Heat, Light, and Sound Workbook - Heat Worksheets

Clipart Source: Florida Educational Technology Clearing House
Why Do Plastic and Metal Feel Different?

1. Which material feels warmer to the touch? Do all group members agree?
   ____________________________________________________________________
   ____________________________________________________________________

2. Temperature of BB’s - ______° C

3. Temperature of plastic beads - ______° C.

4. Explain your observations (the temperature of the two cups).
   ____________________________________________________________________
   ____________________________________________________________________
   ____________________________________________________________________

5. If you were to put the copper and the plastic in the refrigerator, what would you predict about the way they would feel if you were to do the same experiment again? Explain your prediction.
   ____________________________________________________________________
   ____________________________________________________________________
   ____________________________________________________________________

6. Which material feels colder to your fingers?
   ____________________________________________________________________

6. Temperature of BB’s - ______° C

7. Temperature of plastic beads - ______° C.
8. Would you expect a good conductor to feel warmer or colder if you were to touch it after it had been outside all during a winter night?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

9. Do you think that your clothing is a good conductor or a poor conductor of heat? Explain your answer.

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

10. Would you expect carpet or tile flooring to feel colder when you step on it in the morning? Explain your answer.

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

The Great Spoon Race

Prediction

What do you think will happen to the shortening on the end of the three spoon handles when the spoons are put in hot water?
Observations

1. Describe what happened after you observed the shortening after several minutes.

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

2. Touch the spoon handles. How do they feel?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

Conclusions

3. Which material is the best conductor?

__________________________________________________________________

4. How is heat transferred from the water to the shortening?

__________________________________________________________________
Who’s the Conductor?

Complete the hypothesis column before you begin your experiment.

<table>
<thead>
<tr>
<th>Object</th>
<th>Hypothesis</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper cup</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal pan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Styrofoam cup</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plastic cup</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass Cup</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Hypothesis**

*** = hot
** = warm
* = no change

**Result**

*** = hot
** = warm
* = no change

**Analysis & Questions**

1. In what ways are the objects that get warmer similar to each other?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

2. In what ways are the objects that do not get warmer similar to each other?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
3. Was your hypothesis correct? Why or why not?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

How Can You Have An Ice Cube Race?

1. Temperature of air in the first cup - ______ °C.

2. Temperature of water in the second cup - ______ °C.

3. Which ice cube will melt faster?

4. Which ice cube melts faster?

5. Explain what happened to the ice cubes.

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

Butter on a Wire

Data Table

<table>
<thead>
<tr>
<th>Wire</th>
<th>Time For Butter to Melt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Copper</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
</tr>
</tbody>
</table>

1. Explain why there are time differences between the different wires.

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

2. Compare your results with two other groups. Are they different? Are they the same? Explain.

   Group 1 - ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________

   Group 2 - ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________

3. How does this activity demonstrate conduction?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
Convection Currents

1. Draw a diagram of what you observed.

2. Which way does the water move over the heat source?

__________________________________________________________________

__________________________________________________________________

3. What happens to the water when it reaches the surface?

__________________________________________________________________

__________________________________________________________________

4. What happens to the water when it reaches the edge?

__________________________________________________________________

__________________________________________________________________

5. Which way does the water move along the bottom of the container?

__________________________________________________________________

__________________________________________________________________
Paper Spiral  
(a lesson from Energy Heats Main)

1. Predict what will happen when you light the candle.

__________________________________________________________________  
__________________________________________________________________  
__________________________________________________________________  

2. Describe your observations as you do your experiments.

__________________________________________________________________  
__________________________________________________________________  
__________________________________________________________________  

__________________________________________________________________  

3. How does this activity demonstrate convection?

__________________________________________________________________  
__________________________________________________________________  
__________________________________________________________________  

__________________________________________________________________  

When Hot Meets Cold  
(modified from a lesson plan in the Elementary Core Academy 2007 Handbook)

Observe, draw, and color a picture of the results in the space below.

![Diagram of a cylinder with hot and cold water]
1. What did you notice happened to the hot water from the baby food jar?
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

2. Why do you think this happened?
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

3. What did you notice happened to the cold water from the baby food jar?
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

4. Explain how this experiment demonstrates convection.
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

Water Wars
(from a lesson plan found in the 6th Grade Sci-ber Text)

Observations
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
Volcano Under Water

1. Describe what happens as you lower your bottle into the cold water.

2. What principle of heat transfer does this represent? Explain your answer.
**Best Emitter?**

1. Briefly touch the side of each tube. Which feels the hottest? Why?

2. Explain how this activity demonstrates radiation.

**Best Absorber?**

1. Was your *Best Absorber* the *Best Emitter*? Explain why or why not.

2. When does a test tube emit heat radiation and when does it absorb it?
3. What color should you paint your house to conserve energy? Explain your answer.

4. Explain how this experiment demonstrates radiation.

Surface Color and Effect on Temperature Change: A Confirmation-Verification Activity
(from NASA Meteorology Activities for Grades 5-9)

On a hot summer day, do you find dark or light clothing the most comfortable to wear in the bright sunshine? Explain.

On a bright, hot summer day, if you had to walk barefoot down a dark sidewalk or along pavement lined with green grass, which surface would feel most comfortable to your feet? Why?
## Data Table

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature Dark Container</th>
<th>Temperature Light Container</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 minutes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Analysis and Questions**

1. Did the temperature rise in both containers? Explain.

2. Did the temperatures in each of the containers rise at the same rate? Explain.
3. What was the final temperature at the end of 25 minutes in each of the containers?

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

4. Make a line or bar graph of your results. *Time should be placed on one axis and temperature on the other axis to view both the rate of rise and the final resulting temperatures.*

5. How does this experiment demonstrate radiation?

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

6. What is/are your conclusion(s)?

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

The highly sophisticated technology NASA employs to measure planetary surface temperature
The Marshmallow Roasts

1. Temperature of air above unlit candle - ______° C.

2. What happens as you hold the marshmallow above the flame?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

3. Temperature of air above unlit candle - ______° C.

4. What do your results show about the transfer of heat energy?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

5. How is radiation different from convection and conduction? How is it the same?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
1. Using the data tables, graph the heating and cooling cycles to compare the rates at which the various substances heated and cooled. Using two colors, graph the information on one graph.

2. Which material absorbed more heat in the first ten minutes?

3. Which material lost the most heat in the last ten minutes?

4. Imagine that it’s summer and that the sun is shining on the ocean and on a stretch of land. Which will heat up more during the day? Which will cool more slowly at night? Explain.
5. Imagine three cities in the desert, all at about the same altitude and latitude.

- One city (A) is surrounded by a dark-colored rocky surface.
- Another city (B) is surrounded by a light-colored sandy surface.
- The third city (C) is built on the edge of a large man-made desert lake.

Which city would likely have the highest average summer air temperature and why?

6. Since the sun is approximately 93 million miles from the earth and space has no temperature, how do we get heat from the sun?
# Identify the Heat Transfer

(a lesson from Energy Heats Main)

<table>
<thead>
<tr>
<th>Example</th>
<th>Form of Heat Transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person’s breath on a cold day</td>
<td></td>
</tr>
<tr>
<td>Steaming hot chocolate</td>
<td></td>
</tr>
<tr>
<td>Hot soup with metal spoon</td>
<td></td>
</tr>
<tr>
<td>Ice cream melting in the Sun</td>
<td></td>
</tr>
<tr>
<td>Heat lamp</td>
<td></td>
</tr>
<tr>
<td>Hot spring geyser</td>
<td></td>
</tr>
<tr>
<td>Boiling water</td>
<td></td>
</tr>
<tr>
<td>Wood stove</td>
<td></td>
</tr>
<tr>
<td>Mirage</td>
<td></td>
</tr>
<tr>
<td>Woman peeking in oven</td>
<td></td>
</tr>
</tbody>
</table>
F.I.R.E.- High Flying Aircraft

This podcast identifies two ways clouds affect radiation coming to the Earth and leaving the Earth. Identify the two ways.

a. ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________

b. ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________

Volcanoes and Global Warming - The Chilling Effect

Explain how the Tambora Volcano was responsible for the year without summer.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________