# Pre-Lab Information

**Purpose** To observe how heat flows through conduction, convection, and radiation

**Time** Approximately 45 minutes

**Question** How do the processes of conduction, convection, and radiation help distribute energy on Earth?

**Summary** In this virtual lab, you will do three short experiments to understand the processes of conduction, convection, and radiation. You will be able to explain how thermal energy in the form of heat moves in each type of energy transfer.

# Lab Procedure

1. **Prepare for the project.**
2. Read through this guide before you begin, so you know the expectations for this lab.
3. If anything is not clear to you, be sure to ask your teacher for assistance.
4. **Open the virtual lab.**
5. **Model and observe conduction.**
6. Read about conduction. You may go back to this information by pressing the “**?**”buttonat any point in the conduction experiment. Press the “**Model and observe conduction!**” button to start the virtual lab.
7. Drag a glass block to the left side of the table. Then, drag the other glass block to the right side of the table.
8. Place the foil bridge on top of the blocks.
9. Place the chocolate pieces on the foil bridge.
10. Proceed to the next part of the activity.
11. Drag the candle from the materials panel and place it under the first piece of chocolate.
12. Press the “**Play**” button to start the timer.
13. Observe the chocolate pieces. When the first chocolate piece starts to melt, stop the timer and record the time in **Table A** inthe **Data** section of this guide. Repeat this step until you have recorded the melting time of all the chocolate pieces.
14. If you want to observe how conduction works again, you may do so by pressing the reset button (blue button). You may also pressthe“**x2**” button to speed up the animation.
15. When you have completed the conduction experiment, move on to the next activity.
16. **Model and observe convection.**
17. Read about convection. You may go back to this information by pressing the “?” button at any point in this experiment. Press the “**Model and observe convection!**” button to proceed.
18. Drag the eyedropper to the glass to add blue water to the cold water in the glass.
19. Press the “**Play**” button to start the timer when you are ready.
20. Observe what happens to the blue water. The timer will stop every 30 seconds until it reaches 3 minutes. Every time the timer stops, record what happens to the blue water in **Table B** in the **Data** section of this guide, then start the timer to complete your observations.
21. You may observe this part of the convection experiment again by pressing the reset button. You may press the“**x2**” button to speed up the animation.
22. Proceed to the next part of the convection experiment.
23. Drag the eyedropper to the glass to add red water to the hot water in the glass.
24. Press the “**Play**” button to start the timer when you are ready.
25. Observe what happens to the red water. The timer will stop every 30 seconds until it reaches 3 minutes. Every time the timer stops, record what happens to the red water in **Table C** in the **Data** section of this guide, then start the timer to complete your observations.
26. You may observe this part of the convection experiment by pressing the reset button. You may also pressthe“**x2**” button to speed up the animation.
27. When you have completed the convection experiment, move on to the next activity.
28. **Model and observe radiation.**
29. Read about radiation. You may go back to this information by pressing the “**?**” button at any point during the radiation experiment. Press the “**Model and observe radiation!**” button to proceed.
30. Drag the white paper and place it under the lamp on the left. Then drag the black paper and place it under the lamp on the right.
31. Switch on the lamps.
32. Observe how the temperature of the sheets change.
33. Record your observations in **Table D** in the **Data** section of this guide. The timer will stop every 30 seconds until it reaches 3 minutes. Every time the timer stops, record the temperature of the white and black sheets in **Table D**, then start the timer to complete your observations.
34. You may observe how radiation works again by pressing the reset button. You may also increase the speed of the animation by pressing the “**x2**” button.
35. When you have completed the radiation experiment, move on to the next activity in the Virtual Classroom.

# Data

Record your observations and data either in your lab notebook or in the space below.

**Table A: Conduction**

|  |  |
| --- | --- |
| **Chocolate Piece** | **Time to Start Melting**  **(minutes : seconds)** |
| 1st (closest to candle) |  |
| 2nd |  |
| 3rd |  |
| 4th |  |
| 5th |  |
| 6th (farthest from candle) |  |

**Table B: Convection (Cold Water)**

|  |  |
| --- | --- |
| **Time**  **(minutes : seconds)** | **Food Coloring Movement** |
| **0:30** |  |
| **1:00** |  |
| **1:30** |  |
| **2:00** |  |
| **2:30** |  |
| **3:00** |  |

**Table C: Convection (Hot Water)**

|  |  |
| --- | --- |
| **Time**  **(minutes : seconds)** | **Food Coloring Movement** |
| **0:30** |  |
| **1:00** |  |
| **1:30** |  |
| **2:00** |  |
| **2:30** |  |
| **3:00** |  |

**Table D: Radiation**

|  |  |  |
| --- | --- | --- |
| **Time**  **(minutes : seconds)** | **White Paper**  **Temperature (°C)** | **Black Paper**  **Temperature (°C)** |
| **0:30** |  |  |
| **1:00** |  |  |
| **1:30** |  |  |
| **2:00** |  |  |
| **2:30** |  |  |
| **3:00** |  |  |