ScienceCube

Specific Heat

Understand and explain specific heat by observing temperature changes when heating equal masses of water and cooking oil.

Fundamental Concept

When heating equal masses of water and cooking oil, the temperature of the cooking oil rises faster than that of the water. Similarly, the temperature of the cooking oil drops faster than that of the water when cooling. This difference in how substances change temperature is due to the varying amounts of heat required to change the temperature of different substances. The amount of heat needed to raise the temperature of 1 kg of a substance by 1°C is called specific heat, with units of cal/(g·°C) or kcal/(kg·°C).

Water Cooking oil Aluminum Sand Iron

Specific heat varies depending on the type of substance. When the same amount of heat is applied to equal masses of different substances, a substance with a higher specific heat will

have a smaller temperature change, while a substance with a lower specific heat will have a larger temperature change. Water, in particular, has a very high specific heat, which affects climate by moderating temperature changes

Experiment

Materials Needed

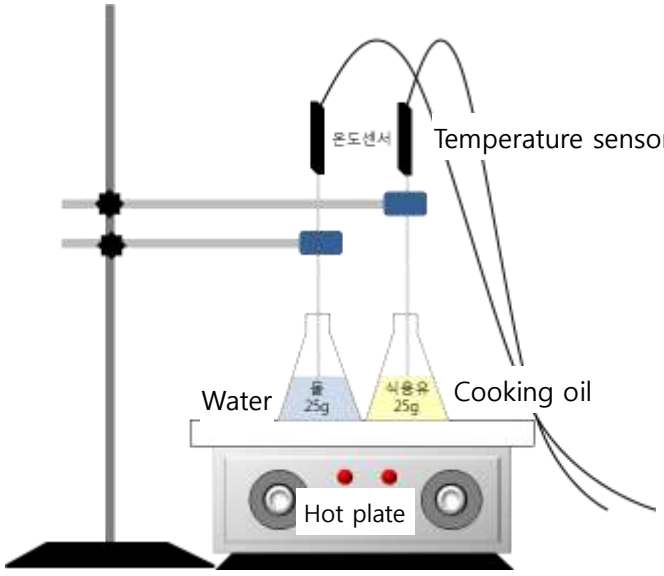
Interface, Science# program (smart device), Two temperature sensors, Stand, Two clamps, Two 50 mL Erlenmeyer flasks, 25 g water, 25 g cooking oil, Hot plate, Electronic scale

Experiment Preparation

1. Measure and pour 25 g of water and 25 g of cooking oil into separate Erlenmeyer flasks

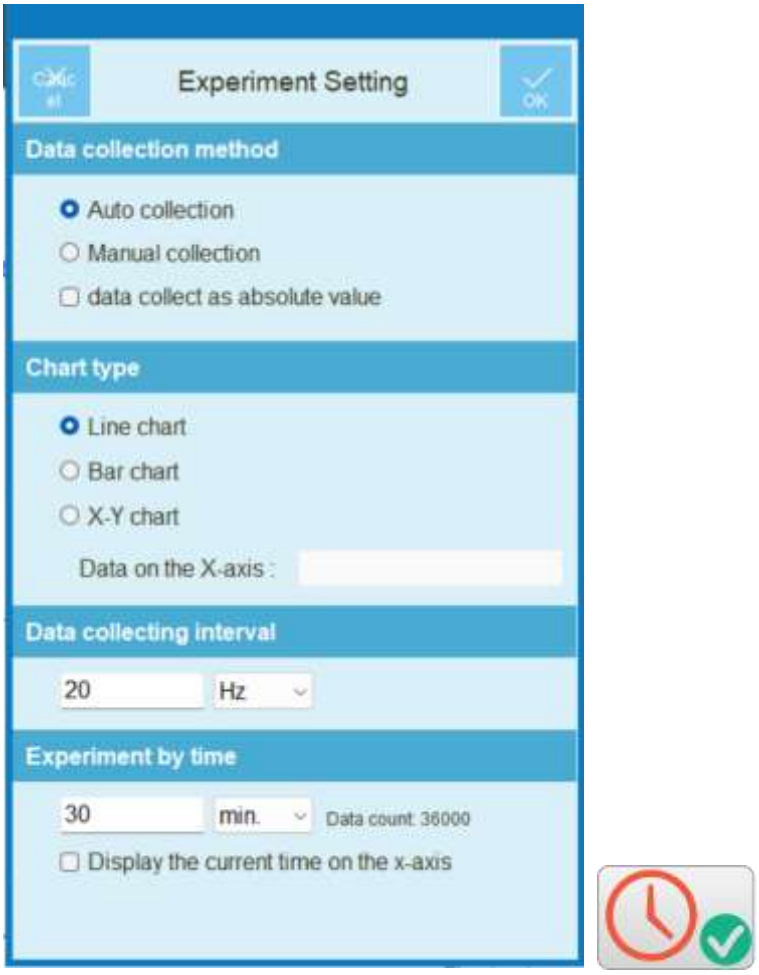
2. Place the two Erlenmeyer flasks on the hot plate.

3. Use the stand to fix the temperature sensors in the liquids inside the flasks, ensuring the sensors do not touch the bottom or sides of the flasks



Interface Setup

1. Run the Science# program.
2. Connect the temperature sensors to the interface
3. Press to set up the experimental environment as shown below or press for automatic setup.



Data Collection

1. When the temperatures of the water and cooking oil are the same, press to start data collection.
2. Turn on the hot plate and heat uniformly (set the hot plate temperature between 100°C and 150°C).
3. When the water and cooking oil begin to boil, press to stop data collection..

Data Analysis

Recording Data

1. Heat equal masses of water and cooking oil simultaneously and draw a graph of the temperature changes.

Data Application

1. Note which substance, water or cooking oil, heats up faster.

2. What are the specific heats of water and cooking oil? Explain the relationship with the answer to question 1 above.

3. Predict which substance, water or cooking oil, will cool down faster and write your prediction.

4. Predict which substance, iron or aluminum, with equal masses, will heat up faster and explain your reasoning.


Report
(For Teachers)
Report
(For Students)