ScienceCube

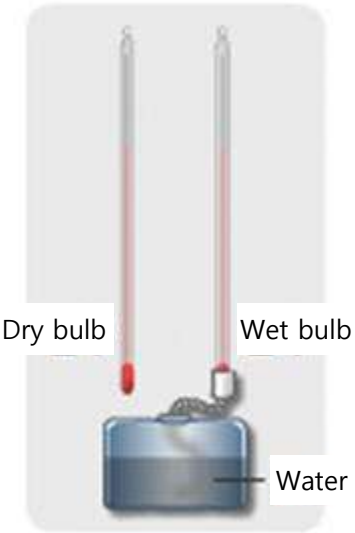
Psychrometer (Wet and Dry Bulb Thermometer)

1. **Through experiments, you can explain the principle of the wet and dry bulb thermometer.**
2. **You can directly determine the relative humidity using the wet and dry bulb thermometer.**

Fundamental Concept

1. Psychrometer (Wet and Dry Bulb Thermometer)

An instrument that can determine humidity based on the temperature difference between the dry bulb and the wet bulb.



Psychrometer

Wet bulb temperature (℃)	Difference between dry bulb and wet bulb temperatures(℃)					
	0	1	2	3	4	5
16	100	90	82	74	66	60
17	100	91	82	74	67	61
18	100	91	83	75	68	62
19	100	91	83	76	69	62
20	100	91	83	76	69	63

Humidity chart

2. Principle of Determining Humidity

① Calculate the temperature difference between the dry bulb and the wet bulb.

② Find the temperature difference on the horizontal axis of the humidity chart.

③ Locate the corresponding wet bulb temperature on the humidity chart.

④ Read the value at the intersection of the horizontal and vertical axes.

3. Temperature Difference of Wet and Dry Bulb According to Humidity

① Low humidity environment: Evaporation occurs quickly.

Large temperature difference between wet and dry bulb.

② High humidity environment: Evaporation occurs slowly.

Small temperature difference between wet and dry bulb.

※ When humidity is 100%, there is no temperature difference between the wet and dry bulb.

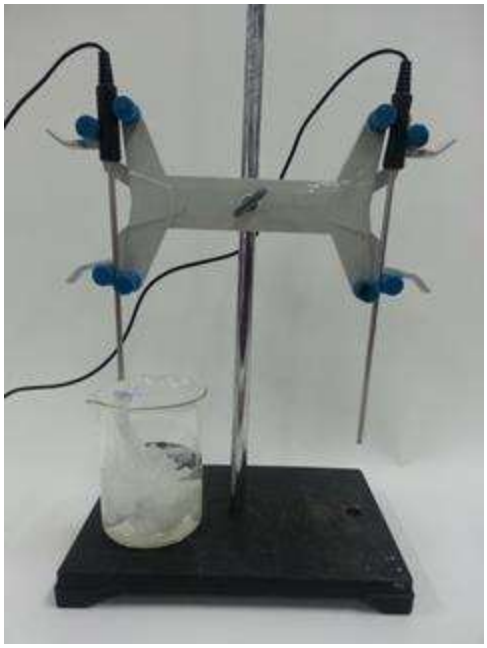
Experiment

Materials

Interface, Science# program, 2 Pt temperature sensors, stand, 250mL beaker, gauze, twist tie, water

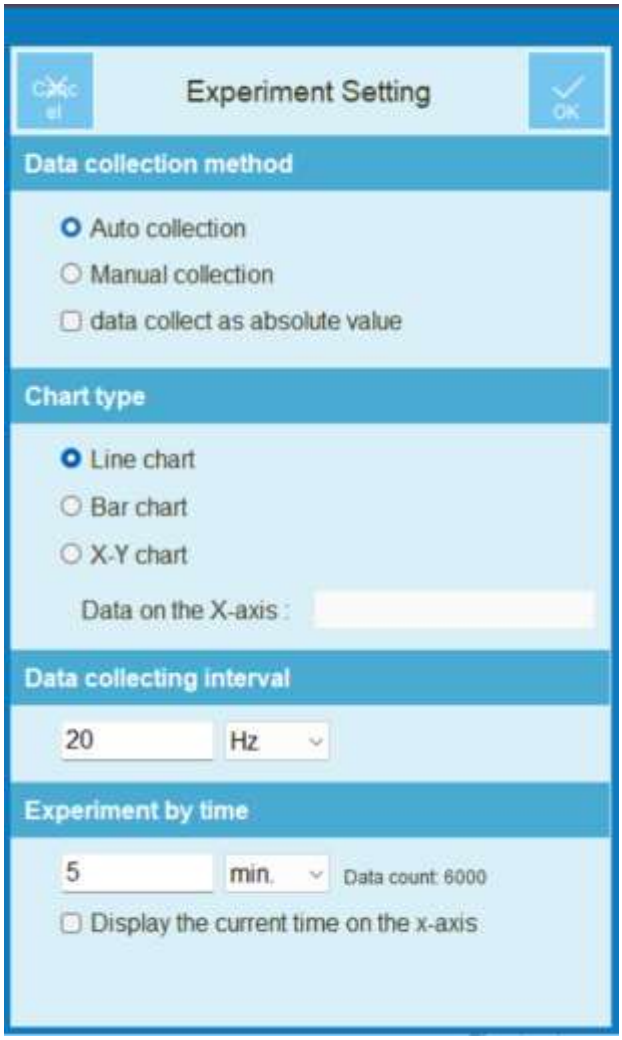
Experiment Setup

1. Wrap the gauze around the temperature sensor up to 3cm from the tip, and secure it with a twist tie.
2. Adjust and fix the height of the two temperature sensors on the stand so that they are at the same level.
3. Pour about 200mL of water into the beaker and place it under the temperature sensors without submerging the gauze.



Interface Setup

1. Run Science#.
2. Connect the interface and the two Pt temperature sensors.
3. Press the button to set up the experiment environment as shown below or press the auto-setup button for automatic settings.




[자동설정]

Data Collection

1. After setting up the device in the classroom, press the start button  to begin data collection.
2. To synchronize the initial dry bulb temperature and wet bulb temperature, press the button  and then fully soak the gauze in water.
3. When data collection is complete, save the data.
4. Select two locations where you expect high humidity or dryness.

5. Carefully move the experimental device to the selected locations and measure the dry bulb and wet bulb temperatures for a certain period.

Data Analysis

Data Recording

1. Based on the collected experimental data, compare the dry bulb and wet bulb temperatures and represent the results using inequality symbols.

2. Explain the reasons for the observed differences between the dry bulb and wet bulb temperatures.

Data Application and Extension Activities

1. Using the dry bulb and wet bulb temperatures measured in locations expected to be humid or dry, calculate the humidity for each location using the humidity chart below.

Wet bulb temperature (℃)	Difference between dry bulb and wet bulb temperatures(℃)							
	1	2	3	4	5	6	7	8
27	92	85	78	72	67	61	56	52
26	92	85	78	71	66	60	55	51
25	92	84	77	71	65	59	54	50
24	92	84	77	70	64	59	53	49
23	91	84	76	69	63	58	53	48
22	91	83	76	69	63	57	52	47
21	91	83	75	68	62	56	51	46
20	91	82	74	67	61	55	49	44
19	91	82	74	66	60	54	48	43
18	90	81	74	66	59	53	47	42
17	90	81	72	65	58	52	46	40
16	90	80	72	64	57	50	44	30

<Humidity Chart>

2. Investigate the phenomena that occur in our daily lives when humidity is high or low..

3. Predict how the dry bulb and wet bulb temperatures will change when a humidifier is used in an enclosed space.