Germinating Peas Lab

BACKGROUND

Aerobic cell respiration converts **chemical energy** of organic molecules into a form immediately usable by organisms and is summarized by the following reaction:

$$C_6H_{12}O_6 + 6\ O_2(gas) \longleftrightarrow 6\ H_2O + 6\ CO_2(gas) + \text{energy (ATP)}$$

All organisms, including plants and animals, break down glucose for energy.

Photosynthesis converts **radiant energy** from the sun into **chemical energy** in the form of **glucose**. Only **photoautotrophs**, including plants, most protists, and some bacteria can perform this process. It is summarized by the following reaction:

$$6\ H_2O + 6\ CO_2(gas) \longleftrightarrow C_6H_{12}O_6 + 6\ O_2(gas)$$

OBJECTIVES

Peas are the seeds of the pea plant. The emergence and initial growth of the plant from the seed is called **germination**. Like all plants, full grown pea plants perform both **photosynthesis** and **aerobic cell respiration**. In this lab, we will try to answer the following questions:

1. **Do peas undergo cell respiration or photosynthesis while germinating?**

Using the CO_2 and O_2 Gas Sensors, you will monitor the carbon dioxide and oxygen produced by peas over time (see figure 1).

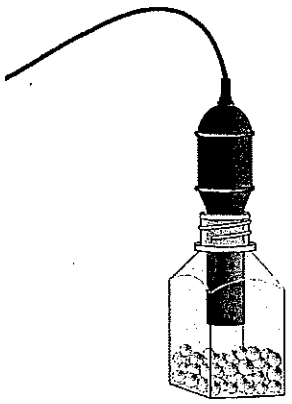


Figure 1

Names _____ Block _____ Date _____

MATERIALS

Vernier CO_2 Gas Sensor	Timer	Germinating peas	Plastic chambers
Vernier O_2 Gas Sensor	Beads	LabQuest 2	Light Box

PRE-LAB QUESTIONS

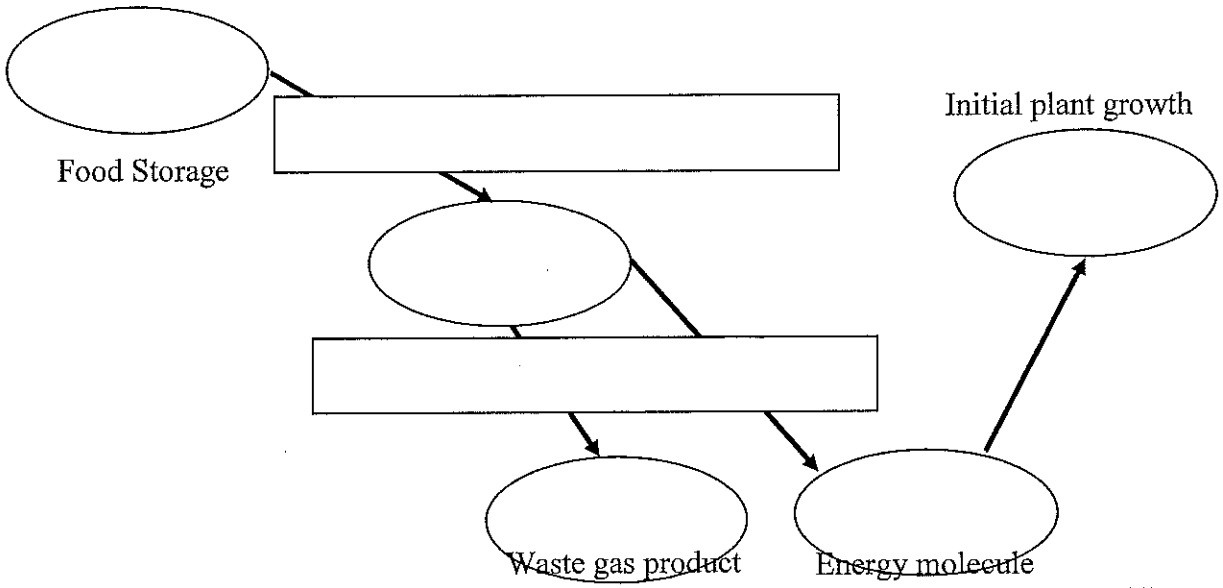
Predictions

1. If oxygen is increasing, what process is occurring (photosynthesis or respiration):
   - _____
2. If oxygen is decreasing, what process is occurring:
   - _____
3. If carbon dioxide is increasing, what process is occurring:
   - _____
4. If carbon dioxide is decreasing, what process is occurring:
   - _____
5. Summary

Process	Oxygen Level	Carbon Dioxide Level
Photosynthesis		
Respiration		

6. Peas are made mostly of **starch** (stored food). They perform **digestion** of starch using an enzyme to make individual **glucose** molecules. Glucose is provided to the growing plant inside the seed, which undergoes **cell respiration.** This produces the **ATP** needed for the initial **germination** of the plant, as well as ~~**oxygen**~~ carbon dioxide.

   Complete the concept map below to create a model of the phenomena described above using the ALL the bold terms from the paragraph above.



Names_____Period_____Date_____

Germinating Peas – Experimental Design

FORMING A QUESTION AND A HYPOTHESIS

Question:

Hypothesis and Prediction:

Why do you believe your hypothesis is true?

- **Scientific Concepts or Personal Experiences:**

DESIGNING AN INVESTIGATION

General Plan:

- Identify **constants** (factors that will be kept the same). List at least 3.

- Identify **variables** (factors that will be changed on purpose and may change as a result).
    - Independent variable:
    - Dependent variable:

- Design a **control group** (group tested to prove that the dependent variable is changing *only* because of the independent variable).

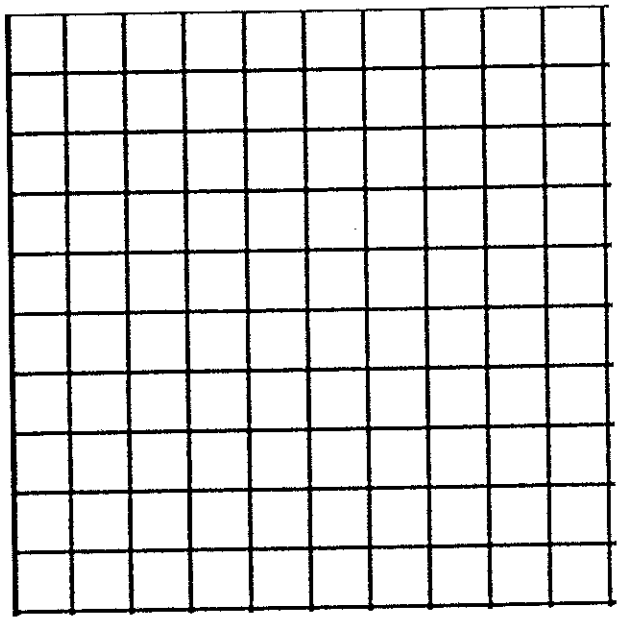
Enzyme Simulation Lab

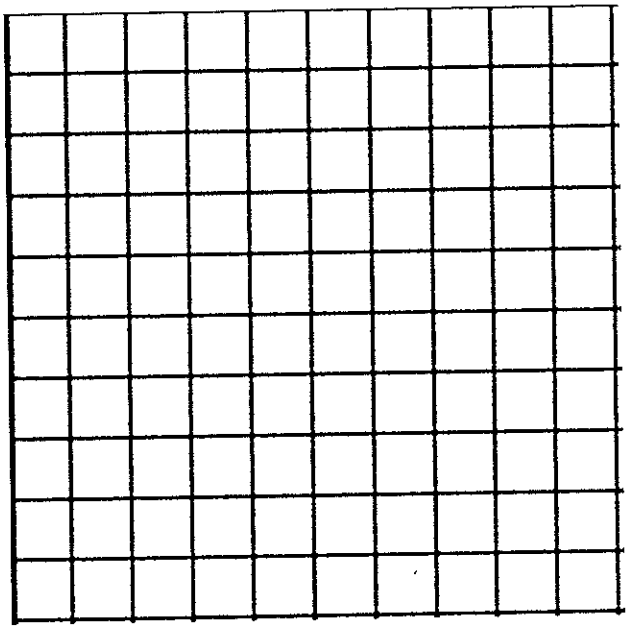
COLLECTING AND PRESENTING DATA

Data Tables (including independent variable, dependent variable results, and statistics/analysis):

Graph:

- Label the axes with the **IV** and **DV** and **units** in the correct places.
- Axis scales are increasing and evenly spaced.





Enzyme Simulation Lab

ANALYZING AND INTERPRETING RESULTS

Conclusion (including claim, evidence, and reasoning):
Use the framework below, or write your conclusion in paragraph form.

Claim (Answer your original scientific question.)	
Evidence (Summarize what your data shows.)	Reasoning (*Explain* what your data means.)

OR

Write your conclusion in paragraph form: