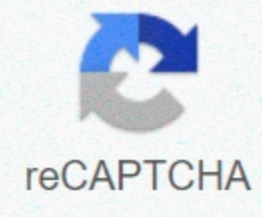




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Chatterjea Textbook of Medical Biochemistry PDF 8th Edition is one of the top and best selling medical biochemistry book read by many students across the world. Although there are many books for medical biochemistry available in the market, but many of books are voluminous and are difficult for students of medicine to handle if you can Medical Biochemistry pdf by chatterjea from the link given at the end of this review. If you are a new medical student and looking for best medical biochemistry book, then you must read this review till the end. Overview The eighth edition of Textbook of Medical Biochemistry provides a concise, comprehensive overview of biochemistry, with a clinical approach to understand disease processes. Beginning with an introduction to cell biology, the book continues with an analysis of biomolecule chemistry, molecular biology and metabolism, as well as chapters on diet and nutrition, biochemistry of cancer and AIDS, and environmental biochemistry. Each chapter includes numerous images, multiple choice and essay-style questions, as well as highlighted text to help students remember the key points. About Authors Of This Book: This book has been written by two authors Namely MN CHATTERJEA AND RANA SHINDE, who possess considerable experience in teaching biochemistry to medical students in Indian universities. Key Features of Chatterjea Textbook of Medical Biochemistry PDF 8th Edition: Some of the key features of Chatterjea Textbook of This book is one of the top rated medical biochemistry books across the world. This book is one of the best book of Medical Biochemistry. This book is more detailed than other books given above. This book has various clinical notes and case studies. This book has various comparison boxes that help students to have a better understanding of the topic. There are questions and MCQs at the end of each chapter that helps students in the preparation of exams. There are 8 editions of this book, which means that this book is widely used and free from any mistakes etc. This is one of the most used biochem books in Asia but is also used in other parts of the world. This book is spread over 40 chapters, and every topic has been explained with necessary details. There is six section of the book which are: i. Cell biology ii. Chemistry of Biomolecules iii. Molecular Biology iv. Metabolism v. Clinical Biochemistry vi. Miscellaneous At the beginning of each chapters major concepts and specific objectives are there. So that student can know what to study and learn. The whole book is molded in such away that student can do self-study easily. Each topic in the books seems to be self-explanatory. Chemical formulae and chemical equations have been restricted to a minimum and used to explained reactions. At the end of each chapter "essay type" or "short notes type" question are also there, which helps in memorizing the particular topics. There are also 15 to 30 MCQs with an answer at the end of each chapter which is very helpful to medical students for their practice. This book also contain clinical notes. There is 8th edition of this book and are regularly receives updates from time to time. As this book has 8th editions so far, thus it has been totally free of errors and mistakes. This book is widely distributed across the Asia and many other parts of the world. Also check; Product details Paperback: 876 pages Publisher: Jaypee Brothers Medical Pub; 8 edition (November 30, 2011) Language: English ISBN-10: 9789350254844 ISBN-13: 978-9350254844 ASIN: 9350254840 Download Chatterjea Textbook of Medical Biochemistry PDF 8th Edition: You can download Chatterjea Textbook of Medical Biochemistry PDF 8th Edition free below: Download Link Disclaimer: This site complies with DMCA Digital Copyright Laws.Please bear in mind that we do not own copyrights to the book/software. 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About Jaypee Brothers Medical Publishers Jaypee Brothers Medical Publishers has been publishing the most reliable and widely-used medical books and study resources, from undergraduate levels through to the rest of the professional careers of people in the medical field. It was established in the year 1969. Some of the books published by Jaypee Brothers Medical Publishers are 100 Cases Histories in Clinical Medicine for MRCP, 50 Cases in Clinical Cardiology: A Problem Solving Approach, A Color Atlas of Minimal Access Surgery in Children (with CD-ROM), and A Complete Manual of Hospital Instruments and Procedures for Medical Students, among others. 1. Textbook of Medical Biochemistry 2. Textbook of Medical Biochemistry Eighth Edition Dr (Brig) MN Chatterjea BSc MBBS DCP MD (Biochemistry) Ex-Professor and Head, Department of Biochemistry Armed Forces Medical College, Pune, Maharashtra, India Christian Medical College and Hospital, Ludhiana, Punjab, India MGM Medical College, Aurangabad, Maharashtra, India (Specialist in Pathology and Ex-Reader in Pathology) Rana Shinde PhD FACB MRC Path (Chemical Pathology) Professor and Head and Chief, Chemical Pathologist Department of Biochemistry, SSR Medical College Belle Rive, Mauritius Ex-Reader and Consultant, Department of Biochemistry Christian Medical College and Hospital, Ludhiana, Punjab, India Ex-Professor, Department of Biochemistry JN Medical College, Belgaum, Karnataka, India Formerly Wanless Hospital Miraj and Christian Medical College and Hospital, Ludhiana, Punjab, India Forewords T Venkatesh Vijaykant B Kampli C Sita Devi KP Sinha JAYPEE BROTHERS MEDICAL PUBLISHERS (P) LTD New Delhi • Panama City • London © 3. 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Inquiries for bulk sales may be solicited at: jaypee@jaypeebrothers.com This book has been published in good faith that the contents provided by the authors contained herein are original, and is intended for educational purposes only. While every effort is made to ensure a accuracy of information, the publisher and the authors specifically disclaim any damage, liability, or loss incurred, directly or indirectly, from the use or application of any of the contents of this work. If not specifically stated, all figures and tables are courtesy of the authors. Where appropriate, the readers should consult with a specialist or contact the manufacturer of the drug or device. Publisher: Jitendar P Vij Publishing Director: Tarun Duneja Editor: Richa Saxena Cover Design: Seema Dogra Textbook of Medical Biochemistry First Edition : 1993 Second Edition : 1995 Third Edition : 1998 Fourth Edition : 2000 Fifth Edition : 2002 Sixth Edition : 2005 Seventh Edition : 2007 Eighth Edition : 2012 ISBN 978-93-5025-484-4 Printed at © 4. "Today's Biochemistry is Tomorrow's Medicine" rightly said by many is truly justified by Dr (Brig) MN Chatterjea and Dr Rana Shinde in their Textbook of Medical Biochemistry. Authors' sincere efforts are appreciated both by students and faculty who have been using this book, which is meeting most of the requirements of MCI regulations. I have found lot of appreciation and greater acceptance in India and abroad for which authors have put in special efforts to cover wide spectrum of current topics in medical biochemistry through constant review and changes from time-to- time. This popular book itself is a good guide and a tool to both undergraduate students and teachers in medical biochemistry. Prof T Venkatesh PhD FACBI Director National Referral Centre for Lead Poisoning in India Professor, Department of Biochemistry and Biophysics Past President, ACBI St John's National Academy of Health Sciences Bengaluru, Karnataka, India FOREWORD 5. I am very happy to write the foreword for this edition of the Textbook of Medical Biochemistry. In keeping with its prior editions, the authors have given full attention to include the advancements occurred in the field of clinical biochemistry. I am a practicing clinical chemist in community hospital who used tools in basic concepts of the subject, when teaching students the art and science of clinical biochemistry. I encourage the teachers in medical schools in India and abroad to use the book for teaching the subject of clinical biochemistry. I am a strong advocate of teaching the fundamental concepts in biochemistry to medical students, clinical laboratory technologists and clinical pathologists to advance their understanding of the subject. The authors are well-known teachers and have spent decades in this field. This edition is enriched with relevant subject information for those who are seeking to understand medical biochemistry. I recommend the book for medical students at undergraduate as well as postgraduate levels. I am sure the medical college community in India and abroad will welcome this edition of Textbook of Medical Biochemistry. Dr Vijaykant B Kampli PhD MBA FACB DABCC Director Quality Assurance and Point of Care Testing Former Director, Clinical Biochemistry Department of Pathology Norwalk Hospital Norwalk, Connecticut, USA FOREWORD 6. The discipline of biochemistry has expanded by leaps and bounds. It is an independent subject with a separate examination in almost all medical colleges. Though there are a few books on biochemistry written by Indian authors, there is need for a comprehensive yet simplified textbook. I am happy that the Textbook of Medical Biochemistry, written by Dr (Brig) MN Chatterjea and Dr Rana Shinde, fulfills this need. Both authors have long experience in teaching biochemistry to undergraduate and postgraduates. They have tried their best to make the text simple and lucid and at the same time have also incorporated the recent developments in the subject. The textbook is useful not only for undergraduates but also for postgraduates in biochemistry and others registering for diploma examination of the National Board of Examinations. I hope the book will receive appreciation as well as encouragement from all biochemists. Dr C Sita Devi MD FAMS FIMSA Vice President-Lab Services Retd. Principal and Professor Department of Biochemistry Andhra Medical College Vishakhapatnam, Andhra Pradesh, India FOREWORD 7. I am pleased to go through the Textbook of Medical Biochemistry written by Dr (Brig) MN Chatterjea and Dr Rana Shinde. The book makes a lucid reading, is full of necessary facts for medical students, and the text is clinically oriented. Both the authors are well-known teachers of repute and have really tried to make the book simple as well as useful for medical students at undergraduate and postgraduate levels. The book though similar to many other such textbooks, is unique for its clarity and comprehension. I am sure students and teachers will gladly accept the book. Dr KP Sinha MD PhD (Lond) Ex-Professor and Head Department of Biochemistry Patna Medical College Patna, Bihar, India FOREWORD 8. It is a great pleasure to present the Eighth Edition of Textbook of Medical Biochemistry to our beloved teachers and students. The main framework of the book has been retained, without much changes, new additions have been made, some portions rewritten in certain chapters. Few teachers wanted that the university question types and MCQs be added at the end of each chapter which were in existence in first three editions but later removed to reduce pages. To quote, "I suggest that short type of questions and multiple choice questions should be included at the end of each chapter in future edition of the book." We have included the same in the topics pertaining to MBBS. We feel confident that this edition will fulfil the requirement of the undergraduate students as per MCI recommendations and also meet the needs and expectations of postgraduate students of Biochemistry. As the book is clinically oriented, it will be of much help to PG students of other disciplines, viz. Pathology/medicine/pediatrics, etc. Colour printing has been used to make the book more attractive, easy recording and highlighting the important portions like Clinical Aspects/Significance and Biochemistry Importance. The overall objective of the book has been to provide concise yet authoritative coverage on the basics of Biochemistry with clinical approach to understand the disease processes. The important points in the text to be remembered by the students have been highlighted in bold and italicised prints. We do not claim to the perfect. Errors/mistakes may creep-up due to oversight/or printing errors. We shall look forward for any valuable comments and useful suggestions from teachers and students so that errors are rectified and suggestions are taken into account for future. We sincerely thanks Shri Jitendar P Vij (Chairman and Managing Director), Mr PG Bandhu (Director-Sales), and Mr Tarun Duneja (Director-Publishing) for their untiring work and keen efforts to bring out the new revised edition of the book. Dr (Brig) MN Chatterjea Rana Shinde PREFACE TO THE EIGHTH EDITION 9. Biochemistry holds a key position in the curricula of medical colleges under Indian universities, and is one of the basic preclinical science subjects for first professional MBBS students. Biochemistry is being transformed with astonishing rapidity and current efflorescence in the knowledge in this subject has necessitated that it should be learnt separately from physiology. The three basic science subjects make a plinth for the house of medicine. A sound and comprehensive learning of biochemistry will help a medical student understand medicine and pathology more clearly. A large number of books on biochemistry for medical students are available in the market—both international and Indian. Many of the international books are voluminous and too difficult for our students of medicine to handle and comprehend. The Textbook of Medical Biochemistry for the medical students is the outcome of the joint efforts of a medical and a nonmedical biochemist, who possess considerable experience in teaching biochemistry to undergraduate and postgraduate medical students of Indian universities. We have tried our utmost to ensure that the language used is lucid and simple, makes an easy-reading, and the text provides an intelligent and comprehensive study. At the same time, we have attempted to maintain a high standard after incorporating the recent developments and concepts. Though the book is primarily meant for the first professional MBBS students, certain chapters have been dealt with in greater detail to meet the requirements of postgraduates, viz. MSc, MD (Biochemistry) students and those preparing for Diplomat in NBE. It meets the requirements of students of medical, dental science, agricultural science, home science, and others who have to take a basic course in biochemistry. The text of the book is spread over 40 chapters and special mention has been made to introduce to the reader some recent topics such as cyclic nucleotides—cyclic AMP and cyclic GMP, prostaglandins, prostacyclins, throm- boxanes and leukotrienes, immunoglobulins, recombinant DNA technology, clinical significance of enzymes and isoenzymes, radioisotopes and their clinical and therapeutic uses, etc. Recently, much importance has been given to self-study by students in small groups and to avoid or to restrict to the minimum the traditional way of learning based on "didactic" lectures. Keeping this in view, we have included in the beginning of each chapter the "major concepts" and "specific objectives" of the chapter for the information of the readers so that medical students know what to study and learn. The text of each chapter has been written keeping in view the objectives so that students can make a self-study. We wish to emphasise that these are "behavioural objectives" and are self-explanatory. In our several years of teaching experience, we have observed that medical students have a "fear-complex" that biochemistry involves too many structural formulae and chemical equations. Though this is unavoidable to some extent for proper understanding of the subject, we have tried to restrict the chemical formulae to the minimum and used them to explain certain reactions. At the end of each chapter we have given "essay type" or "short notes type" questions which we have compiled from the examination papers of different Indian universities. It will be seen that there is repetition of some questions, but the framing of the question and language is different. We have also tried to give some 15 to 30 MCQs (with answers at the end) in each chapter which may be useful for the medical students for their homework. While writing the chapters and compiling the questions, we have consulted syllabi of several Indian universi- ties to cover all the topics prescribed for undergraduate and postgraduate medical students. We have included a large number of tables and comparative discussions wherever possible to meet the needs of the students. Our aim has been to provide a comprehensive, self-contained textbook of biochemistry to effectively satisfy the curricular requirements of medical students of Indian universities. PREFACE TO THE FIRST EDITION 10. xii Textbook of Medical Biochemistry In addition, our main target has been to make the book clinically-oriented. We have given the clinical significance and biomedical importance wherever it is applicable. Biochemical aspects of certain pathological conditions, specially those due to abnormal metabolism, have been discussed in detail. We earnestly hope that the book will be of help to both the undergraduate and postgraduate medical students and their teachers. No one can be perfect, and there could have been some flaws or shortcomings in the book. We will welcome constructive criticism and comments, if any, along with fruitful suggestions to improve the text in its future editions. In writing a textbook of this nature, one has to take help from others and this book is no exception. We are highly indebted to our colleagues and friends, and other authors whom we have consulted in compiling this book. Our thanks to Mrs KN Valsa and Mrs Gracy for their untiring efforts and forbearance in typing the manu- script. We are also grateful to Shri Jitendar P Vij (Chairman and Managing Director), and Mr YN Arjuna, Editorial and Publishing Consultant, of Jaypee Brothers Medical Publishers (P) Ltd, for their sincere and untiring efforts in transforming the typed manuscript to printed form. MN Chatterjea Rana Shinde 11. 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Biochemistry of Ageing 851 • Definition of Ageing 851 • Life Span and Life Expectancy 851 • Ageing Theories 851 • In Search of the Secrets of Ageing 852 • Oxygen Radicals 853 • Antioxidants and Ageing Gerbils 853 • Glucose Crosslinking 853 • DNA Repair 854 • Heat Shock Proteins 855 • Hormones 855 • Hormones and Research on Ageing 855 • Hormone Replacement 856 • Growth Factors 856 • Role of Dopamine Receptors in Ageing 856 • Macular Degeneration of Eye 857 Bibliography 859 Index 861 16. Major Concept To study the molecular and functional organisation of a cell and its subcellular organelles. Specific Objectives 1. To know importance of cell, and the types: Prokaryotic and eukaryotic cell. 2. Learn the essential differences of a prokaryotic cell and eukaryotic cell. 3. Draw a diagram of an eukaryotic cell showing different cell organelles. 4. Study the following cellular organelles: • Nucleus—its structure and functions. • Mitochondrion, the power house of a cell. Learn its structure and functions. • Study endoplasmic reticulum, its types, structure and functions. • Learn structure and functions of golgi complexes. • Study about lysosomes, their functions, inherited disorder— cell disease. • Learn about peroxisomes: Their structure and functions. • Study the structure and functions of cytoskeleton. Characteristics • It has a minimum of internal organisation and smaller in size • It does not have any membrane bound organelles. • Its genetic material is not enclosed by a nuclear membrane • Its DNA is not complexed with histones. Histones are not found in prokaryotic cells • Its respiratory system is closely associated with its plasma membrane and • Its sexual reproduction does not involve mitosis or meiosis. 2. Eukaryotic Cells The eukaryotic cells (Greek: Eu=true and karyon-nucleus) include the protists, fungi, plants and animals including humans. Cells are larger in size (Fig. 1.1). Characteristics • It has considerable degree of internal structure with a large number of distinctive membrane enclosed having specific functions • Nucleus is the site for informational

of large particles like viruses, bacteria, cells, or debris by macrophages and granulocyte. They extend pseudopodia and surround the particles to form phagosomes which later fuse with lysosomes to form Phagolysosomes in which the particles are digested. Biochemical mechanism is called respiratory burst, in which O₂ consumption is increased and lead to formation of superoxide ion O₂⁻. Superoxide anion O₂⁻ is converted to H₂O₂ and other free radicals OH[•] and OCl⁻, etc. which are potent microbial agent. O₂⁻ + O₂⁻ + 2H⁺ → H₂O₂ + O₂ The electron transport chain system responsible for the “respiratory burst” is “NADPH oxidase”. In resting phagocyte it is in an inactive form, consisting of cytochrome b 558 + two polypeptides (heterodimer). The NADPH oxidase system is activated by recruitment in plasma membrane by two more cytoplasmic polypeptides. Thus: 2 Cytoplasmic polypeptides Cytb558 + 2 Polypeptides _____ Cytb588 (Inactive NADPH oxidase) + 4 Polypeptides (Active NADPH oxidase) NADPH oxidase is activated upon contact with various ligands like complement fragment C5a, chemotactic peptides, etc. Events resulting in activation of the NADPH oxidase system involve G proteins, activation of phospholipase C and generation of inositol-1, 4, 5-triphosphate (P3). The P3 mediates a transient increase in the level of cytosolic Ca⁺⁺, which is essential for the induction of the respiratory burst. Killing of bacteria within phagolysosomes appears to depend on the combined action of elevated pH, superoxide ions or other “free radicals” like H₂O₂, OH[•], and HOCl (hypochlorous acid) and on the action of certain bactericidal peptides, called defensins and other proteins, e.g. cathepsin G and certain cationic proteins present in phagocytic cells. Macrophages are extremely active and may ingest 25 per cent of their volume per hour. In such a process, a macrophage may internalize 3 per cent of its plasma membrane each minute or the entire membrane every 1/2 hour. CLINICAL ASPECT Chronic granulomatous disease has been recently implicated due to defective phagocytosis and respiratory burst. The disease is characterised by: • Recurrent infections • Widespread granuloma formation in various tissues like lungs, lymph nodes, skin, etc. Defect: The disorder is attributed to mutations in the genes encoding the four polypeptides that constitute the active NADPH oxidase system. The granulomas are formed as attempts to wall off bacteria that have not been killed due to genetic deficiencies in the NADPH oxidase system (Fig. 2.11). 2. Pinocytosis: It is a property of all cells and leads to the cellular uptake of fluid and fluid contents. (a) Fluid phase pinocytosis: It is a nonselective process in which uptake of a solute by formation of small vesicles is simply proportionate to its concentration in the surrounding extracellular fluid (ECF). The formation of these vesicles is an extremely active process. (b) Receptor mediated absorptive pinocytosis (Fig. 2.12): By coated vesicles and endosomes All eukaryotic cells have transient structures like coated vesicles and endosomes that are involved in the transport of macromolecules from the exterior of the cells to its interior. Approximately 2 per cent of the external surface of plasma membrane are covered with receptors and characteristic coated pits. Cell surfaces are rich in receptor proteins that can combine with macromolecules (ligands). The membrane bound receptors with macromolecules move laterally into “coated pits”. These coated pits are rapidly pinched off and are internalised as coated vesicles. The coated vesicles about 100 nm in diameter have a very characteristic brittle coat on their outer surface. The vesicles are covered with an unusual peripheral protein called clathrin, having molecular weight of 1,85,000. The protein dynamin which binds and hydrolyses GTP, is necessary for the pinching off of clathrin-coated vesicles from the cell surface. 32. Biological Membranes: Structure and Function 19 SECTION ONE Near the periphery of the cell's interior, another structure called endosome (also called receptosome), having diameter 0.3 to 1 µ found. They do not contain hydrolytic enzymes, are less dense than lysosomes and have an internal pH of 5.0. The internalised coated vesicles fuse with the endosomes and discharge their macromolecules into the interior of the endosomes. The low pH breaks the linkage between receptor-macromolecule, with a simultaneous release of clathrin, macromolecule, free receptors and membrane fragments, most of which recycle back to the plasma membrane to replenish the population of receptors and coated pits. The macromolecules containing endosomes now move, by the help of microtubule to further interior of the cell where they fuse with lysosomes or become associated with vesicles derived from the Golgi apparatus (Fig.2.12). Example: The low density lipoproteins (LDL) molecule bound to receptors are internalised by means of coated pits. Fig. 2.12: Receptor mediated absorptive pinocytosis CLINICAL ASPECT Receptor mediated endocytosis with viruses are responsible for many diseases, viz. • Hepatitis virus affecting liver cells • Poliovirus affecting motor neurons • AIDS affecting T cells. Iron toxicity also occurs with excessive uptake due to endocytosis. DISEASES DUE TO GENETIC MUTATIONS 1. Leber's Hereditary Optic Neuropathy (LHON) In this disease mutations in genes encoding mitochondrial membrane proteins involved in oxidative phosphorylation can produce neurologic and vision problems. 2. Cystic Fibrosis Inheritance: A recessive genetic disorder, prevalent among whites in N America and certain parts of Northern Europe. Clinical Features: The disease is characterised by: • Chronic bacterial infections of the respiratory tract and sinuses • Fat maldigestion due to pancreatic exocrine insufficiency • Infertility in males due to abnormal development of the vas deferens, and • Elevated levels of chloride in sweat, greater than > 60 mmol/L. Defect Cystic fibrosis transmembrane protein (CFTR) is a cyclic AMP dependant regulatory protein for chloride channel. Gene for CFTR has been identified on chromosome 7. This gene is responsible for encoding CFTR protein, a polypeptide of 1480 amino acids which regulates chloride channel. Genetic mutation produces an abnormal CFTR, which produces an abnormality of membrane Cl⁻ permeability resulting to increased viscosity of many bodily secretions. The commonest mutation found involves deletion of three bases resulting to loss of phenylalanine in 508 position. Prognosis: It is bad, life threatening and serious complication is recurrent lung infections due to overgrowth of bacteria in viscous secretions. Efforts are in progress to use gene therapy to restore the activity of CFTR protein. 33. Major Concepts A. What are carbohydrates? Their general properties and biomedical importance. B. List the monosaccharides of biological importance and learn their properties. C. List the disaccharides of biological importance and learn their properties. D. Study the chemistry and properties of various polysaccharides. E. Study the chemistry and functions of proteoglycans. Specific Objectives A. 1. Define carbohydrates in chemical terms. 2. Classify carbohydrates into four major groups with examples of each group. 3. Describe the biomedical importance of carbohydrates. 4. Learn the general properties of carbohydrates with reference to glucose. B. 1. List and describe the monosaccharides of biological importance, viz. trioses, tetroses, pentoses, hexoses, etc. Example of both aldoderivatives and ketoderivatives. 2. Study important properties of monosaccharides. 3. Study the sugar derivatives of biological importance. • Deoxy sugars • Amino sugars • Amino sugar acids—Neuraminic acid • Glycosides—Learn the chemistry and biological/medical importance, viz. cardiac glycosides, ouabain, phlorizin, etc. • Define “aglycone”. C. 1. List the disaccharides of biological importance. 2. Study the chemistry and properties of three important disaccharides. 3. What are invert sugars and what is “inversion”? Learn about lactulose, a Keso disaccharide and its clinical importance. 4. Differentiate sucrose from either lactose or maltose. D. Learn the chemistry and properties of polysaccharides of biological importance. a. Homopolysaccharides (homoglycans) 1. Starch: Chemistry and properties. Differentiate between amylose and amylopectin (in tabular form) 2. Glycogen (animal starch)—Chemistry and properties. 3. Inulin—Chemistry and physiological importance. 4. Cellulose —“Roughage” value. 5. Dextrins and Dextran—Differentiate. Use of dextran as plasma expander. b. Heteropolysaccharides (heteroglycans). Example—Mucopolysaccharides (glycosaminoglycans) 1. Sulphate free acid MPS—Hyaluronic acid and chondroitin 2. Sulphate containing MPS • Chondroitin sulphate—A, B, C and D • Keratan sulphate • Heparin and Heparitin sulphate 3. Neutral MPS—Blood group substances. Learn chemistry of each MPS, distribution in body, and its biological importance. Relation of MPS to mucopolysaccharidoses. E. Learn chemistry and functions of proteoglycans. CARBOHYDRATES Definition: Carbohydrates are defined chemically as aldehyde or ketone derivatives of the higher polyhydric alcohols, or compounds which yield these derivatives on hydrolysis. CLASSIFICATION Carbohydrates are divided into four major groups— monosaccharides, disaccharides, oligosaccharides and polysaccharides. CHC H C H C H C H E E E E E M I M I M I M I M I S S S S S T T T T T R R R R R R Y O F Y O F Y O F Y O F C A C A C A C A C A R B O H Y R B O H Y R B O H Y R B O H Y R B O H Y D D D D D R A R A R A R A R A T T T T T E E E E E S S S S 3

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