

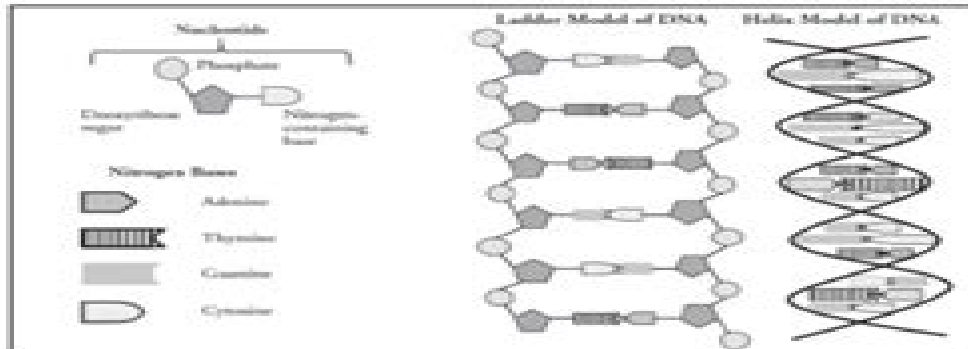
POGIL – DNA Structure and Replication

How is genetic information stored and copied?

Why?

Deoxyribonucleic acid or **DNA** is the molecule of heredity. It contains the genetic blueprint for life. For organisms to grow and repair damaged cells, each cell must be capable of accurately copying itself. So how does the structure of DNA allow it to copy itself so accurately?

Model 1 – The Structure of DNA



1. Refer to the diagram in Model 1.

- What are the three parts of a nucleotide?
- What kind of sugar is found in a nucleotide?
- Which nucleotide component contains nitrogen?
- Name the four nitrogen bases shown in Model 1.

2. DNA is often drawn in a "ladder model." Locate this drawing in Model 1.

- Circle a single nucleotide on each side of the ladder model of DNA.

- What part(s) of the nucleotides make up the rungs of the "ladder"?
- What parts of the nucleotides make up the sides (backbone) of the "ladder"?
- Look at the bottom and top of the "ladder" in Model 1. Are the rungs parallel (the ends of the strands match) or antiparallel (the ends of the strands are opposites)? Describe what antiparallel means.
- Label the 5' and 3' end of each strand in the ladder model of DNA in Model 1.

3. The two strands of DNA are held together with hydrogen bonds between the nitrogen bases. These are weak bonds between polar molecules. Which bases are paired together with hydrogen bonds? How many hydrogen bonds connect the bases of each pair? Draw and label a diagram showing each base pairing.

READ: Erwin Chargaff (1906–2002), an Austrian-American biochemist, investigated the ratio of nucleotide bases found in the DNA from a variety of organisms. From his research, as well as research by Rosalind Franklin and Maurice Wilkins, Watson and Crick developed the complementary base-pair rule during their race to discover the structure of DNA. The complementary base-pair rule states that adenine and thymine form pairs across two strands, and guanine and cytosine form pairs across two strands.

4. Fill in the complementary bases on the strand below according to the base-pair rule.

5' - A T C C A G C G G T C A A - 3'

5. The proportions of the bases are consistent within a species; however, they do vary between species. Using the base-pair rules, complete the following table to show the percentage of each type of base in the three different organisms.

Organism	Percentage of each type of base			
	Adenine	Guanine	Cytosine	Thymine
Human		31		19
Cow	28		22	
Salmon	21			

Pogil Ap Bio Replication

Christian Drosten



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POGIL Shawn R. Simonson, 2023-07-03 Process Oriented Guided Inquiry Learning POGIL is a pedagogy that is based on research on how people learn and has been shown to lead to better student outcomes in many contexts and in a variety of academic disciplines Beyond facilitating students mastery of a discipline it promotes vital educational outcomes such as communication skills and critical thinking Its active international community of practitioners provides accessible educational development and support for anyone developing related courses Having started as a process developed by a group of chemistry professors focused on helping their students better grasp the concepts of general chemistry The POGIL Project has grown into a dynamic organization of committed instructors who help each other transform classrooms and improve student success develop curricular materials to assist this process conduct research expanding what is known about learning and teaching and provide professional development and collegiality from elementary teachers to college professors As a pedagogy it has been shown to be effective in a variety of content areas and at different educational levels This is an introduction to the process and the community Every POGIL classroom is different and is a reflection of the uniqueness of the particular context the institution department physical space student body and instructor but follows a common structure in which students work cooperatively in self managed small groups of three or four The group work is focused on activities that are carefully designed and scaffolded to enable students to develop important concepts or to deepen and refine their understanding of those ideas or concepts for themselves based entirely on data provided in class not on prior reading of the textbook or other introduction to the topic The learning environment is structured to support the development of process skills such as teamwork effective communication information processing problem solving and critical thinking The instructor s role is to facilitate the development of student concepts and process skills not to simply deliver content to the students The first part of this book introduces the theoretical and philosophical foundations of POGIL pedagogy and summarizes the literature demonstrating its efficacy The second part of the book focusses on implementing POGIL covering the formation and effective management of student teams offering guidance on the selection and writing of POGIL activities as well as on facilitation teaching large classes and assessment The book concludes with examples of implementation in STEM and non STEM disciplines as well as guidance on how to get started Appendices provide additional resources and information about The POGIL Project

DNA Replication Judith L. Campbell, 1995-10-11 The critically acclaimed laboratory standard for forty years Methods in Enzymology is one of the most highly respected publications in the field of biochemistry Since 1955 each volume has been eagerly awaited frequently consulted and praised by researchers and reviewers alike More than 250 volumes have been published all of them still in print and much of the material is relevant even today truly an essential publication for researchers in all fields of life sciences Key Features Includes descriptions of functional structural kinetic and genetic methods for analyzing major enzymes of DNA replication Describes strategies for studying interactions of these

proteins during replication Provides comprehensive descriptions of uses of prokaryotic and eukaryotic crude in vitro replication systems and reconstitution of such systems from purified proteins Includes methods for analyzing DNA replication in vivo

The Initiation of DNA Replication Dan S Ray, 2012-12-02 The Initiation of DNA Replication contains the proceedings of the 1981 ICN UCLA Symposia on Structure and DNA Protein Interactions of Replication Origins held in Salt Lake City Utah on March 8 13 1981 The papers explore the initiation of DNA replication and address relevant topics such as whether there are specific protein recognition sites within an origin how many proteins interact at an origin and whether they interact in a specific temporal sequence or whether origins can be subdivided into distinct functional domains The specific biochemical steps in DNA chain initiation and how they are catalyzed are also discussed This book is organized into six sections and comprised of 41 chapters The discussion begins by analyzing the replication origin region of the Escherichia coli chromosome and the precise location of the region carrying autonomous replicating function A genetic map of the replication and incompatibility regions of the resistance plasmids R100 and R1 is described and several gene products produced in vivo or in vitro from the replication region are considered The sections that follow focus on the DNA initiation determinants of bacteriophage M13 and of chimeric derivatives carrying foreign replication determinants suppressor loci in E coli and enzymes and proteins involved in initiation of phage and bacterial chromosomes The final chapters examine the origins of eukaryotic replication This book will be of interest to scientists students and researchers in fields ranging from microbiology and molecular biology to biochemistry molecular genetics and physiology

DNA Replication Across Taxa, 2016-05-27 DNA Replication Across Taxa the latest volume in The Enzymes series summarizes the most important discoveries associated with DNA replication Contains contributions from leading authorities Informs and updates on all the latest developments in the field of enzymes

DNA Replication Arthur Kornberg, Tania A. Baker, 2005-06-24 DNA Replication second edition a classic of modern science is now back in print in a paperback edition Kornberg and Baker's insightful coverage of DNA replication and related cellular processes have made this the standard reference in the field

Mechanism and Regulation of DNA Replication Alan Kolber, 2012-12-06 1 Chromosome Replication in Prokaryotes Enzymatic Aspects of Chromosome Replication in E coli Escherichia coli DNA Polymerase II and III Initiation of DNA Synthesis In vitro Replication of DNA The Role of ATP in Chromosome Replication Studied in Toluene-induced Escherichia coli Membrane Protein Components and DNA Synthesis in Escherichia coli A Possible Common Role for DNA Polymerase I and Exonuclease V in Escherichia coli The Joining of DNA Duplexes at Their Base Paired Ends The Attachment of the Bacterial Chromosome to the Cell Membrane DNA Replication in Bacteriophage and

The DNA Replication-Repair Interface, 2021-11-12 Replication Coupled Repair Volume 661 in the Methods in Enzymology series highlights new advances in the field with this new volume presenting interesting chapters on a variety of timely topics including the Repair of replication born DNA breaks by sister chromatid recombination High resolution and high throughput DNA cyclization measurements to

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DNA Replication Hisao Masai, Marco Foiani, 2018-01-22 This book reviews the latest trends and future directions of DNA replication research The contents reflect upon the principles that have been established through the genetic and enzymatic studies of bacterial viral and cellular replication during the past decades The book begins with a historical overview of the studies on eukaryotic DNA replication by Professor Thomas Kelly a pioneer of the field The following chapters include genome wide studies of replication origins and initiation factor binding as well as the timing of DNA replications mechanisms of initiation DNA chain elongation and termination of DNA replication the structural basis of functions of protein complexes responsible for execution of DNA replication cell cycle dependent regulation of DNA replication the nature of replication stress and cells strategy to deal with the stress and finally how all these phenomena are interconnected to genome instability and development of various diseases By reviewing the existing concepts ranging from the old principles to the newest ideas the book gives readers an opportunity to learn how the classical replication principles are now being modified and new concepts are being generated to explain how genome DNA replication is achieved with such high adaptability and plasticity With the development of new methods including cryoelectron microscopy analyses of huge protein complexes single molecular analyses of initiation and elongation of DNA replication and total reconstitution of eukaryotic DNA replication with purified factors the field is enjoying one of its most exciting moments and this highly timely book conveys that excitement to all interested readers

Molecular Themes in DNA Replication Lynne Suzanne Cox, 2009 Written by leading experts this learned but accessible book highlights the latest work on eukaryotic DNA replication

DNA Replication, Recombination and Repair, 1995 **DNA Replication in Eukaryotic Cells** Melvin L. DePamphilis, 1996 National Institutes of Health Cold Spring Harbor Monograph Volume 31 Extensive text on the replication of DNA specifically in eukaryotic cells for researchers 68 contributors 54 U S

DNA Replication Melvin L. DePamphilis, 2002 DNA Replication and Human Disease Melvin L. DePamphilis, 2006 At least 5 trillion cell divisions are required for a fertilized egg

to develop into an adult human resulting in the production of more than 20 trillion meters of DNA And yet with only two exceptions the genome is replicated once and only once each time a cell divides How is this feat accomplished What happens when errors occur This book addresses these questions by presenting a thorough analysis of the molecular events that govern DNA replication in eukaryotic cells The association between genome replication and cell proliferation disease pathogenesis and the development of targeted therapeutics is also addressed At least 160 proteins are involved in replicating the human genome and at least 40 diseases are caused by aberrant DNA replication 35 by mutations in genes required for DNA replication or repair 7 by mutations generated during mitochondrial DNA replication and more than 40 by DNA viruses Consequently a growing number of therapeutic drugs are targeted to DNA replication proteins This authoritative volume provides a rich source of information for researchers physicians and teachers and will stimulate thinking about the relevance of DNA replication to human disease

Eukaryotic DNA Replication J. Julian Blow, 1996 DNA replication is an area of intense research effort which has recently yielded fascinating new insights into the phenomenon In this book leading researchers review this rapidly advancing field The book begins with reviews of the molecular and genetic components of the replication machinery and builds into a detailed picture of how the replication process is regulated within the cell cycle Topics include the initiation of replication origin recognition the enzymology of the replication fork the use of SV40 to identify key components of the replication machinery and how replication is co ordinated with other cell cycle events in *Xenopus* cell free extracts and in budding and fission yeasts *Eukaryotic DNA Replication* is a unique and very timely description of the latest research findings in this key subject area It is essential reading for all researchers and advanced undergraduates interested in the topic

DNA Replication J. L. (Ed.) CAMPBELL, 1995 *DNA Replication* Roger Lionel Poulter Adams, 1991 In Focus is a series of books specifically written for students facing the problem of keeping up to date with key areas in biology and medicine Each title presents the very latest information in a clear and accessible format These book will particularly complement course work providing an in depth knowledge of the topic

Proteins Involved in DNA Replication Ulrich Huebscher, 2012-12-27 This book collects the Proceedings of a workshop sponsored by the European Molecular Biology Organization EMBO entitled Proteins Involved in DNA Replication which was held September 19 to 23 1983 at Vitznau near Lucerne in Switzerland The aim of this workshop was to review and discuss the status of our knowledge on the intricate array of enzymes and proteins that allow the replication of the DNA Since the first discovery of a DNA polymerase in *Escherichia coli* by Arthur Kornberg twenty eight years ago a great number of enzymes and other proteins were described that are essential for this process different DNA polymerases DNA primases DNA dependent ATPases helicases DNA ligases DNA topoisomerases exonucleases DNA binding proteins and others They are required for the initiation of a round of synthesis at each replication origin for the progress of the growing fork for the disentanglement of the replication product or for assuring the fidelity of the replication process The number variety and ways in which these

proteins interact with DNA and with each other to the achievement of replication and to the maintenance of the physiological structure of the chromosomes is the subject of the contributions collected in this volume. The presentations and discussions during this workshop reinforced the view that DNA replication in vivo can only be achieved through the cooperation of a high number of enzymes, proteins and other cofactors. DNA Replication Sonya Vengrova, Jacob Dalgaard, 2016-10-29. Updated and revised, this thorough volume covers a range of methods focusing on systems including mammalian, yeast, bacterial and archaeal. This second edition of *DNA Replication Methods and Protocols* describes approaches to analyze whole genomes to single molecules as well as both in vivo and in vitro experiments. As a volume in the highly successful *Methods in Molecular Biology* series, chapters contain introductions to their respective topics, lists of the necessary materials and reagents, step by step, readily reproducible protocols and tips on troubleshooting and avoiding known pitfalls. Authoritative and cutting edge, *DNA Replication Methods and Protocols* Second Edition provides a collection of methods intended for newcomers to this research field and for established laboratories. *DNA Replication* Patrick Hughes, 1992. The Regulation of DNA Replication and Transcription Mirko Beljanski, 1983.

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Table of Contents Pogil Ap Bio Replication

1. Understanding the eBook Pogil Ap Bio Replication
 - The Rise of Digital Reading Pogil Ap Bio Replication
 - Advantages of eBooks Over Traditional Books
2. Identifying Pogil Ap Bio Replication
 - 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 Pogil Ap Bio Replication
 - User-Friendly Interface
4. Exploring eBook Recommendations from Pogil Ap Bio Replication
 - Personalized Recommendations
 - Pogil Ap Bio Replication User Reviews and Ratings
 - Pogil Ap Bio Replication and Bestseller Lists
5. Accessing Pogil Ap Bio Replication Free and Paid eBooks

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

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