

Act 4.1: ATP—The free energy carrier 4/21/23

Total: 75

points

How does the ATP molecule capture, store, and release energy?

Why?

A sporting goods store might accept a \$100 bill for the purchase of a bicycle, but the corner store will not take a \$100 bill when you buy a package of gum. That is why people often carry smaller denominations in their wallets—it makes everyday transactions easier. The same concept is true for the energy transactions in cells. Cells need energy (their "currency") to take care of everyday functions, and they need it in many denominations. As humans we eat food for energy, but food molecules provide too much energy for our cells to use all at once. For quick cellular transactions, your cells store energy in the small molecule of ATP. This is analogous to a \$1 bill for your cells' daily activities.

Each question: 5 points

Model 1 – Adenosine Triphosphate (ATP)



1. The diagram of ATP in Model 1 has three parts. Use your knowledge of biomolecules to label the molecule with an "adenine" section, a "ribose sugar" section, and a "phosphate groups" section.

2. Refer to Model 1.

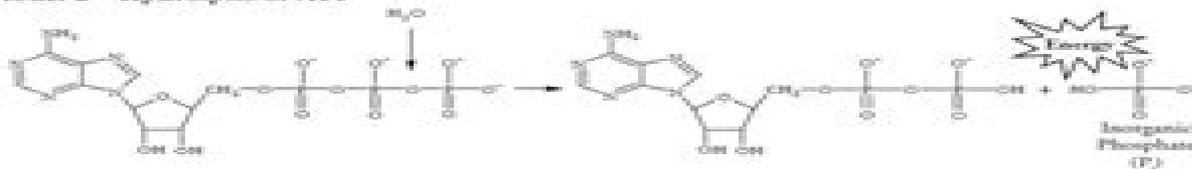
a. What is meant by the "tri-" in the name adenosine triphosphate?

- three phosphates.

b. Discuss with your group what the structure of adenosine diphosphate (ADP) might look like. Draw or describe your conclusions.

- It is the same as ATP but just with 2 phosphates.

Model 2 – Hydrolysis of ATP



3. Model 2 illustrates a chemical reaction. Write the reaction as an equation, using the name or abbreviation of each of the two reactants and each of the three products.

- $ATP + H_2O \rightarrow ADP + P_i + \text{energy}$.

4. Consider the structural formulas of ATP, ADP, and phosphate in Model 2 carefully. What happens to the atoms from the water molecule during the hydrolysis of ATP?

- Water is fit into the ADP molecule and in the formation of inorganic phosphate.

Atp Pogil Answers

Masahiro Kinoshita



Atp Pogil Answers:

ATP and the Heart Joanne S. Ingwall, 2012-12-06 ATP plays a central role in the two leading causes of cardiac morbidity and mortality in the western world ischemia and heart failure We are in our infancy applying what is known about biology and chemistry of ATP toward developing effective therapies for these diseases In this volume the current understanding of the chemistry and biology of ATP specifically in the cardiomyocyte is presented New insights into ATP have been gleaned using biophysical techniques allowing dynamic measurement of chemical events in the intact beating heart and using new animal models in which cardiac proteins are either over expressed deleted or harbor specific mutations This book provides a summary of the basic understanding and includes illustrations of why ATP and the Heart is important to both the clinician and scientist Molecular Structure, Function, and Assembly of the ATP Synthases Sangkot Marzuki, 2012-12-06

In recent years the ATP synthase H ATPase FoFrATPase has been the subject of intensive investigations in many laboratories The major reason for this lies in the fact that this enzyme complex catalyses one of the most important reactions in living cells namely the synthesis of ATP utilizing the energy from an electrochemical transmembrane H gradient generated by the cellular respiratory chain or by the light reactions of photosynthetic organisms The mechanism by which the H motive force is utilized to drive the synthesis of ATP is one of the major unsolved problems in biochemistry Thus the fundamental information concerning the molecular structure and the mechanism of assembly of the ATP synthase is of major significance in cell biology A seminar workshop on the Molecular Structure Function and Assembly of the ATP synthases was held in April 1987 at the East West Center University of Hawaii Honolulu Hawaii to promote exchange of information between laboratories actively engaged in the study of the ATP synthases and to provide a forum for discussion and coordination of data derived from molecular genetic and biochemical approaches used in different laboratories This volume summarizes the result of the seminar workshop in the form of a collection of papers presented at the meeting and provides an overview of current work in this rapidly progressing area of research

Bioenergetics Baltazar D. Reynafarje, 2014-10-31 This book is designed to provide new trends of thought concerning the transformation of free energy that occur in living cells and between living cells and their environment **Energy-Transducing ATPases - Structure and Kinetics** Yuji

Tomomura, 1986-07-31 Professor Tomomura's book explains at the molecular level how cells use energy harnessed as adenosine triphosphate to perform the fundamental physiological functions such as muscle contraction and the active transport of cations A well written interesting account of the structure and kinetics of energy transducing ATPases

Handbook of ATPases Masamitsu Futai, Yoh Wada, Jack H. Kaplan, 2006-01-24 ATP dependent active ion transport enables cells to regulate their pH value and to control their ion composition The reverse process transforming an ion imbalance into chemical energy drives mitochondrial and chloroplast ATP synthesis The mediators of these fundamental processes are ion motive ATPases highly conserved enzymes that play key roles in cell physiology from bacteria to man As the first

comprehensive overview of this important class of enzymes this handbook summarizes recent knowledge about the molecular mechanism of ATPases relating this information to the physiology and pathophysiology of ion transport mitochondrial function vesicle transport and lysosomal acidification All important P type F type and V type ATPases are treated systematically complemented by a special section on the cell biology and physiology of acidic compartments and backed by an extensive bibliography and index This premier reference source for physiologists molecular biologists biophysicists and clinical researchers contains contributions by the world's foremost ATPase research groups

ATP Synthase in Photosynthetic Organisms, 2020-09-18 Advances in Botanical Research Volume 96 highlights new advances in the field with this new volume presenting interesting chapters on the Structure and supramolecular architecture of chloroplast ATP synthase Chloroplast ATP Synthase from Green Microalgae Subunit movements in H ATPases from chloroplasts detected by single molecule FRET Regulation and control of the chloroplast ATP synthase mechanisms and impact on maintaining efficient photosynthesis and photoprotection Regulation machineries of ATP synthase from phototroph How do we understand the formation of Δ pH in photosynthesis Regulation of photosynthesis by cyclic electron transport around photosystem and the Biogenesis regulation of chloroplast ATP synthase Presents the most recent biological knowledge and advances on ATP Synthase in Photosynthetic Organisms Content covers innovations to biotechnological aquacultural and chemical developments about ATP Synthase in Photosynthetic Organisms Written by the most experienced authors in the field

The Role of Water in ATP Hydrolysis Energy Transduction by Protein Machinery Makoto Suzuki, 2018-05-07 This book introduces recent progress in biological energetics from ATP hydrolysis to molecular machineries The role of water is now recognized to be essential in biological molecular energetics Although energetics is a rather distant field to many biologists any working models for protein machineries such as protein motors transporters and other enzymes must be consistent with their energetics Therefore the book is intended to help scientists build systematic models of biomolecular functions based on three categories 1 ATP hydrolysis reactions including ionic hydration and protonation deprotonation of biomolecules 2 protein ligand protein protein interactions including hydration dehydration processes and 3 functioning mechanisms of protein machineries based on water functions

The Mechanism of ATP Hydrolysis in Nitrogenase Using Tetralabeled Phosphate and ATP Stephan Oswald Krause, 1999

The Role of Water in ATP Hydrolysis Energy Transduction by Protein Machinery Makoto Suzuki, 2018 This book introduces recent progress in biological energetics from ATP hydrolysis to molecular machineries The role of water is now recognized to be essential in biological molecular energetics Although energetics is a rather distant field to many biologists any working models for protein machineries such as protein motors transporters and other enzymes must be consistent with their energetics Therefore the book is intended to help scientists build systematic models of biomolecular functions based on three categories 1 ATP hydrolysis reactions including ionic hydration and protonation deprotonation of biomolecules 2 protein ligand protein protein interactions

including hydration dehydration processes and 3 functioning mechanisms of protein machineries based on water functions

Studies on the Mechanism of ATP Synthesis in Energy Transducing Systems Jeff Boork,1984 *Cell ATP* William A. Bridger,Joseph Frank Henderson,1983 **Dynamics of ATP, PCr, Pi and H During Exercise and Recovery** Daniel J. McCann,1989 **The Effect of AMP·PNP on ATP Hydrolysis Catalysed by Beef Heart Submitochondrial Particles and F1-ATPase [microform]** Kastelic, Tania,1987 **Mechanism of Functional Expression of F1-ATPase** Masahiro Kinoshita,2021-02-15 This book presents a new view of the mechanism of functional expression of ATP driven motors proteins or protein complexes It is substantially different from the prevailing idea that the motor converts chemical energy to mechanical work To facilitate understanding the differences between the new and prevailing views are explained using many illustrations The book is of interest to those who are not convinced of the notion of chemo mechanical coupling The claims presented are the following The system which comprises not only the motor but also water does no mechanical work during the ATP hydrolysis cycle a protein is moved or a protein in the complex is rotated by the entropic force generated by water The highlight of the explanation in the book is that the mechanism of unidirectional rotation of the central shaft in F1 ATPase is discussed in detail on the basis of this new view The hydration entropy of each subunit to which a specific chemical compound ATP ADP and Pi Pi or nothing is bound the hydration entropy of the 3 3 complex and the dependence of the hydration entropy of F1 ATPase on the orientation of the subunit play essential roles **Kinetics of ATP Hydrolysis by Myosin** Jane F. Koretz,1974 Mechanistic Insights Into ATP Hydrolysis by the ABC Transporter TAP Min Chen,2004 Adenosine Triphosphate Ebert Kuester,Traugott Gisa Kuester Ebert,Gisa Traugott,2014-05-14 Every organism needs energy for life To satisfy this need the so called molecular currency adenosine triphosphate ATP is ubiquitously used for intracellular chemical energy transfer processes and therefore constitutes the universal form of directly available energy within cells In this book the authors discuss the chemical properties biosynthesis and functions in cells of ATP Topics include ATP as a sperm movement energizer the hydrolysis reaction of adenosine triphosphate molecules and bio energy transport in the cell the use of exogenous ATP to stimulate the growth of human tissue engineered cartilage ATP in experimental liver surgery the functional role of cerebral ATP levels in body weight regulation ATP as a potential mediator of the aging process and involvement of extracellular ATP and derivatives in trichomonas vaginalis infection *The Effects of MG2, ATP and ADP on ATP Hydrolysis and Electron Transfer by Azotobacter Vinelandii Nitrogenase* Sotaro Kotake,1980 *Adenosine Triphosphate (ATP) Levels in Microbial Cultures and a Review of the ATP Biomass Estimation Technique* A. A. Qureshi,Jayantkumar Patel,1976 *ATP Optimization in the Body* Christopher Lively,2025-11-27 Overcome Fatigue Naturally Master Cellular Energy Boost Vitality with ATP Optimization Are you struggling with persistent fatigue low energy and a lack of inspiration ATP Optimization in the Body Optimize Your Natural Vitality Experience Boundless Energy is your new solution to understanding and boosting your body s natural power source so you can better experience life to the fullest

This highly informative book dives into the science of Adenosine Triphosphate ATP the essential cellular energy currency that fuels every function in your body Learn how to combat fatigue at its root cause and unlock a new level of natural vitality Inside this science backed guide you will Optimize ATP Production Discover how to maximize the creation of this vital energy molecule Conquer Chronic Fatigue Move beyond quick fixes to address the underlying issues of low energy Elevate Physical Performance Fuel your workouts and daily life with sustained energy Enhance Cognitive Function Achieve sharper mental clarity focus and memory Support Youthful Energy Counteract age related energy decline for sustained vitality Improve Emotional Well being Understand the direct link between cellular energy and mood Implement Actionable Lifestyle Changes Practical strategies for nutrition exercise sleep and stress management ATP Optimization in the Body provides a comprehensive roadmap to a more energized and fulfilling life Empower yourself with the knowledge and tools to cultivate sustainable natural energy from within free from caffeine dependence and temporary solutions This book is ideal for individuals seeking to Increase energy levels naturally Overcome chronic fatigue Improve athletic performance Enhance cognitive function Support overall health and well being Understand cellular energy production Live a more vibrant and productive life Don t let low energy dictate your life It s time to tap into your body s full potential Order your copy of ATP Optimization in the Body How to Start Having More Energy and upgrade your quality of life in a way you may not have thought possible

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