted from Ocean Currents – GEMS)

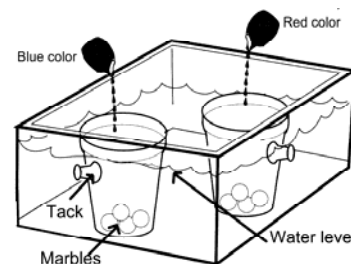
OBJECTIVE: Students observe, explain, and evaluate the movement of heat through convection currents. (TEKS 6B)

PROBLEM: How does temperature affect the movement of water in a fish tank?

HYPOTHESIS: What do you think? Record your ideas in your journal.

MATERIALS:

- Large clear plastic container or fish aquarium
- Hot plate
- Beaker
- Ice
- Heat resistant gloves
- 2 Styrofoam cups
- marbles
- food coloring – 2 colors (red & blue work well)
- colored pencils/markers (to match the food coloring)
- 2 tacks or push pins
- water
- paper towels
- large beakers/containers for water



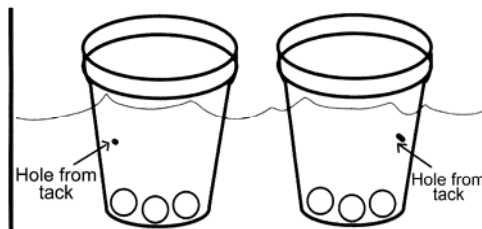
PROCEDURES:

1. Heat 200 mL of water on a hot plate in a beaker. Keep it hot but not boiling.
2. Place 200 mL of water and ice in a container and allow the water to cool.
3. Place room temperature water (not hot or cold) in the bottom of the fish aquarium so the Styrofoam cups will sit in the water but not let the water go over the edge.
4. Fill the 2 Styrofoam cups half way with marbles. Carefully put the cups in the water to make sure the water doesn't go over the edge.
5. Push the tacks in the cup just under the edge of the water level. DO NOT REMOVE the tacks. Turn the cups so the tacks are facing the opposite edges of the tank.
6. Put 6 drops of blue food coloring in one of the cups directly on top of the marbles.
7. Put 12 drops of red food coloring in the other cup of marbles directly on top of the marbles.
8. Carefully remove the hot water from the hot plate using the heat resistant gloves and pour the hot water over the red cup of marbles.
9. Remove the ice cubes, if any, from the cold water and pour the cold water over the marbles of the blue food coloring.

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- Make a prediction of what you think will happen once the tacks are removed from the cups. Write your answers in your journal and draw on the diagram below. Using the colored pencils, color your drawing to indicate your prediction of the movement of the colored water once the tacks are removed.

- Carefully remove the tacks and observe for 5 minutes.
- Answer the questions below in your journal.
- Clean up your area and put equipment away.



ANALYSIS/CONCLUSIONS: (Answer in your journal.)

- Describe what you saw happen once the tacks were removed.
- Draw a diagram of what you saw happen during the 5 minutes. Use the colored pencils to help make your diagram look like what you saw.
- How did your prediction compare to the actual results? Describe any differences.
- Explain why the colored water moved like it did.
- What would you predict the water would look like after it sat for 3 days without anything disturbing the water? Explain your answer.
- Would air of different temperatures have the same movements? Defend your answer.
- How does this experiment demonstrate the movement of heat through convection currents?

GOING FURTHER:

- Parents always tell young children to shut the door when they go outside or step outside for a moment. How could you convince a young brother or sister that they are wasting energy by leaving the door open, especially in the summer with the running air conditioner. Draw a picture to help explain to them what is happening to the air.
- A friend of yours thinks a hot air balloon is full of helium gas and that is how it rises in the air. They also think a hole is put in the balloon to make the balloon come down. How could you convince them they are wrong? Support your argument with facts and scientific reasoning.



Solar Houses

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OBJECTIVE: Investigate and demonstrate the movement of heat through matter.

PROBLEM: Does the direction a window on a house faces affect the temperature inside the house?

HYPOTHESIS: Record your ideas in your journal.

MATERIALS:

- House template copied on white card stock (one per group)
- Tape to “build” the house
- Clear plastic wrap/Saran wrap for the window
- Thermometer
- Stopwatch
- Cardboard/support to hold house and keep off the ground
- Graph paper
- Compass to find the direction (optional)

PROCEDURES:

1. Cut out the house and “build” the house using tape. Place a piece of plastic wrap on the inside of the window before you close the house. Place the house on top of the piece of cardboard as support and insulation from the ground.
2. Create a data table in your journal to record the results of your experiment. Place the house in the sun for 15 minutes and record the temperature every minute.
3. When the class goes outside to conduct the experiment, the houses will need to be placed at different directions (North, South, East, West, and any direction in between). Be sure to observe the location of the sun and the time of day as you conduct the investigation. Also note the weather conditions – sunny, partly cloudy, cloudy, or other notes.
4. As soon as you are outside and have your house set up, take the initial temperature inside the house. Start the stopwatch and record the temperature inside the house every minute for 15 minutes.
5. Graph your results and place in your journal.



Time of day: _____

Direction house pointed:

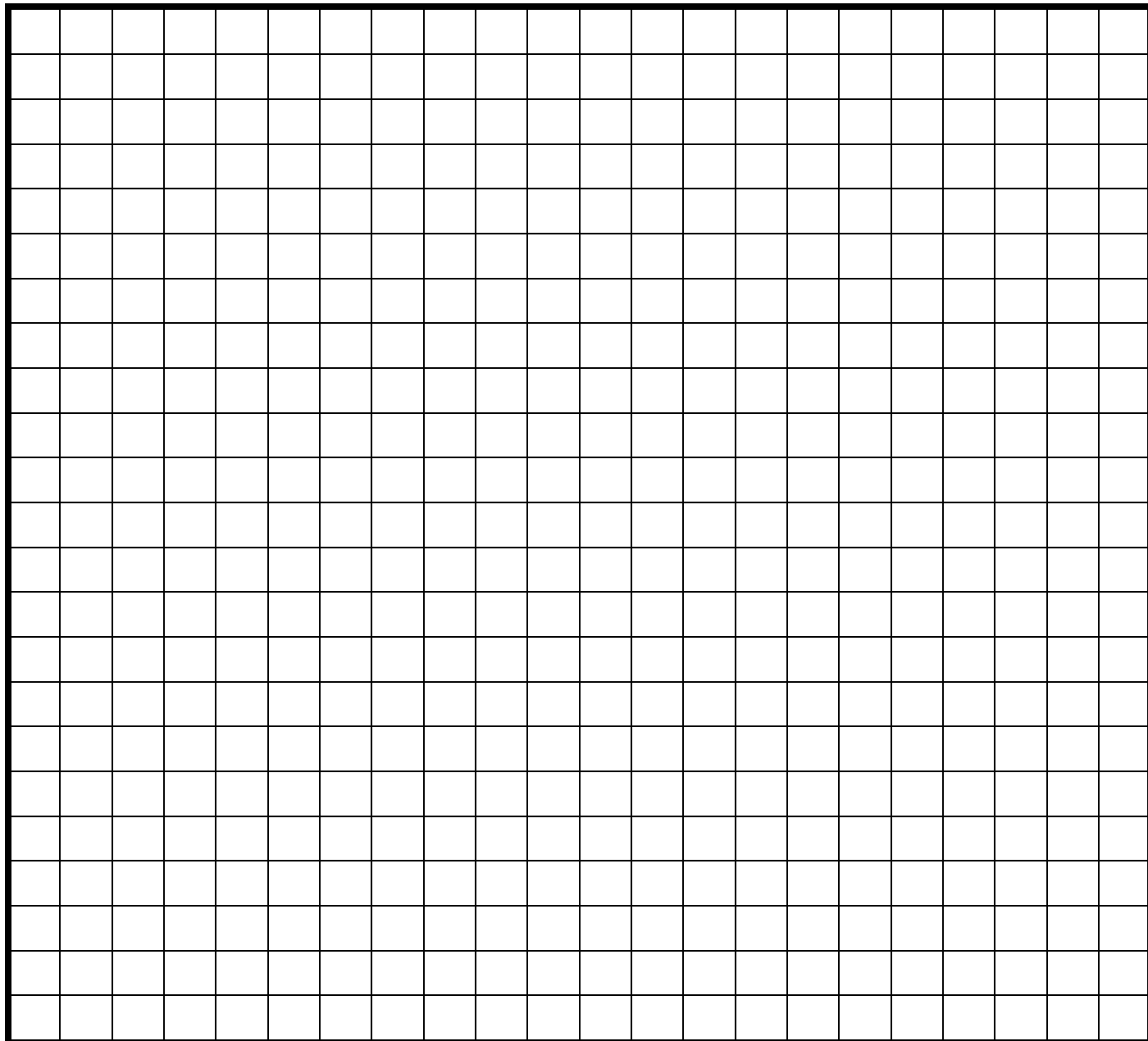
Weather conditions:

Time (minutes)	Temperature (°C)
0 (initial)	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	

ANALYSIS/CONCLUSIONS:

1. What observations did you make about the temperature inside the house?
2. Calculate the temperature change that took place in your house.
3. Why did your temperatures increase or decrease?
4. Looking at your graph, are there any trends in the data? If so, describe the trend.
5. If you stayed outside for 30 minutes collecting data, predict what the data might look like.
6. Compare your results to those of other class periods throughout the day. How did your temperature change compare to your classmates in other groups?
7. How did your results compare to the temperature changes of other class periods throughout the day?
8. If you were designing a house, where would you place the largest windows in the house to maximize the light but minimize the temperature increase?





SOLAR HOUSE TEMPLATE DIRECTIONS:

1. Cut along the solid lines.
2. Fold along the dotted lines (you may use a ruler to fold straight).
3. Tape the plastic/Saran over the window hole.
4. Tape the tabs to the edges to create a house.

