ScienceCube

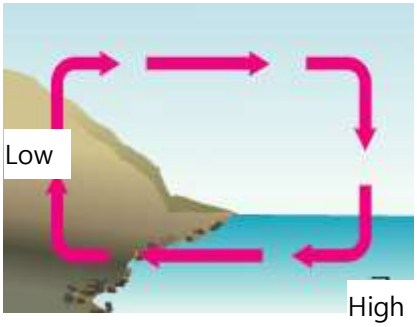
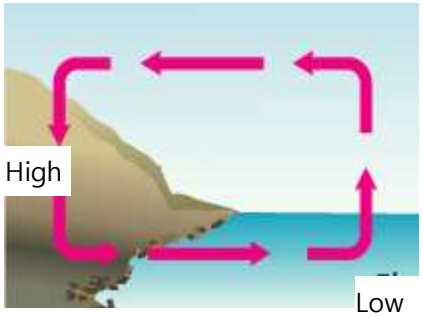
Sea and Land Breezes

You can explain the principles of sea breezes and land breezes by examining the differences in heating and cooling rates of sand and water.

Fundamental Concept

1. **Sea and Land Breezes**

Sea and land breezes are winds that change direction daily in coastal areas.

Category	Sea and Land Breezes	
	Sea Breeze (Day)	Land Breeze (Night)
Picture		
Cause	The land heats and cools faster than the sea	
Temperature	Land > Sea	Land < Sea
Air Pressure	Land < Sea	Land > Sea
Wind Direction	Sea → Land	Land → Sea

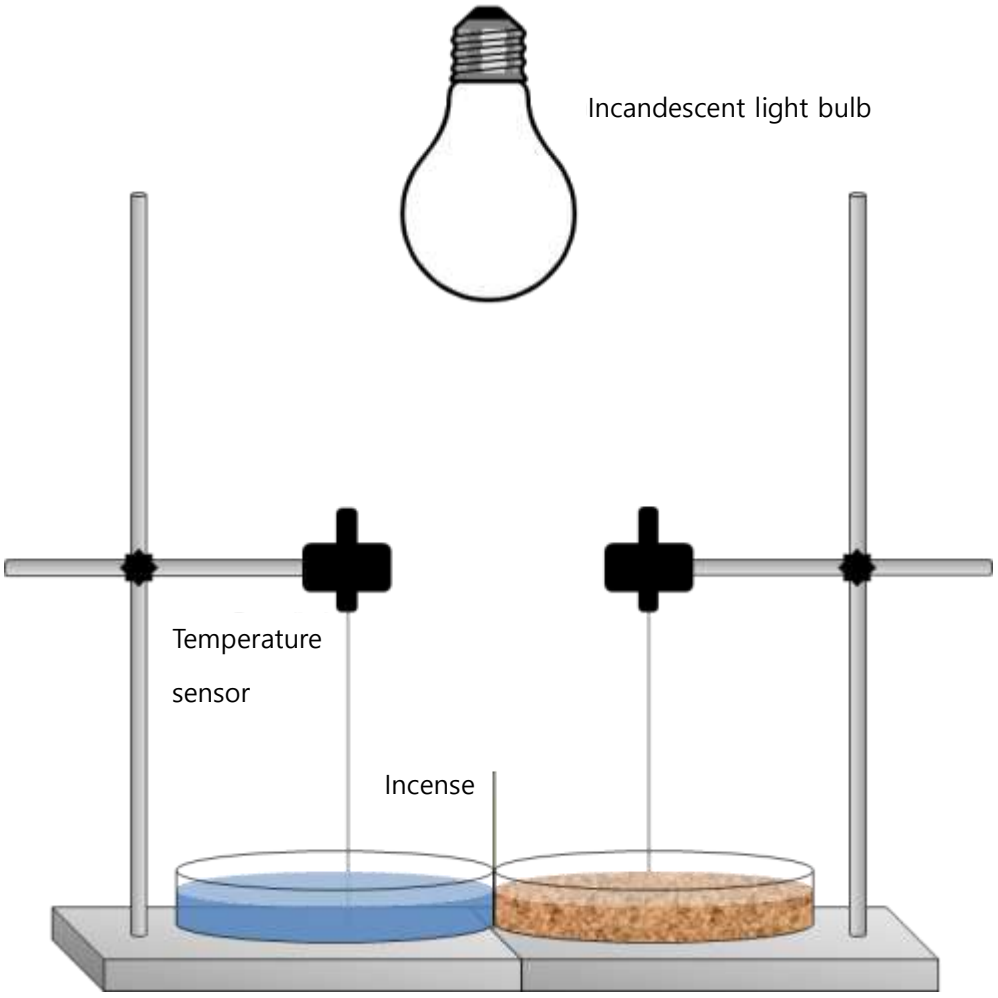
Experiment

Materials Needed

Interface, Science# Program, 2 Temperature Sensors, 2 Stands, Incandescent Lamp, Water, Sand, Incense, 2 Petri Dishes

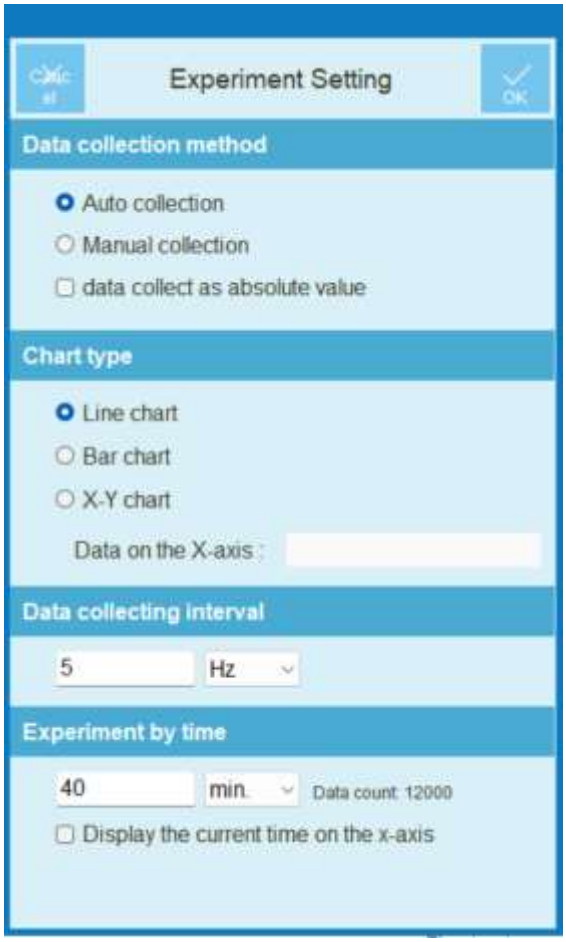
Experiment Setup

1. Fill two Petri dishes with equal amounts of water and sand.
2. Fix the temperature sensors at the center of each Petri dish using stands.
3. Position the incandescent lamp between the two Petri dishes.



Interface Setup

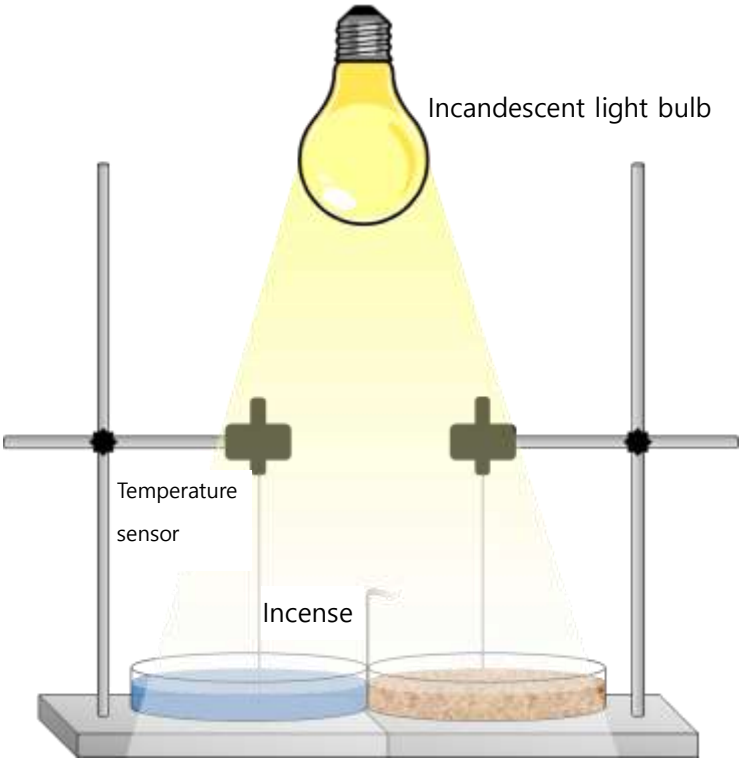
1.  Run Science#.
2. Connect the two temperature sensors to the interface.
3.  Press the button and configure the experiment settings as shown below or press the auto setup button. 



 Auto setup

Data Collection

1.  Press the button and turn on the lamp.
2. Observe the temperature changes in the water and sand as they are heated by the lamp.
3. After about 10 minutes, light the incense and observe the direction of the smoke.
4. When the temperatures of the water and sand equalize, turn off the lamp and observe the temperature changes and the direction of the smoke as they cool down.



Data Analysis

Recording Data

1. Draw a graph showing the temperature changes of the water and sand during heating and cooling.

2. Represent the heating and cooling rates and the direction of the smoke with symbols in the table below..

Condition	Heating	Cooling

Heating & Cooling Rate (<,=,>)	Water ( ) Sand	Water ( ) Sand
Smoke Direction (→,←)	Water ( ) Sand	Water ( ) Sand

Applying Data

1. Identify which heats and cools faster between water and sand.

2. Explain why the temperature changes in water and sand are different.

3. Explain the movement of relatively warm and relatively cold air based on the relationship between temperature and density..

Extension Activities

1. Write down which heats up faster under the hot sun, the air near the land or near the sea.

2. Assuming the sand represents the land and the water represents the sea, fill in the table below with the temperature, air pressure, and wind direction during the day and night.

Condition	Heating	Cooling
Temperature	Sea ( ) Land	Sea ( ) Land
Air Pressure	Sea ( ) Land	Sea ( ) Land
Wind Direction	Sea ( ) Land	Land ( ) Sea

Wind Name		

3. Explain the principles of sea and land breezes based on the experiment results.