

# Ligated Definition Biology

## **Ligated Definition Biology: A Deep Dive into Molecular Joining**

### Introduction:

Ever wondered how DNA fragments are joined together to create recombinant DNA, or how enzymes meticulously stitch together molecules within a cell? The answer lies in the fascinating process of ligation. This comprehensive guide will explore the meaning of "ligated" in a biological context, delving into the various types of ligation, their applications in molecular biology, and the critical role they play in various cellular processes. We'll unpack the intricacies of this fundamental biological mechanism, making it accessible to both students and seasoned researchers. Prepare to unravel the secrets behind the powerful world of molecular joining.

### What does ligated mean in biology?

In biology, "ligated" refers to the process of joining two molecules together, usually through the formation of a covalent bond. This process is crucial in various biological pathways and is extensively utilized in molecular biology techniques. While the term can apply to various molecular connections, it's most commonly associated with the joining of DNA fragments or the connection of other biomolecules. The key aspect is the creation of a stable, chemically bonded connection between the two initially separate entities. This bond formation often requires the assistance of enzymes known as ligases.

### Types of Ligation in Biology:

Several types of ligation processes exist, each with its specific mechanism and application:

- 1. DNA Ligation:** This is perhaps the most widely known type of ligation in molecular biology. It involves the joining of two DNA fragments, typically using DNA ligase enzymes. These enzymes catalyze the formation of a phosphodiester bond between the 3'-hydroxyl group of one DNA fragment and the 5'-phosphate group of another. This process is essential in DNA replication, repair, and recombinant DNA technology.
- 2. RNA Ligation:** Similar to DNA ligation, RNA ligation involves the joining of RNA molecules. This process can be catalyzed by RNA ligases, which are essential for various RNA processing pathways and the repair of broken RNA molecules. Specific examples include the ligation of tRNA precursors and the joining of excised introns during RNA splicing.
- 3. Protein Ligation:** This refers to the covalent joining of two protein molecules. This process can occur naturally through various mechanisms, including the formation of disulfide bonds or peptide bonds. Furthermore, it can be artificially induced through chemical methods or via protein-engineering techniques.

4. **Peptide Ligation:** This is a specific type of protein ligation that involves the joining of two peptide chains. This process is often utilized in the synthesis of large proteins or peptides, where chemically synthesizing the entire sequence might be challenging.

#### The Role of Ligases:

Ligases are enzymes that play a central role in all forms of ligation. These biological catalysts facilitate the formation of covalent bonds between molecules. Different ligases exhibit specificity towards the type of molecules they join (e.g., DNA ligase, RNA ligase). They often require energy in the form of ATP or NAD<sup>+</sup> to drive the ligation reaction.

#### Applications of Ligation in Molecular Biology:

The principle of ligation has revolutionized molecular biology. Its applications are diverse and widespread:

**Recombinant DNA Technology:** Ligation is the cornerstone of recombinant DNA technology. It allows scientists to combine DNA fragments from different sources, creating novel genetic constructs with desired properties. This has paved the way for gene cloning, gene therapy, and the production of recombinant proteins.

**Gene Cloning:** By ligating a gene of interest into a vector (e.g., a plasmid), scientists can create numerous copies of the gene using bacterial or other cellular systems.

**Gene Therapy:** Ligation enables the creation of gene therapy vectors carrying therapeutic genes that can be introduced into cells to correct genetic defects.

**DNA Sequencing:** Ligation is involved in various DNA sequencing techniques, including Sanger sequencing.

**Diagnostics:** Ligation-based assays are used in diagnostic applications for detecting specific DNA or RNA sequences.

#### Challenges and Considerations in Ligation:

While ligation is a powerful tool, several challenges need to be addressed:

**Efficiency:** The efficiency of ligation can be affected by several factors, including the concentration of reactants, the temperature, and the presence of inhibitors.

**Specificity:** Ensuring the specific ligation of desired DNA fragments is crucial, especially in complex mixtures.

**Compatibility:** The compatibility of the ends of the DNA fragments to be ligated is crucial for efficient joining. "Sticky ends" (complementary overhangs) generally lead to more efficient ligation than "blunt ends".

#### Conclusion:

Ligation, the process of joining biomolecules, is a fundamental process in biology with far-reaching applications in molecular biology and biotechnology. Understanding the mechanisms and applications of different types of ligation is crucial for researchers in various fields. From creating recombinant DNA to deciphering the complexities of cellular processes, ligation plays a pivotal role in advancing our understanding of life itself.

## Article Outline: Ligated Definition Biology

### I. Introduction:

Hook: Briefly explain the importance of ligation in biology.

Overview: Define ligation in the biological context and highlight the article's scope.

### II. What does ligated mean in biology?

Provide a precise definition of ligation.

Explain the formation of covalent bonds and the role of ligases.

### III. Types of Ligation in Biology:

DNA ligation: Detail the process and importance in molecular biology.

RNA ligation: Explain its role in RNA processing and repair.

Protein ligation: Describe its occurrence and applications.

Peptide ligation: Explain its use in protein synthesis.

### IV. The Role of Ligases:

Explain the function of ligases as biological catalysts.

Discuss their specificity and energy requirements.

### V. Applications of Ligation in Molecular Biology:

Recombinant DNA technology: Detail its importance and applications.

Gene cloning: Explain the ligation process involved.

Gene therapy: Explain the use of ligation in gene therapy vectors.

DNA sequencing: Describe the role of ligation in sequencing methods.

Diagnostics: Explain the use of ligation in diagnostic assays.

### VI. Challenges and Considerations in Ligation:

Discuss challenges related to efficiency, specificity, and compatibility.

### VII. Conclusion:

Summarize the importance and applications of ligation.

### FAQs:

1. What is the difference between DNA ligase and RNA ligase? DNA ligase joins DNA fragments, while RNA ligase joins RNA fragments; they differ in substrate specificity and mechanism.

2. What are sticky ends and blunt ends in DNA ligation? Sticky ends have overhanging single-stranded sequences, facilitating more efficient ligation, while blunt ends have no overhangs.

3. What is the energy source for DNA ligation? Often ATP (adenosine triphosphate) is used as an energy source by DNA ligase.

4. What are some applications of protein ligation in biotechnology? Protein ligation is utilized in creating novel proteins, modifying existing ones, and producing therapeutic proteins.

5. How is ligation used in gene cloning? A gene of interest is ligated into a vector (plasmid) to be amplified in a host organism.

6. What are the limitations of ligation-based methods? Efficiency can be low, particularly with blunt ends, and there is a risk of non-specific ligation.
7. What is the role of ATP in ligation reactions? ATP provides the energy required for the formation of the phosphodiester bond.
8. Can ligation be used to join molecules other than nucleic acids? Yes, protein and peptide ligation are also important processes.
9. What are some common DNA ligases used in molecular biology? T4 DNA ligase and E. coli DNA ligase are commonly used.

#### Related Articles:

1. Recombinant DNA Technology: A Comprehensive Guide: Explores the techniques and applications of recombinant DNA technology.
2. DNA Replication: The Mechanism of Life's Blueprint: Details the process of DNA replication, including the role of ligases.
3. Gene Cloning: Techniques and Applications: Covers various gene cloning strategies, emphasizing the importance of ligation.
4. Gene Therapy: Promises and Challenges: Discusses the potential and limitations of gene therapy, including the role of ligation.
5. DNA Sequencing Technologies: A Comparative Analysis: Compares different DNA sequencing methods, highlighting the use of ligation.
6. RNA Splicing: The Intricate Process of RNA Maturation: Explains the process of RNA splicing, including the role of RNA ligation.
7. Protein Synthesis: From Genes to Proteins: Covers the entire protein synthesis pathway.
8. Enzyme Kinetics: Understanding Enzyme Activity: Explains the principles of enzyme kinetics, including ligases.
9. Molecular Biology Techniques: A Practical Guide: Provides a comprehensive overview of common molecular biology techniques, including ligation.

**ligated definition biology:** *Molecular Biology of the Cell* , 2002

**ligated definition biology:** Landmark Experiments in Molecular Biology Michael Fry, 2016-06-10 Landmark Experiments in Molecular Biology critically considers breakthrough experiments that have constituted major turning points in the birth and evolution of molecular biology. These experiments laid the foundations to molecular biology by uncovering the major players in the machinery of inheritance and biological information handling such as DNA, RNA, ribosomes, and proteins. Landmark Experiments in Molecular Biology combines an historical survey of the development of ideas, theories, and profiles of leading scientists with detailed scientific and technical analysis. - Includes detailed analysis of classically designed and executed experiments -

Incorporates technical and scientific analysis along with historical background for a robust understanding of molecular biology discoveries - Provides critical analysis of the history of molecular biology to inform the future of scientific discovery - Examines the machinery of inheritance and biological information handling

**ligated definition biology:** *An Illustrated Dictionary of Medicine, Biology and Allied Sciences* George Milbry Gould, 1898

**ligated definition biology:** **Chemoselective and Bioorthogonal Ligation Reactions** W. Russ Algar, Philip Dawson, Igor L. Medintz, 2017-03-17 This timely, one-stop reference is the first on an emerging and interdisciplinary topic. Covering both established and recently developed ligation chemistries, the book is divided into two didactic parts: a section that focuses on the details of bioorthogonal and chemoselective ligation reactions at the level of fundamental organic chemistry, and a section that focuses on applications, particularly in the areas of chemical biology, biomaterials, and bioanalysis, highlighting the capabilities and benefits of the ligation reactions. With chapters authored by outstanding scientists who range from trailblazers in the field to young and emerging leaders, this book on a highly interdisciplinary topic will be of great interest for biochemists, biologists, materials scientists, pharmaceutical chemists, organic chemists, and many others.

**ligated definition biology:** **Mathematical Support for Molecular Biology** Martin Farach-Colton, 1999 This volume features highlights from the DIMACS Special Year on Mathematical Support for Molecular Biology. Top researchers presented both new research results and comprehensive overviews on the use of mathematics (especially discrete mathematics) and theoretical computer science in molecular biology. The book provides a unique snapshot of this growing area of study. It will be of interest to both experts and novices seeking information on the state of the research.

**ligated definition biology:** Methods in Plant Molecular Biology Mary A. Schuler, Raymond E. Zielinski, 2012-12-02 Methods in Plant Molecular Biology is a lab manual that introduces students to a diversity of molecular techniques needed for experiments with plant cells. Those included have been perfected and are now presented for the first time in a usable and teachable form. Because the manual integrates protein, RNA, and DNA techniques, it will serve students, teachers, and researchers in plant physiology, biophysics, and animal molecular biology who have no previous experience handling recombinant DNA or purified proteins. It can also be used by the established molecular biologist who wishes to utilize the powerful techniques of recombinant DNA to explore the mysteries of the plant kingdom. - Eight basic experiments which can be used collectively or individually cover - Recombinant Cloning and Screening in *E. coli*; DNA Sequencing - Plant RNA Isolation and in Vitro Translations - Plant DNA Isolations and Genomic DNA Southern AnalysisChloroplast Isolation and Protein SynthesisPlant Tissue Culture and Agrobacterium Transformations - Experiments that have been student tested for three years - Blueprints for setting up gel rigs - Comprehensive course schedule outlining individual procedures to be finished in each lab segment - Course can be tailored to suit the needs of the individual instructor

**ligated definition biology:** Basic Techniques in Molecular Biology Stefan Surzycki, 2012-12-06 This laboratory manual gives a thorough introduction to basic techniques. It is the result of practical experience, with each protocol having been used extensively in undergraduate courses or tested in the authors laboratory. In addition to detailed protocols and practical notes, each technique includes an overview of its general importance, the time and expense involved in its application and a description of the theoretical mechanisms of each step. This enables users to design their own modifications or to adapt the method to different systems. Surzycki has been holding undergraduate courses and workshops for many years, during which time he has extensively modified and refined the techniques described here.

**ligated definition biology:** Visualizing Human Biology Kathleen A. Ireland, 2010-10-04 Medical professionals will be able to connect the science of biology to their own lives through the stunning visuals in Visualizing Human Biology. The important concepts of human biology are presented as

they relate to the world we live in. The role of the human in the environment is stressed throughout, ensuring that topics such as evolution, ecology, and chemistry are introduced in a non-threatening and logical fashion. Illustrations and visualization features are help make the concepts easier to understand. Medical professionals will appreciate this visual and concise approach.

**ligated definition biology:** How Tobacco Smoke Causes Disease United States. Public Health Service. Office of the Surgeon General, 2010 This report considers the biological and behavioral mechanisms that may underlie the pathogenicity of tobacco smoke. Many Surgeon General's reports have considered research findings on mechanisms in assessing the biological plausibility of associations observed in epidemiologic studies. Mechanisms of disease are important because they may provide plausibility, which is one of the guideline criteria for assessing evidence on causation. This report specifically reviews the evidence on the potential mechanisms by which smoking causes diseases and considers whether a mechanism is likely to be operative in the production of human disease by tobacco smoke. This evidence is relevant to understanding how smoking causes disease, to identifying those who may be particularly susceptible, and to assessing the potential risks of tobacco products.

**ligated definition biology:** An Illustrated Dictionary of Medicine, Biology and Allied Sciences George Milbry Gould, 1900

**ligated definition biology:** Biochemistry and Molecular Biology Compendium Roger L. Lundblad, 2019-11-11 This book is an accessible resource offering practical information not found in more database-oriented resources. The first chapter lists acronyms with definitions, and a glossary of terms and subjects used in biochemistry, molecular biology, biotechnology, proteomics, genomics, and systems biology. There follows chapters on chemicals employed in biochemistry and molecular biology, complete with properties and structure drawings. Researchers will find this book to be a valuable tool that will save them time, as well as provide essential links to the roots of their science. Key selling features: Contains an extensive list of commonly used acronyms with definitions Offers a highly readable glossary for systems and techniques Provides comprehensive information for the validation of biotechnology assays and manufacturing processes Includes a list of Log P values, water solubility, and molecular weight for selected chemicals Gives a detailed listing of protease inhibitors and cocktails, as well as a list of buffers

**ligated definition biology:** Molecular Biology of B Cells Tasuku Honjo, Michael Reth, Andreas Radbruch, Frederick Alt, Michael Neuberger, 2004-02-19 Molecular Biology of B Cells is a comprehensive reference to how B cells are generated, selected, activated and engaged in antibody production. All these developmental and stimulatory processes are described in molecular and genetic terms to give a clear understanding of complex phenotypes. The molecular basis of many diseases due to B cell abnormality is also discussed. This definitive reference is directed at research level immunologists, molecular biologists and geneticists.

**ligated definition biology:** Molecular Biology and Biotechnology M. V. Parakhia, 2009-08 The text is divided into 36 chapters followed by detailed glossary. Most of the required protocols have been included and the book caters to the need of subjects like food microbiology, textile microbiology, medical microbiology, and agriculture microbiology etc. This text is just a guide line to set the hand. In actual working you will be doing much more beyond this text and that will be going to make us wiser. We hope that this text will prove as a good partner for those who set their hands on microbial biotechnology.

**ligated definition biology:** Desk Encyclopedia of Microbiology Moselio Schaechter, 2003-12-11 The Desk Encyclopedia of Microbiology aims to provide an affordable and ready access to a large variety of microbiological topics within one set of covers. This handy desk-top reference brings together an outstanding collection of work by the top scientists in the field. Covering topics ranging from the basic science of microbiology to the current hot topics in the field.\* Provides a broad, easily accessible perspective on a wide range of microbiological topics\* A synthesis of the broadest topics from the comprehensive and multi-volumed Encyclopedia of Microbiology, Second Edition \* Helpful resource in preparing for lectures, writing reports, or drafting grant applications

**ligated definition biology:** *Handbook of RNA Biochemistry* Roland K. Hartmann, Albrecht Bindereif, Astrid Sch n, Eric Westhof, 2015-06-22 The second edition of a highly acclaimed handbook and ready reference. Unmatched in its breadth and quality, around 100 specialists from all over the world share their up-to-date expertise and experiences, including hundreds of protocols, complete with explanations, and hitherto unpublished troubleshooting hints. They cover all modern techniques for the handling, analysis and modification of RNAs and their complexes with proteins. Throughout, they bear the practising bench scientist in mind, providing quick and reliable access to a plethora of solutions for practical questions of RNA research, ranging from simple to highly complex. This broad scope allows the treatment of specialized methods side by side with basic biochemical techniques, making the book a real treasure trove for every researcher experimenting with RNA.

**ligated definition biology:** *Brenner's Encyclopedia of Genetics* Stanley Maloy, Kelly Hughes, 2013-03-03 The explosion of the field of genetics over the last decade, with the new technologies that have stimulated research, suggests that a new sort of reference work is needed to keep pace with such a fast-moving and interdisciplinary field. Brenner's Encyclopedia of Genetics, Second Edition, Seven Volume Set, builds on the foundation of the first edition by addressing many of the key subfields of genetics that were just in their infancy when the first edition was published. The currency and accessibility of this foundational content will be unrivalled, making this work useful for scientists and non-scientists alike. Featuring relatively short entries on genetics topics written by experts in that topic, Brenner's Encyclopedia of Genetics, Second Edition, Seven Volume Set provides an effective way to quickly learn about any aspect of genetics, from Abortive Transduction to Zygotes. Adding to its utility, the work provides short entries that briefly define key terms, and a guide to additional reading and relevant websites for further study. Many of the entries include figures to explain difficult concepts. Key terms in related areas such as biochemistry, cell, and molecular biology are also included, and there are entries that describe historical figures in genetics, providing insights into their careers and discoveries. This 7-volume set represents a 25% expansion from the first edition, with over 1600 articles encompassing this burgeoning field Thoroughly up-to-date, with many new topics and subfields covered that were in their infancy or not inexistence at the time of the first edition. Timely coverage of emergent areas such as epigenetics, personalized genomic medicine, pharmacogenetics, and genetic enhancement technologies Interdisciplinary and global in its outlook, as befits the field of genetics Brief articles, written by experts in the field, which not only discuss, define, and explain key elements of the field, but also provide definition of key terms, suggestions for further reading, and biographical sketches of the key people in the history of genetics

**ligated definition biology:** *Janeway's Immunobiology* Kenneth Murphy, Paul Travers, Mark Walport, Peter Walter, 2010-06-22 The Janeway's Immunobiology CD-ROM, Immunobiology Interactive, is included with each book, and can be purchased separately. It contains animations and videos with voiceover narration, as well as the figures from the text for presentation purposes.

**ligated definition biology:** *Concepts of Biology* Samantha Fowler, Rebecca Roush, James Wise, 2023-05-12 Black & white print. Concepts of Biology is designed for the typical introductory biology course for nonmajors, covering standard scope and sequence requirements. The text includes interesting applications and conveys the major themes of biology, with content that is meaningful and easy to understand. The book is designed to demonstrate biology concepts and to promote scientific literacy.

**ligated definition biology:** *Mechanisms of Vascular Disease* Robert Fitridge, M. M. Thompson, 2011 New updated edition first published with Cambridge University Press. This new edition includes 29 chapters on topics as diverse as pathophysiology of atherosclerosis, vascular haemodynamics, haemostasis, thrombophilia and post-amputation pain syndromes.

**ligated definition biology:** *Genome Stability* Igor Kovalchuk, Olga Kovalchuk, 2021-07-17 *Genome Stability: From Virus to Human Application*, Second Edition, a volume in the Translational Epigenetics series, explores how various species maintain genome stability and genome

diversification in response to environmental factors. Here, across thirty-eight chapters, leading researchers provide a deep analysis of genome stability in DNA/RNA viruses, prokaryotes, single cell eukaryotes, lower multicellular eukaryotes, and mammals, examining how epigenetic factors contribute to genome stability and how these species pass memories of encounters to progeny. Topics also include major DNA repair mechanisms, the role of chromatin in genome stability, human diseases associated with genome instability, and genome stability in response to aging. This second edition has been fully revised to address evolving research trends, including CRISPRs/Cas9 genome editing; conventional versus transgenic genome instability; breeding and genetic diseases associated with abnormal DNA repair; RNA and extrachromosomal DNA; cloning, stem cells, and embryo development; programmed genome instability; and conserved and divergent features of repair. This volume is an essential resource for geneticists, epigeneticists, and molecular biologists who are looking to gain a deeper understanding of this rapidly expanding field, and can also be of great use to advanced students who are looking to gain additional expertise in genome stability. - A deep analysis of genome stability research from various kingdoms, including epigenetics and transgenerational effects - Provides comprehensive coverage of mechanisms utilized by different organisms to maintain genomic stability - Contains applications of genome instability research and outcomes for human disease - Features all-new chapters on evolving areas of genome stability research, including CRISPRs/Cas9 genome editing, RNA and extrachromosomal DNA, programmed genome instability, and conserved and divergent features of repair

**ligated definition biology: Glossary of Biotechnology and Genetic Engineering** Food and Agriculture Organization of the United Nations, 1999 An up-to-date list of terms currently in use in biotechnology, genetic engineering and allied fields. The terms in the glossary have been selected from books, dictionaries, journals and abstracts. Terms are included that are important for FAO's intergovernmental activities, especially in the areas of plant and animal genetic resources, food quality and plant protection.

**ligated definition biology: Synthetic Biology** Christopher A. Voigt, 2011 Synthetic biology encompasses a variety of different approaches, methodologies and disciplines and many different definitions exist. This volume covers topics such as measuring and engineering central dogma processes, mathematical and computational methods and next-generation DNA assembly and manipulation.

**ligated definition biology: Artificial Intelligence and Molecular Biology** Lawrence Hunter, 1993 These original contributions provide a current sampling of AI approaches to problems of biological significance; they are the first to treat the computational needs of the biology community hand-in-hand with appropriate advances in artificial intelligence. The enormous amount of data generated by the Human Genome Project and other large-scale biological research has created a rich and challenging domain for research in artificial intelligence. These original contributions provide a current sampling of AI approaches to problems of biological significance; they are the first to treat the computational needs of the biology community hand-in-hand with appropriate advances in artificial intelligence. Focusing on novel technologies and approaches, rather than on proven applications, they cover genetic sequence analysis, protein structure representation and prediction, automated data analysis aids, and simulation of biological systems. A brief introductory primer on molecular biology and AI gives computer scientists sufficient background to understand much of the biology discussed in the book. Lawrence Hunter is Director of the Machine Learning Project at the National Library of Medicine, National Institutes of Health.

**ligated definition biology: Enzymology Primer for Recombinant DNA Technology** Hyone-Myong Eun, 1996-06-03 Enzymes are indispensable tools in recombinant DNA technology and genetic engineering. This book not only provides information for enzymologists, but does so in a manner that will also aid nonenzymologists in making proper use of these biocatalysts in their research. The Enzymology Primer for Recombinant DNA Technology includes information not usually found in the brief descriptions given in most books on recombinant DNA methodology and gene cloning. - Provides essential basics as well as up-to-date information on enzymes most



commonly used in recombinant DNA technology - Presents information in an easily accessible format to serve as a quick reference source - Leads to a better understanding of the role of biocatalysts in recombinant DNA techniques

**ligated definition biology: Gene Cloning and DNA Analysis** T. A. Brown, 2013-04-25 Known world-wide as the standard introductory text to this important and exciting area, the sixth edition of Gene Cloning and DNA Analysis addresses new and growing areas of research whilst retaining the philosophy of the previous editions. Assuming the reader has little prior knowledge of the subject, its importance, the principles of the techniques used and their applications are all carefully laid out, with over 250 clearly presented four-colour illustrations. In addition to a number of informative changes to the text throughout the book, the final four chapters have been significantly updated and extended to reflect the striking advances made in recent years in the applications of gene cloning and DNA analysis in biotechnology. Gene Cloning and DNA Analysis remains an essential introductory text to a wide range of biological sciences students; including genetics and genomics, molecular biology, biochemistry, immunology and applied biology. It is also a perfect introductory text for any professional needing to learn the basics of the subject. All libraries in universities where medical, life and biological sciences are studied and taught should have copies available on their shelves. ... the book content is elegantly illustrated and well organized in clear-cut chapters and subsections... there is a Further Reading section after each chapter that contains several key references... What is extremely useful, almost every reference is furnished with the short but distinct author's remark. -Journal of Heredity, 2007 (on the previous edition)

**ligated definition biology: DNA** James D. Watson, Andrew Berry, 2009-01-21 Fifty years ago, James D. Watson, then just twentyfour, helped launch the greatest ongoing scientific quest of our time. Now, with unique authority and sweeping vision, he gives us the first full account of the genetic revolution—from Mendel's garden to the double helix to the sequencing of the human genome and beyond. Watson's lively, panoramic narrative begins with the fanciful speculations of the ancients as to why "like begets like" before skipping ahead to 1866, when an Austrian monk named Gregor Mendel first deduced the basic laws of inheritance. But genetics as we recognize it today—with its capacity, both thrilling and sobering, to manipulate the very essence of living things—came into being only with the rise of molecular investigations culminating in the breakthrough discovery of the structure of DNA, for which Watson shared a Nobel prize in 1962. In the DNA molecule's graceful curves was the key to a whole new science. Having shown that the secret of life is chemical, modern genetics has set mankind off on a journey unimaginable just a few decades ago. Watson provides the general reader with clear explanations of molecular processes and emerging technologies. He shows us how DNA continues to alter our understanding of human origins, and of our identities as groups and as individuals. And with the insight of one who has remained close to every advance in research since the double helix, he reveals how genetics has unleashed a wealth of possibilities to alter the human condition—from genetically modified foods to genetically modified babies—and transformed itself from a domain of pure research into one of big business as well. It is a sometimes topsy-turvy world full of great minds and great egos, driven by ambitions to improve the human condition as well as to improve investment portfolios, a world vividly captured in these pages. Facing a future of choices and social and ethical implications of which we dare not remain uninformed, we could have no better guide than James Watson, who leads us with the same bravura storytelling that made The Double Helix one of the most successful books on science ever published. Infused with a scientist's awe at nature's marvels and a humanist's profound sympathies, DNA is destined to become the classic telling of the defining scientific saga of our age.

**ligated definition biology: Pre-mRNA Processing** Angus I. Lamond, 2014-08-23 In the past fifteen years have seen tremendous growth in our understanding of the many post-transcriptional processing steps involved in producing functional eukaryotic mRNA from primary gene transcripts (pre-mRNA). New processing reactions, such as splicing and RNA editing, have been discovered and detailed biochemical and genetic studies continue to yield important new insights into the reaction

mechanisms and molecular interactions involved. It is now apparent that regulation of RNA processing plays a significant role in the control of gene expression and development. An increased understanding of RNA processing mechanisms has also proved to be of considerable clinical importance in the pathology of inherited disease and viral infection. This volume seeks to review the rapid progress being made in the study of how mRNA precursors are processed into mRNA and to convey the broad scope of the RNA field and its relevance to other areas of cell biology and medicine. Since one of the major themes of RNA processing is the recognition of specific RNA sequences and structures by protein factors, we begin with reviews of RNA-protein interactions. In chapter 1 David Lilley presents an overview of RNA structure and illustrates how the structural features of RNA molecules are exploited for specific recognition by protein, while in chapter 2 Maurice Swanson discusses the structure and function of the large family of hnRNP proteins that bind to pre-mRNA. The next four chapters focus on pre-mRNA splicing.

**ligated definition biology:** Concepts in Biology' 2007 Ed.2007 Edition ,

**ligated definition biology:** RNA - Ligand Interactions, Part A: Structural Biology Methods , 2000-05-30 RNA-Ligand Interactions, Part A focuses on structural biology methods. Major topics covered include semisynthetic methodologies (RNA synthetic methods and derivatization of RNA); RNA structure determination (X-ray crystallography, NMR, EM); techniques for monitoring RNA conformation and dynamics (solution methods and electrophoretic and spectroscopic methods); and modeling tertiary structure: Part B, its companion Volume 318 of Methods in Enzymology, focuses on molecular biology methods. The critically acclaimed laboratory standard for more than 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. Now with more than 300 volumes (all of them still in print), the Series contains much material still relevant today--truly an essential publication for researchers in all fields of life sciences.

**ligated definition biology: Chemical Ligation** Luca D. D'Andrea, Alessandra Romanelli, 2017-03-16 Presenting a wide array of information on chemical ligation – one of the more powerful tools for protein and peptide synthesis – this book helps readers understand key methodologies and applications that protein therapeutic synthesis, drug discovery, and molecular imaging. • Moves from fundamental to applied aspects, so that novice readers can follow the entire book and apply these reactions in the lab • Presents a wide array of information on chemical ligation reactions, otherwise scattered across the literature, into one source • Features comprehensive and multidisciplinary coverage that goes from basics to advanced topics • Helps researchers choose the right chemical ligation technique for their needs

**ligated definition biology: Molecular Biology and Genetic Engineering** P. K. Gupta, 2008 PART I Molecular Biology 1. Molecular Biology and Genetic Engineering Definition, History and Scope 2. Chemistry of the Cell: 1. Micromolecules (Sugars, Fatty Acids, Amino Acids, Nucleotides and Lipids) Sugars (Carbohydrates) 3. Chemistry of the Cell . 2. Macromolecules (Nucleic Acids; Proteins and Polysaccharides) Covalent and Weak Non-covalent Bonds 4. Chemistry of the Gene: Synthesis, Modification and Repair of DNA DNA Replication: General Features 5. Organisation of Genetic Material 1. Packaging of DNA as Nucleosomes in Eukaryotes Techniques Leading to Nucleosome Discovery 6. Organization of Genetic Material 2. Repetitive and Unique DNA Sequences 7. Organization of Genetic Material: 3. Split Genes, Overlapping Genes, Pseudogenes and Cryptic Genes Split Genes or .Interrupted Genes 8. Multigene Families in Eukaryotes 9. Organization of Mitochondrial and Chloroplast Genomes 10. The Genetic Code 11. Protein Synthesis Apparatus Ribosome, Transfer RNA and Aminoacyl-tRNA Synthetases Ribosome 12. Expression of Gene . Protein Synthesis 1. Transcription in Prokaryotes and Eukaryotes 13. Expression of Gene: Protein Synthesis: 2. RNA Processing (RNA Splicing, RNA Editing and Ribozymes) Polyadenylation of mRNA in Prokaryotes Addition of Cap (m7G) and Tail (Poly A) for mRNA in Eukaryotes 14. Expression of Gene: Protein Synthesis: 3. Synthesis and Transport of Proteins (Prokaryotes and Eukaryotes) Formation of Aminoacyl tRNA 15. Regulation of Gene Expression: 1. Operon Circuits in Bacteria and

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**ligated definition biology:** Plant Molecular Biology — A Laboratory Manual Melody S. Clark, 2013-11-27 Covering the whole range of molecular biology techniques - genetic engineering as well as cytogenetics of plants -, each chapter begins with an introduction to the basic approach. followed by detailed methods with easy-to-follow protocols and comprehensive troubleshooting. The first part introduces basic molecular methodology such as DNA extraction, blotting, production of libraries and RNA cloning, while the second part describes analytical approaches, in particular RAPD and RFLP. The manual concludes with a variety of gene transfer techniques and both molecular and cytological analysis. As such, this will be of great use to both the first-timer and the experienced scientist.

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**ligated definition biology:** *Guide to Protein Purification* Richard R Burgess, Murray P. Deutscher, 2009-11-03 *Guide to Protein Purification*, Second Edition provides a complete update to existing methods in the field, reflecting the enormous advances made in the last two decades. In particular, proteomics, mass spectrometry, and DNA technology have revolutionized the field since the first edition's publication but through all of the advancements, the purification of proteins is still an indispensable first step in understanding their function. This volume examines the most reliable, robust methods for researchers in biochemistry, molecular and cell biology, genetics, pharmacology and biotechnology and sets a standard for best practices in the field. It relates how these traditional and new cutting-edge methods connect to the explosive advancements in the field. This Guide to

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**ligated definition biology: Biology and Treatment of Colorectal Cancer Metastasis** Anthony J. Mastromarino, 2012-12-06 The theme of the current workshop was identified several years ago and was considered by the working group of the National Large Bowel Cancer Project to be an appropriate workshop topic. Although the subject was important then, it was not possible to conduct such a workshop at that time. In the interim, not only did the problems associated with colorectal metastasis still exist, but new insights on the biology and treatment of colorectal cancer metastasis emerged, making the workshop topic especially important and relevant. With input from an expert Planning Committee, a unique program was designed to provide an opportunity for information

exchange between basic scientists and clinical investigators. The published proceedings reflect the organization of the workshop which consisted of five sections: Section I. The Biology of Colorectal Cancer Metastasis co-chaired by Drs. J. Isaiah Fidler and George Poste Controversies in the Management of Patients with Colorectal Cancer Section II.

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