

## Aerobic Respiration Lab

For the aerobic respiration lab, please do the following:

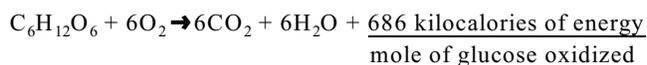
- 1) Graph your data...both the germinating seed and animal respiration
  - include the graph and charts
  - make sure you plot both data on the same graph
  - temperature for the experiment was the temperature of the water
  - use a scatterplot graph and draw a best fit line
  - calculate slope for each line
    - make sure the slope is a number and not in fraction form
  - give the graph and the chart a descriptive title that tells a reader what they are looking at
  - label all axis

Answer the following questions:

- a) What additional questions can you explore about cellular respiration using the same respirometers from this experiment?
- b) In the next part of this investigation, you will design and conduct your own experiments to answer questions that you raised in Procedures. Give at least two suggestions for improving the design of microrespirometers or procedure for measuring oxygen consumption/cellular respiration?

- 2) From your data:
  - discuss  $PV=nRT$ 
    - describe each symbol
    - **use your data** to discuss the relevance of the ideal gas law in this lab
      - address each symbol
      - be sure to discuss how  $PV=nRT$
  - **use your data** to discuss aerobic respiration
    - make sure to discuss each part of aerobic respiration
      - glycolysis, Krebs's cycle, ETC

3) Answer the following questions. Remember, some of the questions you can answer directly from your experiment. However, some of the questions are going to require research. Please make sure to use a cover page for this assignment and include a works cited page at the end.



Suppose you wanted to measure the overall rate of cellular respiration.

- 1) What specific things could you measure?
  - Which of these might be easier or harder to measure?
- 2) Why is it necessary to correct the readings of the respirometers containing seeds with the readings taken from respirometers containing only glass beads? Your answer should refer to the concepts derived from the general gas law:  $PV=nRT$
- 3) What happens to the volume of the gas being measured ( $O_2$  consumption or  $CO_2$  production) when the temperature or pressure changes during the experiment? If pressure and temperature remain constant, will the volume of gas in the respirometers increase or decrease? Please explain.  
Hint: Several tutorials and animations explaining the general gas law are available online (e.g., <http://www.nclark.net/GasLaws>).

4) Imagine that you are given 25 germinating pea seeds that have been placed in boiling water for five minutes. You place these seeds in a respirometer and collect data. Predict the rate of oxygen consumption (i.e., cellular respiration) for these seeds and explain your reasons.

5) Imagine that you are asked to measure the rate of respiration for a 25 g reptile and a 25 g mammal at 10°C. Predict how the results would compare, and justify your prediction. (hint: think metabolism)

6) Imagine that you are asked to repeat the reptile/mammal comparison of oxygen consumption, but at a temperature of 22°C. Predict how these results would differ from the measurements made at 10°C, and explain your prediction in terms of the metabolism of the animals.

7) What difficulties would there be if you used a living green plant in this investigation instead of germinating seeds?

Now that you have learned how to measure the rate of cellular respiration in germinating seeds, you have a tool for exploring questions on your own. Think about the process of cellular respiration.

8) When does respiration occur?

9) Are there any situations when living cells are not respiring?

10) Why might some living cells respire more than others?

11) Are there differences between major groups of organisms in how fast they respire?

12) What is the difference, if any, in the rate of cellular respiration between germinating seeds and nongerminating seeds?

13) Does the temperature of germinating seeds affect the rate of cellular respiration?

14) Do plant seeds consume more oxygen at higher temperatures than at lower temperatures?

15) Do germinating seeds just starting to germinate consume oxygen at a greater rate than seeds that have been germinating for several days (age dependence)?

16) Do seeds such as Wisconsin Fast Plant seeds (which store energy as oil) respire at a different rate from small grass seeds (which store energy as starch)?

17) Do small seeds of spring flowers, weeds, or grasses respire at a different rate from seeds from summer, fall, or winter plants?

18) Do seeds from monocot plants respire at different rates from dicot plants?

19) Do available nutrients affect the rate of respiration in germinating seeds?