

Generate a Calibration Curve for Chlorophyll a

Purpose

To measure and graph the absorbance of light by chlorophyll at a specific wavelength (the absorbance maximum) versus chlorophyll concentration. Students will be given an unknown and determine its concentration from their calibration curve.

Overview

This exercise is designed to familiarize the student with the concept of spectroscopy or the study of the interaction of matter with electromagnetic radiation. Students will prepare solutions and use a colorimeter to measure absorbance by solutions of different concentrations.

Time

One class period.

Key Concepts

Matter absorbs electromagnetic radiation.
Absorbance is proportional to concentration and this relationship can be expressed mathematically (Beer's Law $A=abc$).
Scientists can use this relationship to measure concentrations of solutions if a calibration curve is generated.

Skills

Collecting data
Preparing serial dilutions
Making observations
Graphing data
Forming hypotheses

Materials

Mortar and pestle or glass blender (do not use plastic if you will be using nail polish remover as a solvent)
Spinach or dried algae preparations (can be obtained from health food store as dietary supplement. About five capsules will do)
Nail polish remover (**acetone or ethyl acetate**) or **ethanol or rubbing alcohol** (30 - 50 mL)
Balance
Erlenmeyer flask (or a jelly jar)
Funnel
Filter paper (or coffee filters)
Graduated cylinder (50 mL)
Vernier colorimeter interfaced to a CBL system.
Cuvetts
5 mL graduated pipettes and pipette bulbs

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Generate A Calibration Curve For Chlorophyll A:

Heme, Chlorophyll, and Bilins Alison Smith, Michael Witty, 2008-06-07 In Heme Chlorophyll and Bilins Methods and Protocols an interdisciplinary panel of hands on investigators describe in detail how to work successfully with chlorophyll heme and bilins in biological medical chemical and biochemical research Each method is presented by a researcher who actually uses it on a daily basis and includes step by step instructions and pertinent tricks of the trade that often make the difference between laboratory success and failure Topics range from methods for the analysis of tetrapyrroles heme and hemoproteins to the biosynthesis and analysis of chlorophyll and bilins

A Handbook for the Measurement of Chlorophyll a and Primary Production C. A. Evans, John E. O'Reilly, J. P. Thomas, 1987

Phytochemical Changes in Vegetables During Post-harvest Storage and Processing, and Implications for Consumer Benefits Dharini Sivakumar, Yasmina Sultanbawa, Jessica L. Cooperstone, Carmit Ziv, 2022-11-16

Methods in Stream Ecology F. Richard Hauer, Gary Lamberti, 2017-01-16 Methods in Stream Ecology provides a complete series of field and laboratory protocols in stream ecology that are ideal for teaching or conducting research This two part new edition is updated to reflect recent advances in the technology associated with ecological assessment of streams including remote sensing Volume focusses on ecosystem structure with in depth sections on Physical Processes Material Storage and Transport and Stream Biota With a student friendly price this Third Edition is key for all students and researchers in stream and freshwater ecology freshwater biology marine ecology and river ecology This text is also supportive as a supplementary text for courses in watershed ecology science hydrology fluvial geomorphology and landscape ecology Methods in Stream Ecology 3rd Edition Volume 2 Ecosystem Structure is also available now Provides a variety of exercises in each chapter Includes detailed instructions illustrations formulae and data sheets for in field research for students Presents taxonomic keys to common stream invertebrates and algae Includes website with tables and a link from Chapter 22 FISH COMMUNITY COMPOSITION to an interactive program for assessing and modeling fish numbers Written by leading experts in stream ecology

Handbook for Azospirillum Fabricio Dario Cassán, Yaacov Okon, Cecilia M. Creus, 2015-04-29 The functional analysis of plant microbe interactions has re emerged in the past 10 years due to spectacular advances in integrative study models This book summarizes basic and technical information related to the plant growth promoting rhizobacteria PGPR belonging to the genus Azospirillum considered to be one of the most representative PGPR last 40 years We include exhaustive information about the general microbiology of genus Azospirillum their identification strategies the evaluation of plant growth promoting mechanisms inoculants technology and agronomic use of these bacteria and some special references to the genetic technology and use

Chlorophyll Biosynthesis and Technological Applications Constantin A. Rebeiz, 2013-10-28 Heme and chlorophyll Chl are porphyrins Porphyrins also referred to as tetrapyrroles are essential for life in the biosphere Chlorophyll catalyzes the conversion of solar energy to chemical energy via the process of photosynthesis Organic life in the

biosphere is made possible by consumption of the chemical energy generated by photosynthesis. Hemes are the prosthetic groups of cytochromes which are involved in electron transport during oxidative phosphorylation and photosynthetic phosphorylation which generate ATP and NADPH. The latter are essential for many cellular functions. Chlorophyll, on the other hand, catalyzes the process of photosynthesis. Indeed, life in the biosphere depends on the process of photosynthesis which converts light energy, carbon dioxide, and water into the chemical energy required for the formation of food and fiber. Photosynthetic efficiency is controlled by extrinsic factors such as the availability of water, CO₂, inorganic nutrients, ambient temperature, and the metabolic and developmental state of the plant, as well as by intrinsic factors (Lien and San Pietro 1975). The most important intrinsic factor is the efficiency of the photosynthetic electron transport system (PETS). Conventional agriculture is one of the few human activities that have not undergone a revolution to join other activities such as overcoming gravity by flying and landing on the moon, crossing underwater, the polar cap, and communicating wirelessly over long distances via electromagnetic waves. We now feel that enough biochemical and molecular biological knowledge has accumulated to render this dream amenable to experimentation. We believe that the time has come to bioengineer chloroplasts capable of synthesizing a short chain carbohydrate such as glycerol at rates that approach the upper theoretical limits of photosynthesis.

Rebeiz C A 2010 Investigations of possible relationships between the chlorophyll biosynthetic pathway and the assembly of chlorophyll protein complexes and photosynthetic efficiency. In Rebeiz C A, Benning C, Bohnert H J, Daniell H, Hooper J K, Lichtenthaler H K, Portis A R, and Tripathy B C eds. *The chloroplast: Basics and Applications*. Springer, The Netherlands, p 1-24. In order to achieve this goal, a thorough knowledge of the Chl biosynthetic pathway is needed, along with knowledge in other domains. Rebeiz 2010. In this context, this monograph is devoted to an in-depth discussion of our present knowledge of the Chl biosynthetic pathway. The complexity and biochemical heterogeneity of the Chl biosynthetic pathway and the relationship of this complexity to the structural and biosynthetic complexity of photosynthetic membranes will be emphasized. We will also emphasize, in historical perspective, key stages in our understanding of the Chl biosynthetic heterogeneity. The reader should keep in mind that a complex biosynthetic process is only fully understood when it becomes possible to reconstitute in vitro every step of the process. We are not yet at this stage of understanding of thylakoid membrane biogenesis. Considerable progress has been achieved, however, in the understanding of numerous facets of the Chl biosynthetic pathway, namely: a) detection and identification of various major and minor metabolic intermediates, b) precursor-product relationships between various intermediates, c) structure and regulation of many enzymes of the pathway, and d) the relationship of the Chl biosynthetic heterogeneity to the structural and functional heterogeneity of thylakoid membranes. In addition, topics related to the development of analytical techniques, cell-free systems, herbicides, insecticides, and cancericides are also discussed.

Algae Source to Treatment American Water Works Association, 2010-12-01. AWWA Manual of Water Supply Practice M57 provides all the information required by water treatment professionals to understand

and mitigate problems caused by algae in source waters such as tastes and odors biofouling and toxin production With more than 450 pages and hundreds of photos and illustrations the manual is a comprehensive reference for identifying and treating algae from drinking water sources Satellite Derived Global Ocean Product Validation/Evaluation SeungHyun Son,Trevor Platt,Shubha Sathyendranath,2020-12-11 Ocean satellite remote sensing plays important roles in the observations of physical biological and biogeochemical features in inland coastal and global ocean waters with high temporal and spatial resolution The satellite measured ocean products are used for near real time ocean monitoring and climate data records to understand short long term variabilities in marine environments and ecosystems as well as for decision making tools to manage social economic and environmental benefits Validation evaluation including a combination of field measurements and inter satellite comparison is an essential step in providing more accurate satellite derived ocean products In this Special Issue 14 papers have been published and include research on validation evaluation retrieval algorithms of ocean geophysical and biogeochemical parameters and application of the satellite ocean products in the regional and global ocean Subjects treated include Sea Surface Temperature Sea Ice Surface Temperature from VIIRS thermal infrared sensor Sea Ice Detection from Spectroradiometer Sea Surface Winds from HY 2A Scatterometer and GNSS Reflectometry Wave Height from Sentinel 3A SAR Retrievals of Sea Surface Salinity Chlorophyll a Particulate Organic Carbon Particulate Backscattering Marine Fishery resource and Submesoscale Eddies from multiple Ocean Colour sensors **Biotechniques** S. V. S. Rana,2008 **Introduction to Water Resources and Environmental Issues** Karrie Lynn Pennington,Thomas V. Cech,2021-08-19 Thoroughly updated and expanded new edition introduces students to the complex world of water resources and environmental issues

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