

# How do I prepare a phosphate buffer solution with a specific pH?

I am a science fair student at Shaker Heights Middle School. I need to make a phosphate buffer solution for my experiment. I am testing the effects of growth hormones on green plant life, and the buffer is to be absorbed by a sponge to aid the hormones in working. I would appreciate any assistance that you can give me. The solution needs to be a .001 M phosphate buffer with a pH of 6.1.

B. Peterson 1/13/98

Recipes for preparing phosphate buffer solutions can be found in many texts and handbooks. For example, the CRC Handbook of Chemistry and Physics recommends preparing a pH 6.10 buffer by adding 6.8 mL of 0.1 M NaOH to 50 mL of 0.1 M  $\text{KH}_2\text{PO}_4$ . You can then dilute the buffer 1:100 for your needs.

Here is an abbreviated phosphate buffer table taken from Clark's *Determination of Hydrogen Ions*:

Clark and Lubs standard buffer solutions. Add the indicated number of mL of 0.2 M NaOH to 50 mL of 0.2 M $\text{KH}_2\text{PO}_4$ and dilute to 200 mL. Taken from <i>Determination of Hydrogen Ions</i> , William and Wilkins, Baltimore, 1928.			
pH	mL NaOH	pH	mL NaOH
5.8	3.72	7.0	29.63
6.0	5.70	7.2	35.00
6.2	8.60	7.4	39.50
6.4	12.60	7.6	42.80
6.6	17.80	7.8	45.20
6.8	23.65	8.0	46.80

**Be sure you're using the correct phosphate.** There are several potassium phosphates which can NOT be used interchangeably in buffer solutions! You want  $\text{KH}_2\text{PO}_4$ .

Formula	Systematic name	Other names
$\text{KH}_2\text{PO}_4$	potassium dihydrogen phosphate	acid potassium phosphate monobasic potassium phosphate monopotassium phosphate potassium biphosphate
$\text{K}_2\text{HPO}_4$	potassium hydrogen phosphate	dipotassium phosphate dibasic potassium phosphate
$\text{K}_3\text{PO}_4$	potassium phosphate	tripotassium phosphate tribasic potassium phosphate

If you can't find such a recipe, follow this procedure:

1. **Use the Henderson-Hasselbalch equation** to compute the ratio of the base form to acid form at the desired pH. The Henderson-Hasselbalch equation is

# Phosphate Buffer Solution Preparation

**Uwe Windhorst**

A red circular graphic with a gradient, appearing as a semi-circle or a partial circle, located to the right of the author's name.

## **Phosphate Buffer Solution Preparation:**

*Microbiological Examination of Water and Wastewater* Maria Csuros, 2018-05-04 Microbiological tests have proven to be an indispensable part of environmental contaminant detection. It has also been tremendously difficult to find a comprehensive training manual and laboratory manual for those procedures. *Microbiological Examination of Water and Wastewater* now provides that much needed resource for laboratory trainees and environmental professionals alike. An all inclusive guide to applications and techniques of microbiological testing. *Microbiological Examination of Water and Wastewater* includes coverage of General Microbiology, Environmental Microbiology, Environmental Microbiology Laboratory plus Techniques and Methods in Routine Environmental Microbiology Laboratory. By exploring the fundamentals of microbiology as well as microbial metabolism, growth control and classification, trainees will better understand the purpose and manner of microbiological examination. Those details also make *Microbiological Examination of Water and Wastewater* ideal as a standard guidebook for laboratories, water and wastewater treatment plants and the communities they serve.

*Physical Chemistry for the Biosciences* Raymond Chang, 2005-02-11 This book is ideal for use in a one semester introductory course in physical chemistry for students of life sciences. The author's aim is to emphasize the understanding of physical concepts rather than focus on precise mathematical development or on actual experimental details. Subsequently, only basic skills of differential and integral calculus are required for understanding the equations. The end of chapter problems have both physiochemical and biological applications.

**Analytical Chemistry for Technicians** John Kenkel, 2002-10-29 Surpassing its bestselling predecessors, this thoroughly updated third edition is designed to be a powerful training tool for entry level chemistry technicians. *Analytical Chemistry for Technicians Third Edition* explains analytical chemistry and instrumental analysis principles and how to apply them in the real world. A unique feature of this edition is that it brings the workplace of the chemical technician into the classroom. With over 50 workplace scene sidebars, it offers stories and photographs of technicians and chemists working with the equipment or performing the techniques discussed in the text. It includes a supplemental CD that enhances training activities. The author incorporates knowledge gained from a number of American Chemical Society and PITTCON short courses and from personal visits to several laboratories at major chemical plants where he determined firsthand what is important in the modern analytical laboratory. The book includes more than sixty experiments specifically relevant to the laboratory technician along with a Questions and Problems section in each chapter. *Analytical Chemistry for Technicians Third Edition* continues to offer the nuts and bolts of analytical chemistry while focusing on the practical aspects of training.

**Principles and Techniques of Biochemistry and Molecular Biology** Keith Wilson, John Walker, 2010-03-04 Uniquely integrates the theory and practice of key experimental techniques for bioscience undergraduates. Now includes drug discovery and clinical biochemistry.

*Cell Biology* Julio E. Celis, 2006 This four volume laboratory manual contains comprehensive state of the art protocols essential for research in the life sciences. Techniques are

presented in a friendly step by step fashion providing useful tips and potential pitfalls The important steps and results are beautifully illustrated for further ease of use This collection enables researchers at all stages of their careers to embark on basic biological problems using a variety of technologies and model systems This thoroughly updated third edition contains 165 new articles in classical as well as rapidly emerging technologies Topics covered include Cell and Tissue Culture Associated Techniques Viruses Antibodies Immunocytochemistry Volume 1 Organelle and Cellular Structures Assays Volume 2 Imaging Techniques Electron Microscopy Scanning Probe and Scanning Electron Microscopy Microdissection Tissue Arrays Cytogenetics and In Situ Hybridization Genomics and Transgenic Knockouts and Knock down Methods Volume 3 Transfer of Macromolecules Expression Systems Gene Expression Profiling Volume 4 Indispensable bench companion for every life science laboratory Provides the latest information on the plethora of technologies needed to tackle complex biological problems Includes numerous illustrations some in full color supporting steps and results

*Handbook of Biological Confocal Microscopy* James Pawley, 2006-06-02 Once the second edition was safely off to the printer the 110 larger world of micro CT and micro MRI and the smaller world authors breathed a sigh of relief and relaxed secure in the belief revealed by the scanning and transmission electron microscopes that they would never have to do that again That lasted for 10 To round out the story we even have a chapter on what PowerPoint years When we nally awoke it seemed that a lot had happened does to the results and the annotated bibliography has been In particular people were trying to use the Handbook as a text updated and extended book even though it lacked the practical chapters needed There As with the previous editions the editor enjoyed a tremendous had been tremendous progress in lasers and ber optics and in our amount of good will and cooperation from the 124 authors understanding of the mechanisms underlying photobleaching and involved Both I and the light microscopy community in general phototoxicity It was time for a new book I contacted the usual owe them all a great debt of gratitude On a more personal note I suspects and almost all agreed as long as the deadline was still a would like to thank Kathy Lyons and her associates at Springer for year away

*Methods in Bioengineering* ,2010 Written and edited by recognized experts in the field the new Artech House Methods in Bioengineering book series offers detailed guidance on authoritative methods for addressing specific bioengineering challenges Offering a highly practical presentation of each topic each book provides research engineers scientists and students with step by step procedures clear examples and effective ways to overcome problems that may be encountered Providing alternatives to animal testing is one of the hottest topics in biomedical research and this groundbreaking volume addresses this critical issues head on This unique book presents techniques and methods at the forefront of scientific research that have the potential to replace certain whole animal tests Moreover this book provides a platform where other widely accepted techniques and scientific advancements can be collated into a concise set of methods that can be implemented within both academic and industrial communities

*Handbook of Microbiological Media* Ronald M. Atlas, 2010-03-17 Handbook of Microbiological Media Fourth Edition is an invaluable

reference for every medical veterinary diagnostic and academic laboratory and now in its fourth edition it is even more complete This edition carries on the tradition of CRC Press handbook excellence listing the formulations methods of preparation and uses for more tha

**Biological Electron Microscopy** Michael J. Dykstra, Laura E. Reuss, 2011-06-28

Electron microscopy is frequently portrayed as a discipline that stands alone separated from molecular biology light microscopy physiology and biochemistry among other disciplines It is also presented as a technically demanding discipline operating largely in the sphere of black boxes and governed by many absolute laws of procedure At the introductory level this portrayal does the discipline and the student a disservice The instrumentation we use is complex but ultimately understandable and more importantly repairable The procedures we employ for preparing tissues and cells are not totally understood but enough information is available to allow investigators to make reasonable choices concerning the best techniques to apply to their parti cular problems There are countless specialized techniques in the field of electron and light microscopy that require the acquisition of specialized knowledge particularly for interpretation of results electron tomography and energy dispersive spectroscopy immediately come to mind but most laboratories possessing the equipment to effect these approaches have specialists to help the casual user The advent of computer operated electron microscopes has also broadened access to these instruments allowing users with little technical knowledge about electron microscope design to quickly become operators This has been a welcome advance because earlier instru ments required a level of knowledge about electron optics and vacuum systems to produce optimal photographs and to avoid crashing the instruments that typically made it difficult for beginners

Basic Laboratory Methods for Biotechnology Lisa A. Seidman, Cynthia J. Moore, Jeanette Mowery, 2021-12-28

Basic Laboratory Methods for Biotechnology Third Edition is a versatile textbook that provides students with a solid foundation to pursue employment in the biotech industry and can later serve as a practical reference to ensure success at each stage in their career The authors focus on basic principles and methods while skillfully including recent innovations and industry trends throughout Fundamental laboratory skills are emphasized and boxed content provides step by step laboratory method instructions for ease of reference at any point in the students progress Worked through examples and practice problems and solutions assist student comprehension Coverage includes safety practices and instructions on using common laboratory instruments Key Features Provides a valuable reference for laboratory professionals at all stages of their careers Focuses on basic principles and methods to provide students with the knowledge needed to begin a career in the Biotechnology industry Describes fundamental laboratory skills Includes laboratory scenario based questions that require students to write or discuss their answers to ensure they have mastered the chapter content Updates reflect recent innovations and regulatory requirements to ensure students stay up to date Tables a detailed glossary practice problems and solutions case studies and anecdotes provide students with the tools needed to master the content

*Applied Chemistry : Theory And Practice* O. P. Vermani, 2003 Is An Amalgam Of Theory And

Experiments It Serves As A Laboratory Manual Of Examination Testing Characterisation And Evaluation Of A Few Materials Of Wide Industrial And Engineering Application The Significance And Practical Utility Of The Various Tests And The Inferences Drawn Therefore Have Been Described In Detail The Derivation Of The Formulas Where Ever Used The Introduction Theory And Related Discussion Are Quite Elaborate And Touch The Level Of A Theory Text The Book Has Been Designed To Cover The Laboratory Courses In Applied Chemistry At The Various Engineering And Technical Institutions The Book Will Be Useful To The Students Where Applied Chemistry Is Taught At The M Sc Level And To Public Health Water Analysis Laboratories It Will Also Be Useful To The Students Of Industrial Chemistry A Subject That Is Being Introduced At The Undergraduate Level In Some Of The Universities Students Of All Levels Of Intelligence From Very Weak To Extremely Brilliant Will Find Something Of Interest To Them In The Chapter On Solutions To Viva Voce Questions A Striking Feature Of The Book

**Extraction, Characterization, and Functional Assessment of Bioactive Compounds** María Figueiredo González, Patricia Reboredo Rodríguez, Elena Martínez Carballo, 2024-07-13 This volume details methods and procedures on extraction characterization and functional assessment of bioactive compounds Chapters guide readers through bioactive compounds development testing and characterization of phenolic compounds and other compounds Written in the format of the Methods and Protocols in Food Science series the chapters include an introduction to the respective topic list necessary materials and reagents detail well established and validated methods for readily reproducible laboratory protocols and contain notes on how to avoid or solve typical problems Authoritative and cutting edge Extraction Characterization and Functional Assessment of Bioactive Compounds aims to ensure successful results in the further study of this vital field

*Practical Skills in Chemistry* John R. Dean, 2002 This text s unique and comprehensive coverage includes general advice on practical work basic laboratory skills classical and instrumental techniques analysis and presentation of data information technology library resources and communicating information

**Optimierung der Hydroxynitril-Lyase aus Arabidopsis thaliana für die enantio-selektive Synthese von (R)-Cyanhydrinen** Daniel Okrob, 2012

*Modern Techniques in Neuroscience Research* Uwe Windhorst, 1999 This manual provides an overview of the techniques used in modern neuroscience research The emphasis is on showing how different techniques can optimally be combined in the study of problems that arise at some levels of nervous system organization It is a working tool for the scientist in the laboratory and clinic providing detailed step by step protocols with tips and recommendations Most chapters or protocols are organized such that they can be used independently of one another Cross references between the chapters a glossary a list of suppliers and appendices provide further help

**Microbiology Laboratory Guidebook** United States. Food Safety and Inspection Service. Microbiology Division, 1998

*Methods of Enzymatic analysis V4* Hans-Ulrich Bergmeyer, 2012-12-02 Methods of Enzymatic Analysis Volume 4 reviews developments in the use of enzymes as tools in analytical biochemistry including advances in assay techniques It discusses the principles and methods for the elucidation of structures of enzymes such as

peptides proteins amino acids fatty acid metabolites lipids steroids nucleic acids purines pyrimidines nucleosides and coenzymes It also considers the isolation and characterization of active centers in enzymes This volume is divided into four parts each discussing a group of enzymes and their determination Part I focuses on proteins peptides and amino acids including amines and amides Part II is concerned with fatty acid metabolites lipids and steroids ranging from polyunsaturated fatty acids and lecithin to choline acetylcholine triglycerides glycerol acetoacetate triacetate fumarylacetoacetate 20 ketosteroids prostaglandins bile acids and cholesterol Part III discusses nucleic acids purines pyrimidines nucleosides coenzymes and related compounds whereas Part IV looks at other substrates and effectors such as inorganic phosphate The book concludes with a chapter on metabolites and their concentrations in animal tissues Biochemists as well as students and researchers working in the field of analytical biochemistry will find this book highly informative

**Methods of Preparing Pathologic Specimens for Storage and Shipment**, 1980 **Bancroft's Theory and Practice of Histological Techniques E-Book** Kim S Suvarna, Christopher Layton, John D. Bancroft, 2012-10-01 This is a brand new edition of the leading reference work on histological techniques It is an essential and invaluable resource suited to all those involved with histological preparations and applications from the student to the highly experienced laboratory professional This is a one stop reference book that the trainee histotechnologist can purchase at the beginning of his career and which will remain valuable to him as he increasingly gains experience in daily practice Thoroughly revised and up dated edition of the standard reference work in histotechnology that successfully integrates both theory and practice Provides a single comprehensive resource on the tried and tested investigative techniques as well as coverage of the latest technical developments Over 30 international expert contributors all of whom are involved in teaching research and practice Provides authoritative guidance on principles and practice of fixation and staining Extensive use of summary tables charts and boxes Information is well set out and easy to retrieve Six useful appendices included SI units solution preparation specimen mounting solubility Provides practical information on measurements preparation solutions that are used in daily laboratory practice Color photomicrographs used extensively throughout Better replicates the actual appearance of the specimen under the microscope Brand new co editors New material on immunohistochemical and molecular diagnostic techniques Enables user to keep abreast of latest advances in the field *Handbook of Media for Environmental Microbiology* Ronald M. Atlas, 2005-03-29 The second edition of a bestseller this book provides a comprehensive reference for the cultivation of bacteria Archaea and fungi from diverse environments including extreme habitats Expanded to include 2 000 media formulations this book compiles the descriptions of media of relevance for the cultivation of microorganisms from soil water an

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