

Extension of AOAC Official Method 999.14 (Choline in Infant Formula and Milk) to the Determination of Choline in Dietary Supplements

JEANNE L. RADER, CAROL M. WEAVER, and MARY W. TRUCKSIES

U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition, Division of Research and Applied Technology, Office of Nutritional Products, Labeling and Dietary Supplements, 5100 Paint Branch Pkwy, College Park, MD 20740

AOAC Official Method 999.14 is applicable for the determination of choline in milk and infant formulas. To date, its use has not been extended beyond these matrices. We modified Official Method 999.14 and applied it to the determination of choline in a range of choline-containing dietary supplements. Dietary supplement tablets, capsules, wafers, softgels, liquid products, and drink powders were included. We found that the standard curve could be extended to cover a wider range of choline concentrations and defined a procedure for the use of Norit for samples in which the vitamin C content was high enough to interfere with the analysis. Recoveries of choline added to infant formula powders and to representative dietary supplement tablets, capsules, powdered drink mix, and wafer products were 85–114%. The use of Norit during the procedure did not affect the recovery of choline added to infant formula powders or to dietary supplements. An alkaline digestion was included for use with a product containing lecithin as the sole source of choline. Ten of 11 dietary supplement products analyzed by the modified method contained amounts of choline at or above declarations found on the product labels. The remaining product contained about 40% of the label-declared amount of choline.

Choline, a dietary constituent, is an important component of membrane phospholipids. It provides a source of labile methyl groups, participates in transmembrane signaling, exerts a lipotropic action on the liver, is important for lipid and cholesterol transport and metabolism, and serves as a precursor for the neurotransmitter acetylcholine (1, 2). Choline is widely distributed in foods, with most of it in the form of phosphatidylcholine in membranes. Milk, liver, eggs, and peanuts are rich in choline.

Choline is also available as a dietary supplement of choline chloride or choline bitartrate and as lecithin, which usually contains about 25% phosphatidylcholine or 3–4% choline by weight. Foods and dietary supplements may now carry nutrient content claims, including claims about choline content, as authorized under the U.S. Food and Drug Administration Modernization Act (3).

Relatively few methods for the analysis of choline appear in the literature. Recently published methods report the use of proton nuclear magnetic resonance spectroscopy (4), liquid chromatography/electrospray ionization-isotope dilution mass spectrometry (5), and choline biosensors (6) for the quantitation of choline and its metabolites in several matrices. Instrumentation requirements of some of these methods may put them out of the reach of laboratories needing rapid and routine analyses for choline in foods and dietary supplements.

We studied the recently adopted AOAC Official Method 999.14 (Choline in Infant Formula and Milk—Enzymatic Colorimetric Method; 7, 8) to determine its applicability to the analysis of choline in matrices such as dietary supplements that may bear choline content claims. We used standard reference material (SRM) 1846 (Infant Formula), which has a noncertified reference value for choline, as an in-house quality assurance/quality control (QA/QC) material. We analyzed 5 infant formula powders and 11 dietary supplements of different types.

Experimental

Principle

The test sample is digested in acid (or, if needed, alkali) at 70°C, thereby releasing most of the choline. Following pH adjustment, treatment of hydrolysates with Norit (Fisher Scientific Co., Fairland, NJ) is included if needed to reduce interference from vitamin C. Residual choline phospholipids are then cleaved with phospholipase D, and the free choline moiety is subjected to choline oxidase with subsequent liberation of hydrogen peroxide. In the presence of peroxidase, phenol is oxidized and a quinoneimine chromophore is formed with 4-aminoantipyrine. Both enzymatic and color-forming reactions are formatted to occur concurrently. Absorbance is measured at 505 nm and choline

Aoac Methods For Dairy Products

F Rizvi



Aoac Methods For Dairy Products:

Aoac Methods For Dairy Products Book Review: Unveiling the Magic of Language

In an electronic digital era where connections and knowledge reign supreme, the enchanting power of language has become more apparent than ever. Its ability to stir emotions, provoke thought, and instigate transformation is actually remarkable. This extraordinary book, aptly titled "**Aoac Methods For Dairy Products**," written by a highly acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound impact on our existence. Throughout this critique, we shall delve into the book's central themes, evaluate its unique writing style, and assess its overall influence on its readership.

https://stats.tinkerine.com/book/detail/Download_PDFS/Biology%20Study%20Guide%20Key.pdf

Table of Contents Aoac Methods For Dairy Products

1. Understanding the eBook Aoac Methods For Dairy Products
 - The Rise of Digital Reading Aoac Methods For Dairy Products
 - Advantages of eBooks Over Traditional Books
2. Identifying Aoac Methods For Dairy Products
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Aoac Methods For Dairy Products
 - User-Friendly Interface
4. Exploring eBook Recommendations from Aoac Methods For Dairy Products
 - Personalized Recommendations
 - Aoac Methods For Dairy Products User Reviews and Ratings
 - Aoac Methods For Dairy Products and Bestseller Lists

5. Accessing Aoac Methods For Dairy Products Free and Paid eBooks
 - Aoac Methods For Dairy Products Public Domain eBooks
 - Aoac Methods For Dairy Products eBook Subscription Services
 - Aoac Methods For Dairy Products Budget-Friendly Options
6. Navigating Aoac Methods For Dairy Products eBook Formats
 - ePub, PDF, MOBI, and More
 - Aoac Methods For Dairy Products Compatibility with Devices
 - Aoac Methods For Dairy Products Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Aoac Methods For Dairy Products
 - Highlighting and Note-Taking Aoac Methods For Dairy Products
 - Interactive Elements Aoac Methods For Dairy Products
8. Staying Engaged with Aoac Methods For Dairy Products
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Aoac Methods For Dairy Products
9. Balancing eBooks and Physical Books Aoac Methods For Dairy Products
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Aoac Methods For Dairy Products
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Aoac Methods For Dairy Products
 - Setting Reading Goals Aoac Methods For Dairy Products
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Aoac Methods For Dairy Products
 - Fact-Checking eBook Content of Aoac Methods For Dairy Products
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

Aoac Methods For Dairy Products Introduction

Free PDF Books and Manuals for Download: Unlocking Knowledge at Your Fingertips In today's fast-paced digital age, obtaining valuable knowledge has become easier than ever. Thanks to the internet, a vast array of books and manuals are now available for free download in PDF format. Whether you are a student, professional, or simply an avid reader, this treasure trove of downloadable resources offers a wealth of information, conveniently accessible anytime, anywhere. The advent of online libraries and platforms dedicated to sharing knowledge has revolutionized the way we consume information. No longer confined to physical libraries or bookstores, readers can now access an extensive collection of digital books and manuals with just a few clicks. These resources, available in PDF, Microsoft Word, and PowerPoint formats, cater to a wide range of interests, including literature, technology, science, history, and much more. One notable platform where you can explore and download free Aoac Methods For Dairy Products PDF books and manuals is the internet's largest free library. Hosted online, this catalog compiles a vast assortment of documents, making it a veritable goldmine of knowledge. With its easy-to-use website interface and customizable PDF generator, this platform offers a user-friendly experience, allowing individuals to effortlessly navigate and access the information they seek. The availability of free PDF books and manuals on this platform demonstrates its commitment to democratizing education and empowering individuals with the tools needed to succeed in their chosen fields. It allows anyone, regardless of their background or financial limitations, to expand their horizons and gain insights from experts in various disciplines. One of the most significant advantages of downloading PDF books and manuals lies in their portability. Unlike physical copies, digital books can be stored and carried on a single device, such as a tablet or smartphone, saving valuable space and weight. This convenience makes it possible for readers to have their entire library at their fingertips, whether they are commuting, traveling, or simply enjoying a lazy afternoon at home. Additionally, digital files are easily searchable, enabling readers to locate specific information within seconds. With a few keystrokes, users can search for keywords, topics, or phrases, making research and finding relevant information a breeze. This efficiency saves time and effort, streamlining the learning process and allowing individuals to focus on extracting the information they need. Furthermore, the availability of free PDF books and manuals fosters a culture of continuous learning. By removing financial barriers, more people can access educational resources and pursue lifelong learning, contributing to

personal growth and professional development. This democratization of knowledge promotes intellectual curiosity and empowers individuals to become lifelong learners, promoting progress and innovation in various fields. It is worth noting that while accessing free Aoac Methods For Dairy Products PDF books and manuals is convenient and cost-effective, it is vital to respect copyright laws and intellectual property rights. Platforms offering free downloads often operate within legal boundaries, ensuring that the materials they provide are either in the public domain or authorized for distribution. By adhering to copyright laws, users can enjoy the benefits of free access to knowledge while supporting the authors and publishers who make these resources available. In conclusion, the availability of Aoac Methods For Dairy Products free PDF books and manuals for download has revolutionized the way we access and consume knowledge. With just a few clicks, individuals can explore a vast collection of resources across different disciplines, all free of charge. This accessibility empowers individuals to become lifelong learners, contributing to personal growth, professional development, and the advancement of society as a whole. So why not unlock a world of knowledge today? Start exploring the vast sea of free PDF books and manuals waiting to be discovered right at your fingertips.

FAQs About Aoac Methods For Dairy Products Books

How do I know which eBook platform is the best for me? Finding the best eBook platform depends on your reading preferences and device compatibility. Research different platforms, read user reviews, and explore their features before making a choice. Are free eBooks of good quality? Yes, many reputable platforms offer high-quality free eBooks, including classics and public domain works. However, make sure to verify the source to ensure the eBook credibility. Can I read eBooks without an eReader? Absolutely! Most eBook platforms offer web-based readers or mobile apps that allow you to read eBooks on your computer, tablet, or smartphone. How do I avoid digital eye strain while reading eBooks? To prevent digital eye strain, take regular breaks, adjust the font size and background color, and ensure proper lighting while reading eBooks. What the advantage of interactive eBooks? Interactive eBooks incorporate multimedia elements, quizzes, and activities, enhancing the reader engagement and providing a more immersive learning experience. Aoac Methods For Dairy Products is one of the best book in our library for free trial. We provide copy of Aoac Methods For Dairy Products in digital format, so the resources that you find are reliable. There are also many Ebooks of related with Aoac Methods For Dairy Products. Where to download Aoac Methods For Dairy Products online for free? Are you looking for Aoac Methods For Dairy Products PDF? This is definitely going to save you time and cash in something you should think about.

Find Aoac Methods For Dairy Products :

~~biology study guide key~~

~~biosensors recent advances and mathematical challenges~~

biomaterials and devices for the circulatory

~~biology active guide answer key~~

bioprocess engineering shuler solution manual full

biology staar review key

biology study guide evolution answers

biology spring final study guide answer

biology laboratory manual enzymes lab reviews

biology study guide connections

biology the dynamics of life teacher guide

biology lab manual second puc

biology pglo transformation teacher manual answers

biology selection study guide answers

bioprocess engineering basic concepts shuler solution manual

Aoac Methods For Dairy Products :

Directed Reading A Holt Science and Technology. 4. The Properties of Matter. Section: Physical ... Answer Key. TEACHER RESOURCE PAGE. Page 5. 31. Answers will vary. Sample answer ... Chemical Properties Answer.pdf A matter with different properties is known as a(n) a. chemical change. b. physical change. c. chemical property. d. physical property. Directed Reading A 3. A substance that contains only one type of particle is a(n). Pure Substance ... Holt Science and Technology. 4. Elements, Compounds, and Mixtures. Page 5. Name. Directed Reading Chapter 3 Section 3 . Holt Science and Technology. 5. Minerals of the Earth's Crust. Skills Worksheet. Directed Reading Chapter 3 Section 3. Section: The Formation, Mining, and Use ... Directed Reading A Directed Reading A. SECTION: MEASURING MOTION. 1. Answers will vary. Sample answer: I cannot see Earth moving. Yet, I know. Directed Reading A Directed Reading A. SECTION: MEASURING MOTION. 1. Answers will vary. Sample answer: I cannot see Earth moving. Yet, I know. Key - Name 3. Force is expressed by a unit called the. Force. Force. Newton. 2. Any change in motion is caused by a(n) ... Holt Science and Technology. 60. Matter in Motion. Directed Reading A The product of the mass and velocity of an object is its . 3. Why does a fast-moving car have more

momentum than a slow-moving car of the same mass? HOLT CALIFORNIA Physical Science Skills Worksheet. Directed Reading A. Section: Solutions of Acids and Bases. STRENGTHS OF ACIDS AND BASES. Write the letter of the correct answer in the space ... The Basics 13th edition by Rebecca Donatelle ISBN-13 ... I need this book for my last class to graduate but reeeeaalllyy dont want to have to pay for it. Upvote 20. Downvote 79 comments Access to health 13th edition rebecca j donatelle free ebooks ... edition rebecca j donatelle free ebooks about access to health 13th edition rebecca j dona ... Brief Edition Studyguide for Access to Health by Donatelle, ... Access to Health (13th Edition) by Donatelle, Rebecca J. The Thirteenth Edition adds new features highlighting health topics centering around money and technology issues. Additionally, the book references one Video ... Access to Health, Books a la Carte Edition (13th Edition) Access To Health (14th Edition). Rebecca J. Donatelle. 4.3 out of 5 stars 110. Paperback. 15 offers from \$5.15. Explore more ... Access to Health (13th Edition) - Donatelle, Rebecca J. Access to Health (13th Edition) by Donatelle, Rebecca J. - ISBN 10: 0321832027 - ISBN 13: 9780321832023 - Benjamin Cummings - 2013 - Softcover. Access to Health by Patricia Ketcham and Rebecca J. ... The Thirteenth Edition of "Access to Health " makes personal health engaging for students to learn and easier for instructors to teach by focusing on the most ... Rebecca J. Donatelle | Get Textbooks (13th Edition) by Rebecca J. Donatelle, Patricia Ketcham Paperback, 768 Pages ... Access to Health, Green Edition(11th Edition) by Rebecca J. Donatelle ... Mastering Health with Pearson eText for Health: The Basics Health: The Basics, 13th edition. Published by Pearson (September 15, 2020) © 2019. Rebecca J Donatelle Emeritus, Oregon State University. Best Value. eTextbook. Access to Health by Donatelle, Rebecca J. [Benjamin ... Access to Health by Donatelle, Rebecca J. [Benjamin Cummings,2013] (Paperback) 13th edition [Paperback]. Donatelle. 0.00. 0 ratings0 reviews. Want to read. Health : the basics Health : the basics ; Author: Rebecca J. Donatelle (Author) ; Edition: 13th edition View all formats and editions ; Publisher: Pearson, NY NY, 2019. GE 29875 User Manual - Digital Answering System Digital messaging system (2 pages). Free GE Answering Machine User Manuals GE Answering Machine 2-9991. General Electric Caller ID & Digital Messaging System Owner's Manual. Pages: 24. See Prices. GE Answering ... GE 29875 Answering Machine User Manual Phone manuals and free pdf instructions. Find the user manual you need for your phone and more at ManualsOnline. GE 29888GE1 USER MANUAL Pdf Download View and Download GE 29888GE1 user manual online. Digital Messaging System. 29888GE1 telephone pdf manual download. Also for: 29888. GE Digital Messaging System GE Digital Messaging System identified by the model number 29875GE1 GE 29875GE1 troubleshooting, repair, and service manuals. Owner's Manuals and Installation Instructions - GE Appliance GE Appliance - Owner's Manuals and Installation Instructions. GE Appliances has offered many types of products over the past decades. You may have a newer ... GE Digital Messaging System Instructions Record Greeting and Listening to Messages. Once the machine is set up you can record your greeting. Press and hold the "Greeting" button until you hear a tone. I have a GE 29831A Digital Telephone Answering System. ... Aug 26, 2019 — Hi,. Please find the manual attached - page 10 shows how to

fit the batteries. I hope that helps, Best Regards,. Rich. How to operate a Ge answering machine model no. ... Aug 31, 2009 — I have a GE Digital Messaging System telephone answering device. I have a GE Digital Messaging System telephone answering device. It's brand ... GE 29875GE1-B Digital Answering System Test ... - YouTube