ScienceCube

Respiration of Yeast

1. **Explain what the substrates and by-products of yeast respiration are.**
2. **Compare and explain the yeast respiration rate according to the amount of sugar and temperature.**

Fundamental Concept

1. Definition of Anaerobic Respiration

Anaerobic respiration is the process of breaking down organic matter to obtain energy without oxygen. Anaerobic respiration does not use oxygen, produces a small amount of energy, and is generally classified into fermentation and decay based on its benefits to humans.

2. Aerobic Respiration and Anaerobic Respiration

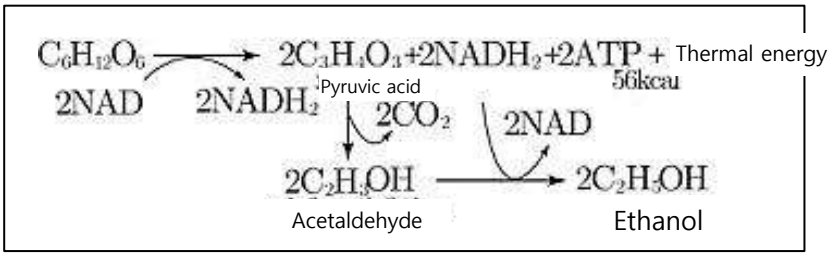
(1) Aerobic Respiration: Respiration that requires oxygen.

Nutrients + Oxygen (O2) → Energy + Water + Carbon Dioxide (CO2)

(2) Anaerobic Respiration: The process of obtaining energy without oxygen, usually in microorganisms.

Yeast (microorganism)

Glucose ⟶ Energy + Ethanol + Carbon Dioxide (CO2)



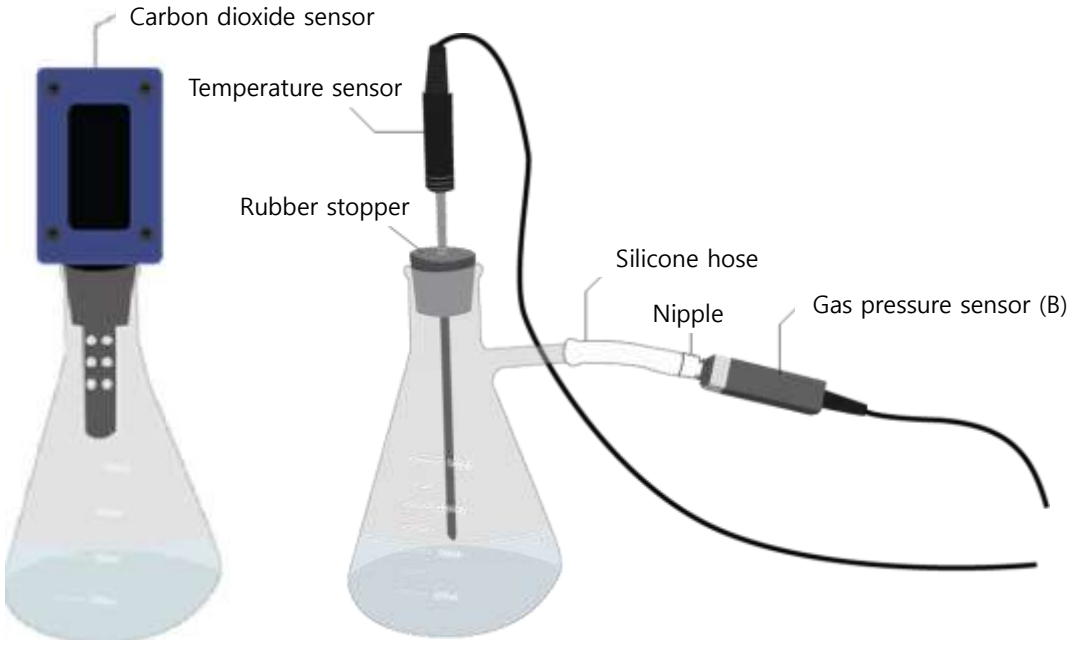
Experiment

Materials Needed

Interface, Science# program, Carbon dioxide sensor, Gas pressure sensor (B), Nipple (pressure sensor accessory), Temperature sensor, 250mL Erlenmeyer flask with side arm, 250mL Erlenmeyer flask, Yeast, Electronic balance, Silicone tube, Glucose, Heater, Distilled water, Rubber stopper (size 10)

Preparation of the Apparatus

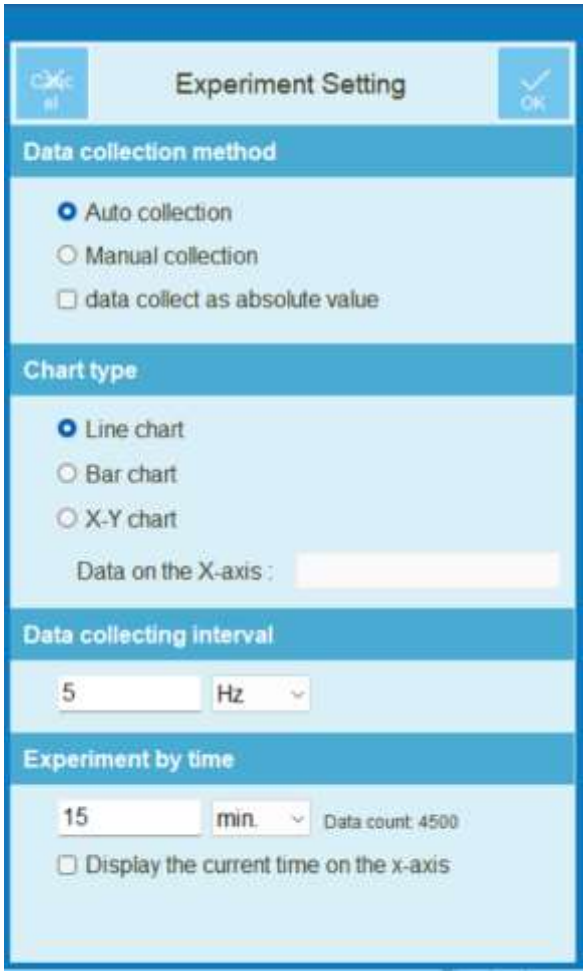
1. Connect a silicone tube to the side arm of the Erlenmeyer flask (B).
2. Connect the nipple to the silicone tube and then connect the gas pressure sensor (B).
3. Add 20mL of distilled water, 1g of yeast, and 1g of glucose to both Erlenmeyer flasks (A and B).
4. Seal the hole of the side-armed Erlenmeyer flask (B) with a rubber stopper containing the temperature sensor.
5. Insert the carbon dioxide sensor into the Erlenmeyer flask (A).



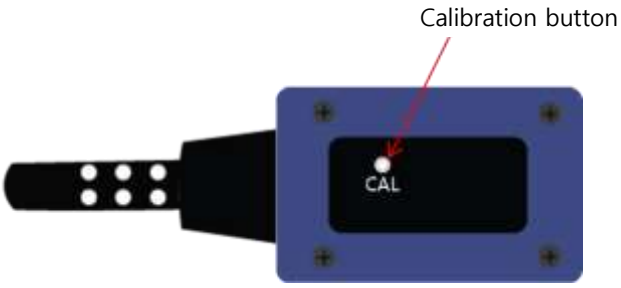
A B .

Interface Setting

1. Run Science#.
2. Connect the temperature sensor, gas pressure sensor, and carbon dioxide sensor to the interface.
3. Click the button to set up the experiment environment as shown below, or click the button for auto setup.

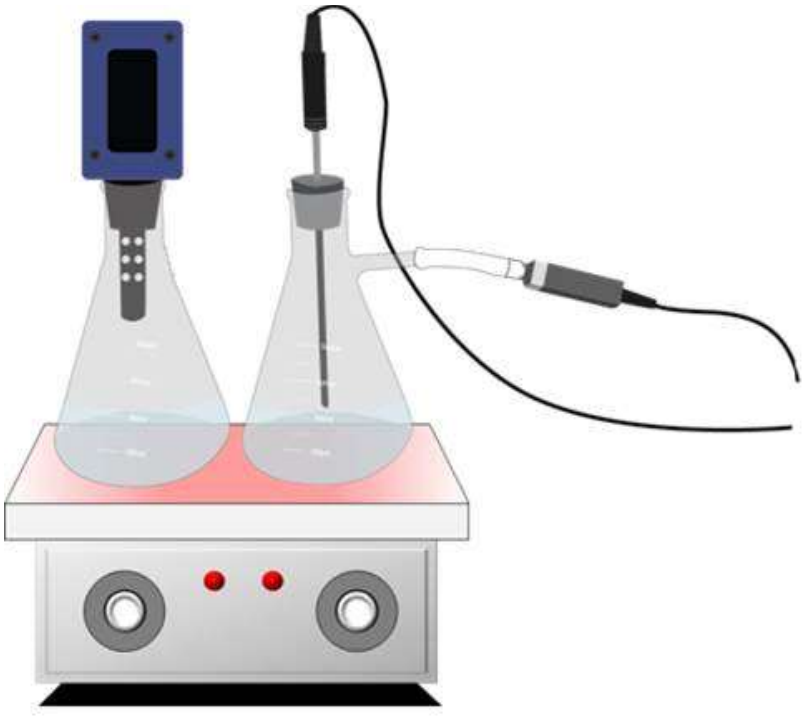


4. Click the button to zero the gas pressure sensor.
5. Calibrate the carbon dioxide sensor by pressing the CAL button with a pointed object to compare the changes in carbon dioxide produced..



Data Collection

1.  Click the button to start collecting data.
2. Vary the amount of glucose to compare the yeast respiration rate according to the amount of sugar.
3. Control the temperature using a heater and compare the yeast respiration rate at different temperatures.



Data Analysis

Recording Data

1. Draw a graph comparing the changes in pressure and carbon dioxide according to the amount of glucose.

2. Draw a graph comparing the changes in pressure and carbon dioxide according to the temperature..

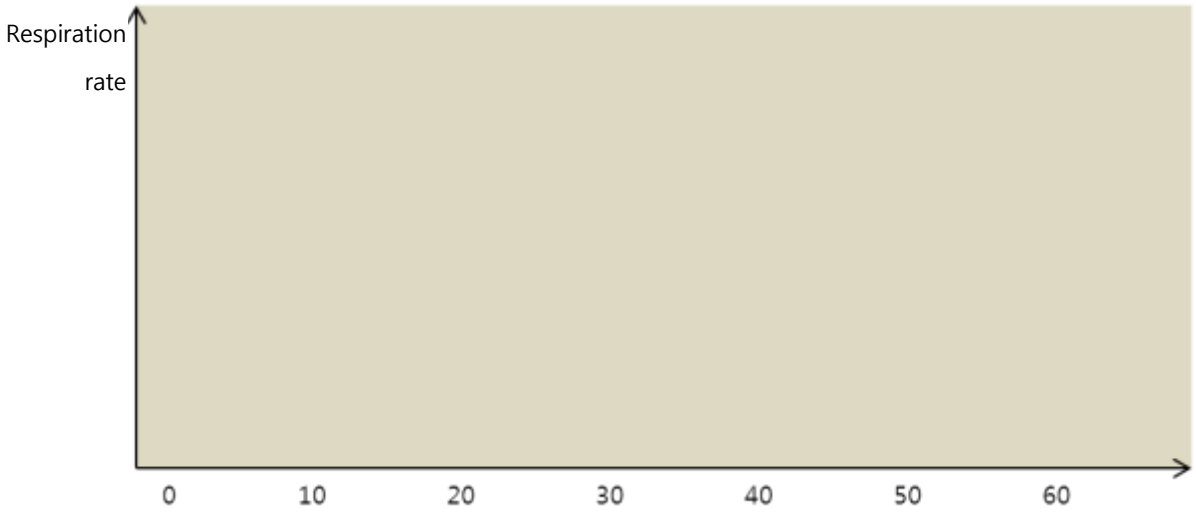
Application of Data

1. Explain the significance of the measurements from the pressure sensor and carbon dioxide sensor.

2. Describe how the yeast respiration rate changed according to the amount of glucose.

3. What was the temperature at which yeast respiration was the fastest? Explain the relationship between temperature and respiration rate based on the data.

4. Draw a graph showing the respiration rates of yeast at different temperatures..



Extension Activities

1. Measure the gas pressure changes of yeast in various beverages and list them in order of the largest change. Predict which beverage has the highest sugar content and write it down.


Report
(For Teachers)
Report
(For Students)