

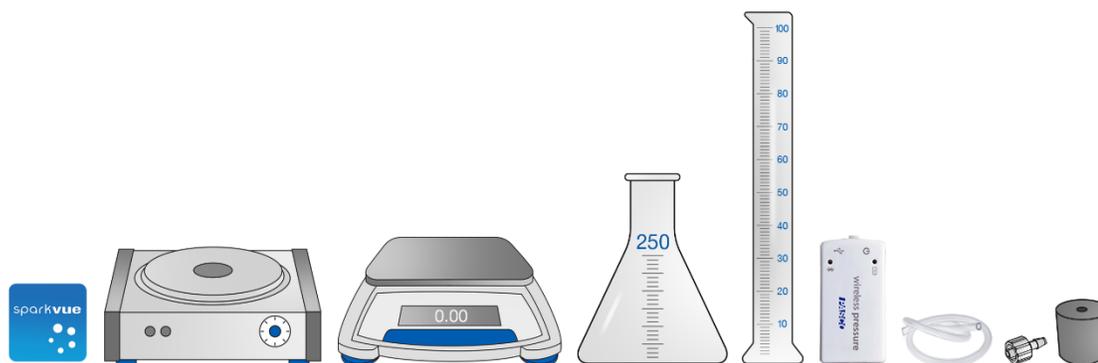
22B – RESPIRATION AND ENERGY

INQUIRY

How do changes in an energy source affect the rate of an organism's cellular respiration?

MATERIALS

- Device with SPARKvue software
- Pressure sensor with tubing and connectors
- Erlenmeyer flask, 250-mL
- One-hole stopper (to fit flask)
- Graduated cylinder, 100-mL
- Balance (readability: 0.01 g)
- Magnetic stirrer with magnet
- Artificial sweetener, 1.0 g
- Sucrose (table sugar), 1.0 g
- Lactose, 1.0 g
- Yeast suspension



BACKGROUND

Cellular respiration involves the conversion of food energy into energy needed for the body's metabolism. The overall reaction for cellular respiration is:



Many factors affect the rates of the reactions during cellular respiration. In this investigation, you will determine the effect of an energy source on the rate of cellular respiration. This can be done by measuring the change in pressure during the process of cellular respiration.

SAFETY

Follow these important safety precautions in addition to your regular classroom procedures.

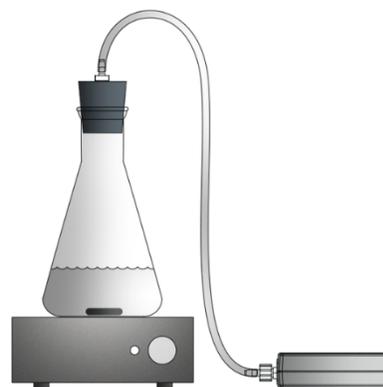
- Wear safety goggles at all times.

PROCEDURE

1. Open SPARKvue.
2. Open the 22B Respiration and Energy lab file in SPARKvue.
3. Use the Bluetooth icon to connect the Pressure sensor.
4. Stir the yeast suspension. Add 100 mL of yeast suspension to the flask.

PROCEDURE

- Assemble the tubing and connectors to the pressure sensor and stopper as shown.
- Add the stir bar to the flask. Seal the flask with the stopper and place it on the heater stirrer. Turn the stirrer on to a slow speed. If you do not have a stirrer, continue to gently swirl the mixture while you collect data.
- Start collecting data. Data collection will stop automatically after 5 minutes.
- After data collection has stopped, pour the solution down the drain. Rinse the flask and stir bar thoroughly.
- Repeat Steps 4-8 for a second, third and fourth trial, except add the following energy sources when indicated:
 - Trial #2 – Add 1.0 g sucrose to the yeast suspension. Swirl the mixture before sealing the flask.
 - Trial #3 – Add 1.0 g artificial sweetener to the yeast suspension. Swirl the mixture.
 - Trial #4 – Add 1.0 g lactose to the yeast suspension. Swirl the mixture.
- Make sure all runs are visible and scale the graph. Sketch your data for each trial in Graph 1 on your answer sheet. Include numbers on the x- and y-axis with appropriate intervals and fill out the legend.



ANALYSIS

Complete the analysis on your answer sheet.

QUESTIONS

Answer the questions on your answer sheet.

EXTENSION

While the energy source is one factor that can affect respiration, there are other factors. Some of these factors could include surface area of a solid particle, temperature, concentration or pH.

Design an experiment to test a different factor that may affect the rate of reaction. Define the investigation question. Outline the procedure and get approval from your teacher. After approval, obtain the necessary materials to complete your experiment. Collect your data in an organized table, analyze your results and report the effect of your new variable on the rate of respiration.