

Cell Respiration Worksheet

Observations and Analysis

Table 1. Volume of Beads and Seeds

Bottle and Components	Volume (mL)
1, Germinating pea seeds	
2, Nongerminating pea seeds and glass beads	
3, Glass beads	
4, Germinating pea seeds	
5, Nongerminating pea seeds and glass beads	
6, Glass beads	

Table 2

Temp (°C)	Time (min)	1-Germinating Pea Seeds			2-Nongerminating Peas and Beads			3-Beads	
		Volume	Change	Corrected	Volume	Change	Corrected	Volume	Change
	0		—	—		—	—		—
	5								
	10								
	15								
	20								
Temp (°C)	Time (min)	4-Germinating Pea Seeds			5-Nongerminating Peas and Beads			6-Beads	
		Volume	Change	Corrected	Volume	Change	Corrected	Volume	Change
	0		—	—		—	—		—
	5								
	10								
	15								
	20								

Calculate the change in volume for each respirometer using the following equation:

$$\text{Change} = (\text{volume at time X}) - (\text{initial volume at time 0}) \quad \text{Equation 2}$$

Each volume reading must be corrected for any expansion or contraction of gases due to changes in the temperature of the air in the pipets. The control samples (beads) reflected the change in temperature by the movement of the air-water interface in the pipet. For example, if the air in the bead respirometer has contracted a total of 0.002 mL, then a change of -0.002 mL on the pipet would have been noted on Table 2. The change in volume for each respirometer must be corrected to account for the change in volume in the control. Likewise, if the gas expanded, the volume would be added to the experimental reading in order to obtain the true value of oxygen used during that time interval. Use the following equation to calculate the corrected volume:

$$\text{Corrected} = (\text{Change}_{\text{pea}}) -/+ (\text{Change}_{\text{bead}}) \quad \text{Equation 3}$$

Questions

1. This activity uses a number of controls. Identify at least three of the controls, and describe the purpose of each control.
2. Why is it important to react the carbon dioxide with potassium hydroxide in the respirometers?
3. Graph the results from the corrected difference column for the germinating peas and nongerminating peas at both room temperature and 10 °C. For this graph you will need to determine the following:
 - a. What is the dependent variable?
 - b. What is the independent variable?
4. Determine the rate of oxygen consumption of germinating and nongerminating peas during the experiments at room temperature and 10 °C.

$$\text{Rate} = \frac{-(\text{Volume at 20 minutes}) - (\text{volume at 0 minutes})}{\text{time (20 minutes)}}$$

The rate of oxygen consumption of germinating peas at room temperature.

The rate of oxygen consumption of nongerminating peas at room temperature.

The rate of oxygen consumption of germinating peas at 10 °C.

The rate of oxygen consumption of nongerminating peas at 10 °C.

5. Describe and explain the relationship between the amount of oxygen consumed and time.
6. Why is it necessary to correct the readings from the peas with the readings from the beads?
7. Explain the effect of germination on the cellular respiration of pea seeds.
8. If you used the same experimental design to compare the rates of respiration of a 25 g reptile and a 25 g mammal, at 10 °C, what results would you predict? Explain your reasoning.