ScienceCube

Heat Conduction in Solids

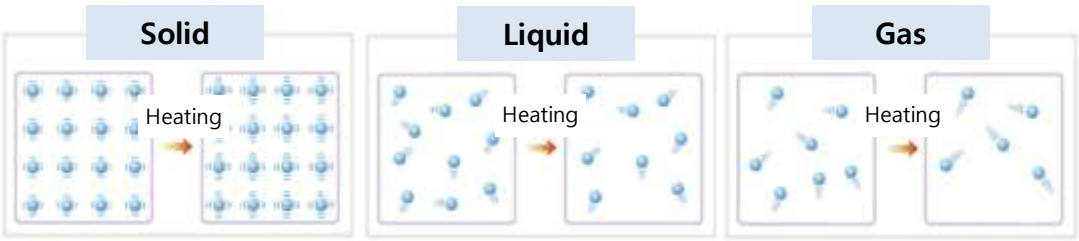
1. **It is possible to observe the transfer of heat in solids.**
2. **We can compare and explain heat conduction according to the type of metal.**

Fundamental Concept

1. Heat (Thermal Energy)

Energy that moves from an object with a higher temperature to an object with a lower temperature.

When the state of the material does not change, the molecular motion becomes more active as the temperature increases when heat is absorbed.



2. Conduction

(1) The phenomenon where molecules constituting the material collide and transfer heat.

(2) Mainly, heat is transferred in solids.

(3) The better the material conducts, the easier it is to gain or lose heat.

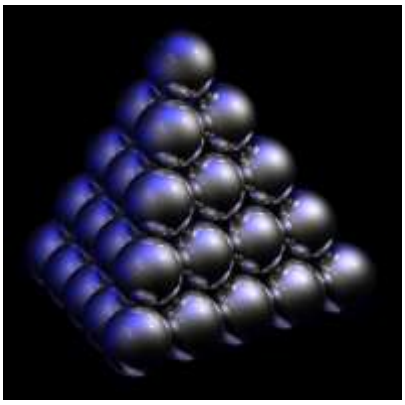
(4) Examples of conduction

- On a winter day, a metal chair feels colder than a wooden chair..
- Pots are made of metals that conduct heat well, while pot handles are made of plastics that do not conduct heat well.

3. Heat Conduction According to Material

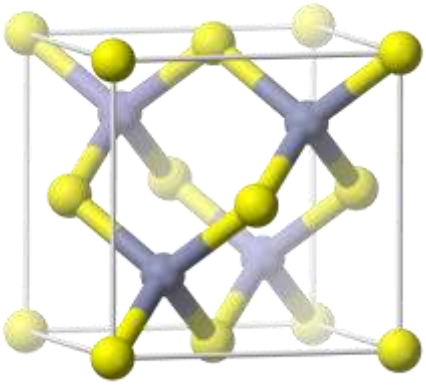
(1) Materials that conduct heat well: metals such as silver, copper, iron, aluminum

→ Mostly conductors, with free electrons that move freely and transfer heat as they move.



(2) Materials that do not conduct heat well: glass, water, plastic, wood, etc.

→ Mostly insulators, without free electrons, making it difficult to transfer heat..



Experiment

Materials Needed

Interface, Science# Program, 3 temperature sensors, 50 mL beakers (4), 3 types of metal plates (aluminum, copper, zinc), hot water, cold water, ruler, marker, stand, ring clamp, clip

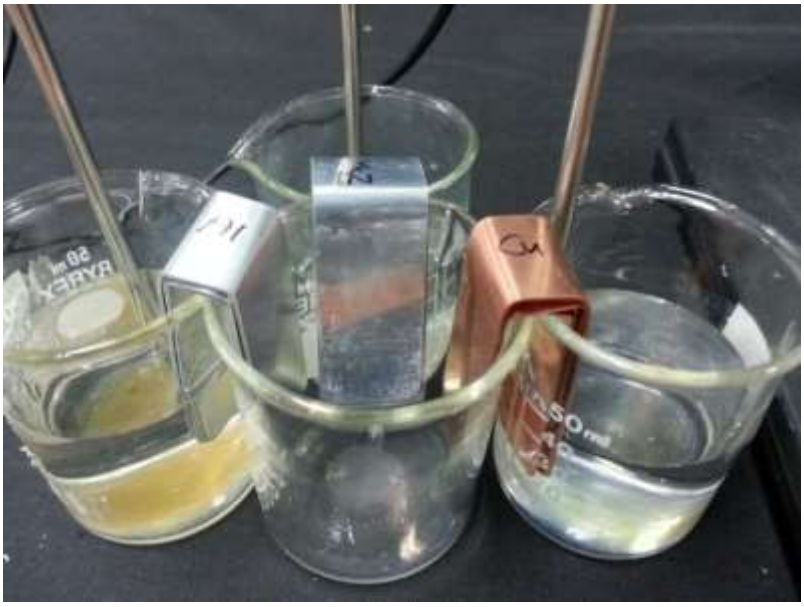
Preparation of Experimental Apparatus

1. Bend three types of metal plates into a 'ㄷ' shape and stack them five times. (It is easier to bend them using a ruler)

2. Write the names of the metals using a marker..
3. Pour 50 mL of cold water into each of the three 50 mL beakers.
4. Unfold the clip and attach it to the ring clamp of the stand, then hang the temperature sensors

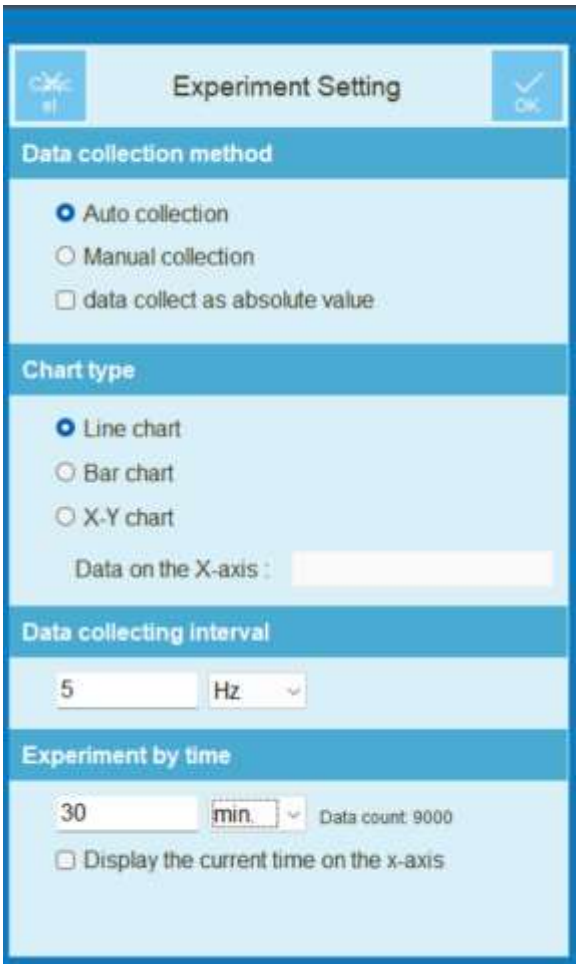
5. Place the temperature sensors into the beakers filled with water and arrange them as shown below, ensuring the sensors do not touch the bottom of the beakers.

6. Connect the three types of metals from the beakers with cold water to the empty beaker..



Interface Setup

1. Run the Science# program..
2. Connect the three temperature sensors to the interface
3. Click to set up the experimental environment as shown below or click to automatically set up.



4. Pour hot water into the empty beaker until it is full but not overflowing.

Data Collection

1. Click to start collecting data.
2. When the time is up and data collection is complete, remove the metals.

Data Analysis

Recording

1. Graph the temperature changes in the beakers of cold water over time..

2. Calculate the temperature changes in the cold water with the metal submerged and record them in the following table.

Category	Initial Temperature (℃)	Final Temperature (℃)	Temperature Difference (℃)
Copper			
Aluminum			
Zinc			

Applying Data

1. Think about and describe why the temperature of the cold water changed as it did in the experiment.

2. List the metals in order of their thermal conductivity from highest to lowest..

	>		>	

3. Which object feels colder when touched in winter, wood or metal? Explain why..