KeScienceCube

Creating Water of Various Temperatures

Learning Objectives

Using Senses to Mix Hot and Cold Water to Achieve a Specific Temperature and Explaining the Difference from Actual Temperature.

Should I think about it?

How accurate is the temperature measured by the sense of touch?

Learning Content

1. Temperature

The numerical value that indicates how hot or cold an object is.

2. Types of Temperature

1) Celsius Temperature

- The freezing point of water is 0℃, and the boiling point is 100℃, with 100 equal divisions between them.
- Unit: ℃

2) Absolute Temperature

- The temperature at which molecular motion stops (about -273℃) is set to 0K, with the same scale interval as Celsius.

- Unit: K (Kelvin)

3) Fahrenheit Temperature

- The freezing point of water is 32°F, and the boiling point is 212°F, with 180 equal divisions between them.

- Unit: °F

3. Thermometer

1) Types

Devices for measuring temperature, such as alcohol thermometers and mercury thermometers.

< Alcohol Thermometer>

< Mercury Thermometer>

2) Measurement Principle

By keeping the thermometer in contact with the part to be measured for a while, the thermometer's temperature equalizes with the object's temperature, allowing measurement.

4. Temperature Sensor

- Can measure temperatures between -50℃ and 180℃.
- The sensor has an element at the tip that changes resistance with temperature, displaying the measured value based on this change.
- Made of stainless steel.

Experimental Activities

Materials Needed

Interface, Science# Program (smart device), temperature sensor, three 100 mL beakers, two 250 mL Erlenmeyer flasks, marker.

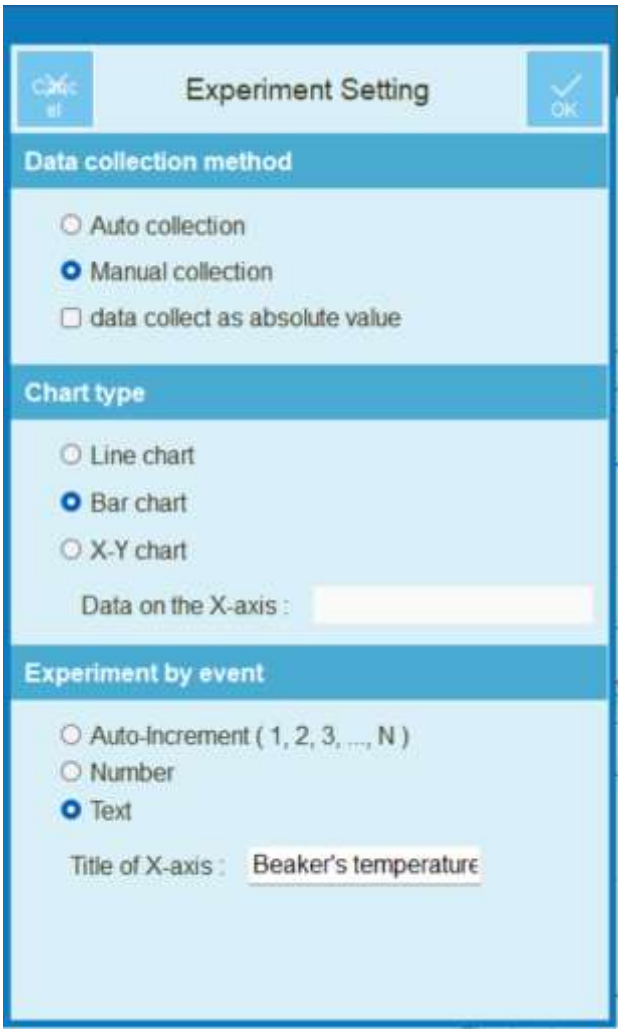
Experimental Procedure

Preparation

1. Run the Science# program on the smart device and connect it to the powered-on interface via Bluetooth or cable.
2. Connect the temperature sensor to the interface.

3. In Science#, click

to set up the experimental environment as shown below. (Clicking the button will automatically set it up.)



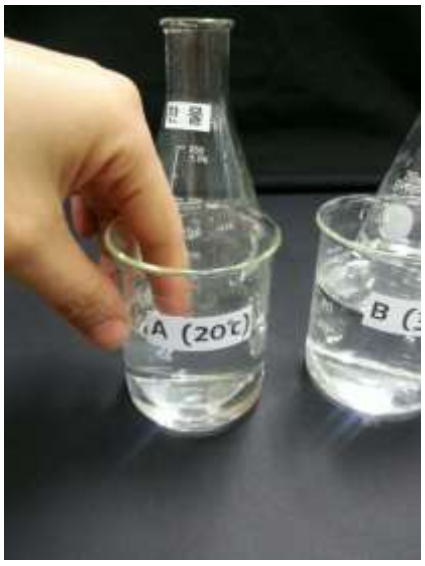
[Experiment 1] Creating Water of a Specific Temperature Using Sense of Touch

1. Fill two Erlenmeyer flasks with cold water and hot water, respectively.

2. Label three beakers as A (20℃), B (30℃), and C (40℃).

3. Mix hot and cold water in small amounts, estimating with your finger to achieve the following temperatures in each beaker:

   A: 20℃, B: 30℃, C: 40℃

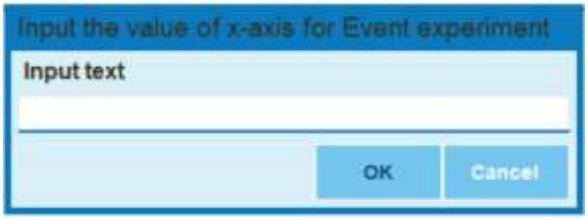


[Experiment 2] Measuring the Temperature of Water in Each Beaker

1. Place the temperature sensor in the A (20℃) beaker, click the button, and once the

value stabilizes, click  the button again to measure the water temperature. Ensure the temperature sensor does not touch the bottom of the beaker.

2. Enter the name of the beaker.



e.g., A or 20℃

3. Measure the temperature of the water in beakers B and C using the same method, entering the beaker names, e.g., B or 30℃, C or 40℃

4. Click  the button to end the experiment..

Experimental contents

1. Measure the temperatures of the beakers you estimated to be 20℃, 30℃, and 40℃ with the sensor and display the results in a bar graph.

2. Record the difference between the temperatures measured by sense and the actual temperatures in the following table.

Temperature measured by sense (℃)	20℃	30℃	40℃
Temperature measured by sensor (℃)			
Error (℃)			

Experimental results

1. Compare the error with other friends and explain the degree of error and the reason.

2. If you mix equal amounts of 40℃ water and 20℃ water, what will be the temperature of the mixture?


Report
(For Teachers)
Report
(For Students)