

# THERMODYNAMICS

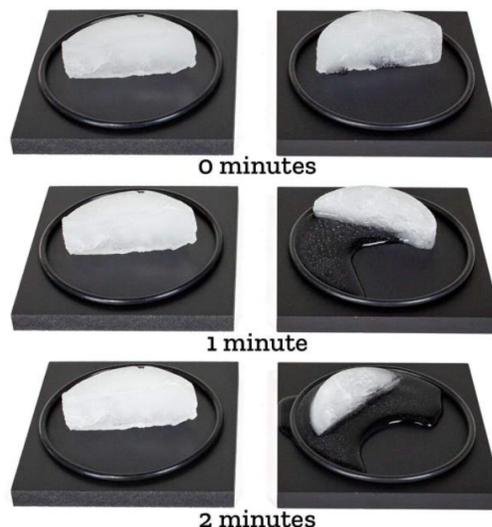
## ICE MELTING BLOCKS

### Materials:

- ✓ One Black Aluminum Block
- ✓ One Black High-Density Foam Block
- ✓ Two Rubber O-rings
- ✓ Infrared Laser Thermometer

### Background Research:

1. Explain Fick's Diffusion Law.
2. How does Fick's Diffusion Law apply to Heat Transfer?
3. Define the 3 types of Heat Transfer
  - a. Conduction
  - b. Convection
  - c. Radiation
4. Differentiate between a conductor and an insulator.
5. Define Specific Heat Capacity.
6. Identify the Specific Heat Capacity of the following
  - a. Water
  - b. Aluminum
  - c. High Density Foam (polyurethanes)
7. Define and Identify the Heat of Fusion for water.



### Scientific Investigation

- ➔ Touch Both Blocks. Which feels Warmer?
- ➔ Measure the Temperature of the Blocks.
- 8. Develop a hypothesis about which block will melt Ice Faster.
- ➔ Place O-rings on the blocks to prevent water from flowing off.
- ➔ You will now place an Ice block on each pad. You will need to measure the mass of the ice before you put it on the pad. Start a timer as soon as the ice touches the pad. You can try to do this simultaneously using two different stop watches, or run two different trials separately.
- ➔ Collect Quantitative data of the % of Ice that has melted every 30 seconds.
- ➔ Touch the block after the ice has melted, does it feel cooler?
- ➔ Measure the temperature of the blocks after the ice has melted.

### Reflection/Conclusion:

9. Make a line graph illustrating your data every 30 minutes. You can use graph paper or graphing software.
10. Did the experiment prove your hypothesis to be true or false?
11. Use your knowledge of the heat of fusion of water and/or specific heat capacity to calculate the amount of energy absorbed by the ice. Do this for each trial.
12. Use your data from the previous question to identify how much energy was transferred from the blocks to the ice every second.
13. Based on your data from number 12, which is the better conductor/insulator? Did the eye test provide the same conclusion or do they contradict each other?
14. Use the term "Thermal Energy" to discuss the temperature of the blocks before and after the experiments.
15. Make a 5-minute max loom video in which you will recreate the experiment. As the experiment is proceeding in your video discuss the physics of what is happening.

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**ICE MELTING BLOCKS**

<i>Time (minutes)</i>	<i>% of Ice melted on Aluminum Block</i>	<i>% of Ice melted on Polyethylene Block</i>
0	0%	0%
0.5		
1.0		
1.5		
2.0		
2.5		
3.0		
3.5		
4.0		
4.5		
5.0		
5.5		
6.0		
6.5		
7.0		
7.5		
8.0		
8.5		
9.0		
9.5		
10.0		
<i>Mass of Ice</i>		
<i>Temp of Blocks</i>		
<i>Feel of blocks</i>		