

# Student Exploration: Photosynthesis Lab

By Nidhi Karayadra

#### Gizmo Warm-up

During photosynthesis, plants use the energy of light to produce glucose ( $C_8H_{12}O_8$ ) from carbon dioxide ( $CO_2$ ), and water ( $H_2O$ ). Glucose is a simple sugar that plants use for energy and as a building block for larger molecules.

A by-product of photosynthesis is oxygen. Plants use some of the oxygen they produce, but most of it is released. In the *Photosynthesis Lab* Gizmo, you can monitor the rate of photosynthesis by measuring oxygen production.



- Observe the left pane closely. What do you think the bubbles are?
  - Oxygen gas.
- Select the BAR CHART tab. On the graph, notice the Oxygen production bar. Move the Light intensity slider back and forth. How does light intensity affect oxygen production?
  - As light intensity decreases oxygen production decreases and when the light intensity increases the production of oxygen increases too however after a certain % of light intensity (38%) oxygen produced stays the same.
- Experiment with the vertical Temperature slider (upper left) and the CO<sub>2</sub> level slider.
  - A. How does temperature affect oxygen production?
  - As the temperature increases the oxygen production increase however after 28 degrees the production of oxygen starts to fall.
  - B. How does CO<sub>2</sub> level affect oxygen production?
  - As CO2 level rise oxygen production increase however after 360 ppm oxygen produced stays the same
  - C. How does oxygen production relate to the rate of photosynthesis?
  - The higher the rate of photosynthesis is, the higher is oxygen production.
  - D. What is the formula for photosynthesis?
  - 6CO2 + 6H2O → C6H12O6 + 6O2.

202020	Get the Gizmo ready:	1
Activity A:	<ul> <li>Select the COLOR tab and the BAR CHART tab.</li> </ul>	14 44 5
Colored light	<ul> <li>Set the Temperature to 24°C, the Light intensity to 90%, and the CO<sub>2</sub> level to 1,000 ppm.</li> </ul>	

Introduction: Plants use a green pigment called chlorophyll to absorb light and convertes energy into a form that the plant can use. Chlorophyll gives plants their green color.



# **Answers For Student Exploration Photosynthesis Lab**

**Eric Brunsell** 

#### **Answers For Student Exploration Photosynthesis Lab:**

Student Centered Investigative Labs for Middle School Science Walter L. Saunders, 2003-06 This resource book is intended for experienced middle school science teachers who are seeking ways to incorporate a more student centered approach to investigative lab activities New teachers can also benefit from this manual This resource book is based upon a teaching philosophy known as the Learning Cycle In the Learning Cycle LC model of teaching scinece students work together in groups of three or four with limted teacher guidance to develop lab procedures for the investigation of guestions which can be studied in the laboratory or field Creating Project-Based STEM Environments Jennifer Wilhelm, Ronald Wilhelm, Merryn Cole, 2019-02-05 This book models project based environments that are intentionally designed around the United States Common Core State Standards CCSS 2010 for Mathematics the Next Generation Science Standards NGSS Lead States 2013 for Science and the National Educational Technology Standards ISTE 2008 The primary purpose of this book is to reveal how middle school STEM classrooms can be purposefully designed for 21st Century learners and provide evidence regarding how situated learning experiences will result in more advanced learning This Project Based Instruction PBI resource illustrates how to design and implement interdisciplinary project based units based on the REAL Realistic Explorations in Astronomical Learning Unit 1 and CREATES Chemical Reactions Engineered to Address Thermal Energy Situations Unit 2 The content of the book details these two PBI units with authentic student work explanations and research behind each lesson including misconceptions students might hold regarding STEM content pre post research results of unit implementation with over 40 teachers and thousands of students In addition to these two units there are chapters describing how to design one s own research based PBI units incorporating teacher commentaries regarding strategies obstacles overcome and successes as they designed and implemented their PBI units for the first time after learning how to create PBI STEM Environments the REAL way Chapter Resource 5 Photosynthesis/Cell Response Biology Holt Rinehart & Winston, Holt, Rinehart and Winston Staff, 2004 The Science Teacher ,2006 **Integrating Engineering and Science** in Your Classroom Eric Brunsell, 2012 From the very first day you use them the design challenges in this compendium will spur your students too to jump right in and engage throughout the entire class The activities reinforce important science content while illustrating a range of STEM skills The 30 articles have been compiled from Science and Children Science Scope and The Science Teacher NSTA's journals for elementary through high school Integrating Engineering and Science in Your Classroom will Excite students of all ages with activities involving everything from light sabers and egg racers to prosthetic arms and potatoes Apply to lessons in life and environmental science Earth science and physical science Work well in traditional classrooms as well as after school programs Next time you need an engaging STEM activity you ll be glad you have this collection to help you blend meaningful and memorable experiences into your lessons As Editor Eric Brunsell promises By exposing students to authentic engineering activities you can help students uncover the profession that makes

the world work STEM Labs for Life Science, Grades 6 - 8 Schyrlet Cameron, Carolyn Craig, 2017-01-03 STEM Labs for Life Science by Mark Twain includes 26 fun integrated labs that help students understand concepts such as life human body systems ecosystems. This middle school life science book encourages students to collaborate and communicate to solve real world problems The STEM Labs for Life Science book for sixth eighth grades features introductory materials to explain STEM education concepts and provides materials for instruction and assessment Correlated to meet current state standards each lab combines the following essential STEM concepts communication creativity teamwork critical thinking The Mark Twain Publishing Company provides classroom decorations and supplemental books for middle grade and upper grade classrooms These products are designed by leading educators and cover science math behavior management history government language arts fine arts and social studies **Exploring Biology** Wilke, 1996-04 **Resources for Teaching** Middle School Science Smithsonian Institution, National Academy of Engineering, National Science Resources Center of the National Academy of Sciences, Institute of Medicine, 1998-04-30 With age appropriate inquiry centered curriculum materials and sound teaching practices middle school science can capture the interest and energy of adolescent students and expand their understanding of the world around them Resources for Teaching Middle School Science developed by the National Science Resources Center NSRC is a valuable tool for identifying and selecting effective science curriculum materials that will engage students in grades 6 through 8 The volume describes more than 400 curriculum titles that are aligned with the National Science Education Standards This completely new guide follows on the success of Resources for Teaching Elementary School Science the first in the NSRC series of annotated guides to hands on inquiry centered curriculum materials and other resources for science teachers The curriculum materials in the new guide are grouped in five chapters by scientific area Physical Science Life Science Environmental Science Earth and Space Science and Multidisciplinary and Applied Science They are also grouped by type core materials supplementary units and science activity books Each annotation of curriculum material includes a recommended grade level a description of the activities involved and of what students can be expected to learn a list of accompanying materials a reading level and ordering information The curriculum materials included in this book were selected by panels of teachers and scientists using evaluation criteria developed for the guide The criteria reflect and incorporate goals and principles of the National Science Education Standards The annotations designate the specific content standards on which these curriculum pieces focus In addition to the curriculum chapters the guide contains six chapters of diverse resources that are directly relevant to middle school science Among these is a chapter on educational software and multimedia programs chapters on books about science and teaching directories and guides to science trade books and periodicals for teachers and students Another section features institutional resources One chapter lists about 600 science centers museums and zoos where teachers can take middle school students for interactive science experiences Another chapter describes nearly 140 professional associations and U S government agencies that offer

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address questions by scholars based in the global south It will be useful to students and practitioners of science humanities social sciences philosophy of science and philosophy of social science Research scholars from these disciplines especially those engaging in interdisciplinary research will also benefit from this volume **Resources in Education** ,1994 for Thought Steve Metz, 2011 The concept of energy is central to all the science disciplines seamlessly connecting science technology and mathematics For high school and upper middle school teachers this compendium comprises inquiry based activities lesson plans and case studies designed to help teach increased awareness of energy environmental concepts and the related issues Science Today: Problem or Crisis? Ralph Levinson, Jeff Thomas, 1997-01-02 What is science What is the purpose of science education Should we be training scientists or looking towards a greater public understanding of science In this exciting text some of the key figures in the fields of science and science education address this debate Their contributions form an original dialogue on science education and the gener <u>Lipids in Photosynthesis</u> Hajime Wada, Norio Murata, 2009-11-07 Lipids in Photosynthesis Essential and Regulatory Functions provides an essential summary of an exciting decade of research on relationships between lipids and photosynthesis The book brings together extensively cross referenced and peer reviewed chapters by prominent researchers. The topics covered include the structure molecular organization and biosynthesis of fatty acids glycerolipids and nonglycerolipids in plants algae lichens mosses and cyanobacteria as well as in chloroplasts and mitochondria Several chapters deal with the manipulation of the extent of unsaturation of fatty acids and the effects of such manipulation on photosynthesis and responses to various forms of stress The final chapters focus on lipid trafficking signaling and advanced analytical techniques Ten years ago Siegenthaler and Murata edited Lipids in Photosynthesis Structure Function and Genetics which became a classic in the field Lipids in Photosynthesis Essential and Regulatory Functions belongs with its predecessor in every plant and microbiological researcher's bookcase Place-Based Science Teaching Whitney Aragaki, Kirstin J. Milks, 2025-09-16 Jumpstart your imagination and transform your science classroom by centering place based learning Identity community and place are tightly connected and can be leveraged to deepen science learning for students Place Based Science Teaching offers K 12 science educators an innovative approach to building learning experiences that embrace the rich and varied knowledge held by people both past and present about the places we call home This book helps teachers to foster greater personal investment of students in their learning as well as develop NGSS informed authentic problem solving and critical reasoning skills The book will also help teachers create and find joy in their classrooms by connecting lessons to local environments cultural heritage and global issues Written by nationally recognized STEM educators Whitney Aragaki and Kirstin Milks the book blends inspiring storytelling with practical frameworks and resources Chapters will take you behind the scenes into innovative classrooms detailing high impact standards aligned activities and sharing educator stories from diverse settings Grounded in cutting edge research and real world examples Place Based Science Teaching Introduces the Place Based Science Teaching Framework that asks where

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concerns please call your occupational therapist at shoulder flexion 0 180 always make sure the person s thumb is up as if they are hitchhiking caregiver should be on the same

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