

Photosynthesis & Cellular Respiration

Investigation · Biology / Lab Skills · Grades 9–12

Use a virtual Elodea experiment to test factors that affect photosynthesis, collect oxygen-bubble data, and connect photosynthesis with cellular respiration.

NGSS: HS-LS1-5 — Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. HS-LS1-7 — Use a model to illustrate cellular respiration as a chemical process with a net transfer of energy.

Name: _____ Class: _____ Date: _____

Driving Question

How do environmental conditions affect the rate of photosynthesis, and how is photosynthesis related to cellular respiration?

1. Predict how moving the lamp closer to the Elodea will affect oxygen-bubble production. Explain your reasoning.

Part A · Establish the Control

Select Digital Lab and press Load Control. The control is 20 cm lamp distance, white light, lamp ON, 60% dissolved CO₂, and 25°C. Choose a prediction when prompted, then run a 5-minute trial.

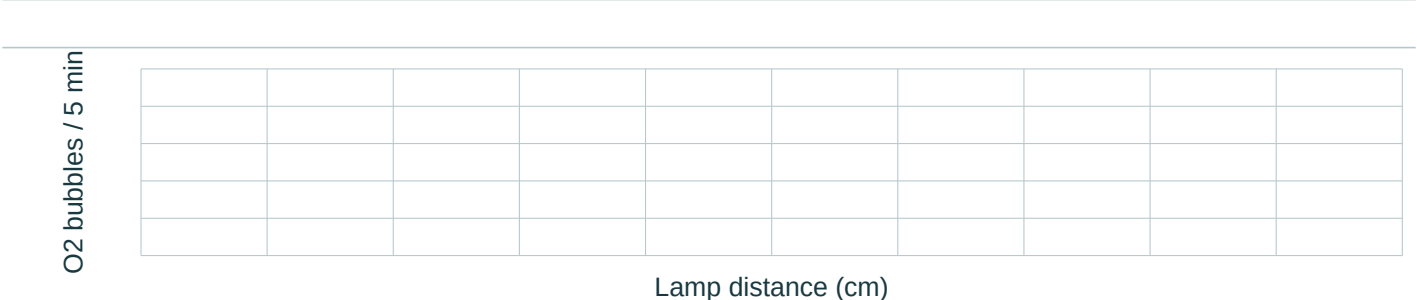
Trial	Lamp distance	Light color	CO ₂ (%)	Temp. (°C)	O ₂ bubbles / 5 min
Control					

Part B · Controlled Lamp-Distance Investigation

Change only lamp distance. Keep the lamp ON, white light, CO₂ at 60%, and temperature at 25°C. Make a prediction before each trial. Collect at least four trials across the distance range.

Trial	Lamp distance (cm)	CO ₂ (%)	Temp. (°C)	O ₂ bubbles / 5 min
1				
2				
3				
4				

2. What pattern do you see between lamp distance and oxygen-bubble production?



Part C · Test Another Variable

Return to the control setup. Choose either dissolved CO₂ availability or water temperature. Change only that variable; keep the lamp ON, white light, and lamp distance at 20 cm.

Independent variable		Controlled variables	Your prediction

Trial	Independent-variable value	O ₂ bubbles / 5 min
1		
2		
3		
4		

3. State the relationship you found. Use at least two data points as evidence.

Connect Photosynthesis and Cellular Respiration

4. In photosynthesis, where does the carbon in sugar come from? Where does the released oxygen come from?

5. Describe the inputs and outputs of photosynthesis using words or a simple chemical model.

6. Turn the lamp OFF for one trial. What happens to photosynthesis, respiration, and the net O₂ effect in the model?

7. Oxygen bubbles show that photosynthesis is occurring, but do not directly measure stored chemical energy. Why is this an important model limitation?

CER Conclusion

Claim: Which tested condition had the strongest effect on oxygen-bubble production?

Evidence: Give two numerical results that support your claim.

Reasoning: Explain why those data support the claim using photosynthesis concepts.