

Factors Affecting the Rate of Photosynthesis

By introducing various modern conveniences in our society we are slowly changing our global ecosystem. We as heterotrophs are also very dependent upon plants to undergo photosynthesis as the products of this reaction sustain our everyday metabolic activities. Therefore, it would be wise to investigate whether these changes in environmental conditions affect the rate of photosynthesis.

The process of photosynthesis can be described with the following equation.



In this investigation, you will measure the effect of light intensity, colour of light, temperature and carbon dioxide concentration on the rate of photosynthesis. You will expose spinach samples to these variables and determine the relative rates of photosynthesis by observing oxygen levels produced. Oxygen levels produced in a predetermined amount of time can be used to infer a qualitative rate of photosynthesis.

The basic set-up is shown below.

Things to consider:

- ✓ 3 separate conditions for your variable must be tested.
- ✓ Time given for photosynthesis to occur should be overnight.
- ✓ Is your design written in such a way that **ANY** grade 12 student could perform the lab?

Mrs. Dharmai must approve your experimental design prior to the date of experimentation.

Due Date for Design:

Discussion:

1. Explain how measuring the oxygen levels after the time elapsed for photosynthesis indirectly tells you the rate of photosynthesis.
2. Explain the theoretical and experimental results obtained from changing:
 - a) Light intensity
 - b) Colour of light
 - c) Temperature
 - d) CO₂ concentration
3. Levels of oxygen produced was used to measure the rate of photosynthesis. Suggest another experimental design that may be used to measure the rate of photosynthesis.
4. Explain why measuring the volume of oxygen collected is not the best indicator of the rate of photosynthesis.

Evaluation Rubric

Group Members:

Name of Project:

	Level			
Communication	1	2	3	4
Components /2	Contains very few of the basic lab report components and requires major correction. Little or no references are not included.	Contains some of the basic lab report components and requires minor correction. Some references are included.	Contains all of the basic lab report components in the correct sequence and requires minor correction.	Contains all of the basic lab report components in the correct sequence and requires no correction.
Presentation /3	Presents little information in logical order Spelling, grammar, and S.I. usage need major improvement. Lab report is hand written.	Presents some information in logical order Spelling, grammar, and S.I. usage need some improvement. Most components of the lab report are typed.	Presents most information in logical order Spelling, grammar, and S.I. usage are correct in most cases. All components of the lab report are typed.	Presents all information in logical order Spelling, grammar, and S.I. usage are correct in all cases. All components of the lab report are typed.
Understanding (Introduction) /3	Describes few terms discussed in class and information given is unclear.	Describes some terms raised in class. More detail may be needed.	Describes most terms discussed in class and information is clear.	Describes all relevant terms and connections raised in class with great detail.
Observation and Recording /3	Forms tables or graphs that are inappropriate, or require major correction.	Forms tables or graphs that require minor correction.	Forms tables or graphs that are appropriate, correct and legible.	Forms tables or graphs that are appropriate, correct, detailed and easily understood.
Group Communication Total:		/11		

Inquiry	1	2	3	4
Laboratory Design /5	Lab design requires more detail and requires a great deal of correction.	Lab design requires more detail and may require some correction.	Procedure is well designed in a clear, logical order and is presented with a fair amount of detail.	Procedure is thoroughly designed in a clear, logical order and is presented with a great deal of detail.
Error Analysis /2	Determines error related to human error. Suggested improvements are not realistic.	Determines few sources of error. Suggests a few relevant improvements.	Determines many sources of error and where possible degrees of error. Suggests several relevant improvements.	Determines all major sources of error, and where possible degrees of error. Suggests many relevant improvements.
Discussion: /5	Results are discussed with little detail and accuracy that demonstrate limited understanding.	Results are discussed with fair detail and accuracy that demonstrate some understanding.	Results are discussed in good detail and accuracy that demonstrate good understanding.	Results are discussed with great detail and accuracy that demonstrate complete and good understanding.
Conclusion /3	Reaches few realistic conclusions. Societal application are not described	Reaches some realistic conclusions. A vague explanation of a societal application is given.	Reaches many realistic conclusions that relate back to the purpose and hypothesis. A clear explanation of a societal application is given.	Reaches all or almost all realistic conclusions that relate to the purpose and hypothesis. An explanation of a societal application is given in great detail.
Group Inquiry Total				
/15				
Peer Evaluation				
/5				