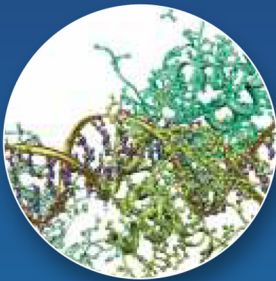
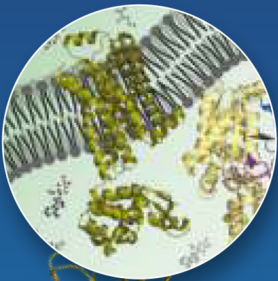


**Second
Edition**

Exam-Oriented
BIOCHEMISTRY



**S Rajan
R Selvichristy**



CBS Dedicated to Education
CBS Publishers & Distributors Pvt Ltd

Second Edition

Exam-Oriented

BIOCHEMISTRY

S Rajan MSc, PhD

Assistant Professor
Department of Microbiology
MR Government Arts College
Mannargudi

R Selvichristy MSc, MPhil

Microbiologist



CBS Publishers and Distributors Pvt Ltd

New Delhi • Bengaluru • Chennai • Kochi • Kolkata • Mumbai
Bhopal • Bhubaneswar • Hyderabad • Jharkhand • Nagpur • Patna
Pune • Uttarakhand • Dhaka (Bangladesh) • Kathmandu (Nepal)

Disclaimer

Science and technology are constantly changing fields. New research and experience broaden the scope of information and knowledge. The authors have tried their best in giving information available to them while preparing the material for this book. Although, all efforts have been made to ensure optimum accuracy of the material, yet it is quite possible some errors might have been left uncorrected. The publisher, the printer and the authors will not be held responsible for any inadvertent errors, omissions or inaccuracies.

eISBN: 978-93-896-8838-2

Copyright © Authors and Publisher

Second eBook Edition: 2020

All rights reserved. No part of this eBook may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system without permission, in writing, from the authors and the publisher.

Published by Satish Kumar Jain and produced by Varun Jain for
CBS Publishers & Distributors Pvt. Ltd.

Corporate Office: 204 FIE, Industrial Area, Patparganj, New Delhi-110092

Ph: +91-11-49344934; Fax: +91-11-49344935; Website: www.cbspd.com; www.eduport-global.com;

E-mail: eresources@cbspd.com; marketing@eduport-global.com

Head Office: CBS PLAZA, 4819/XI Prahlad Street, 24 Ansari Road, Daryaganj, New Delhi-110002, India.

Ph: +91-11-23289259, 23266861, 23266867; Fax: 011-23243014; Website: www.cbspd.com;

E-mail: publishing@cbspd.com; eduportglobal@gmail.com.

Branches

-
- **Bengaluru:** Seema House 2975, 17th Cross, K.R. Road, Banasankari 2nd Stage, Bengaluru - 560070, Karnataka Ph: +91-80-26771678/79; Fax: +91-80-26771680; E-mail: bangalore@cbspd.com
 - **Chennai:** No.7, Subbaraya Street Shenoy Nagar Chennai - 600030, Tamil Nadu Ph: +91-44-26680620, 26681266; E-mail: chennai@cbspd.com
 - **Kochi:** 36/14 Kalluvilakam, Lissie Hospital Road, Kochi - 682018, Kerala Ph: +91-484-4059061-65; Fax: +91-484-4059065; E-mail: kochi@cbspd.com
 - **Mumbai:** 83-C, 1st floor, Dr. E. Moses Road, Worli, Mumbai - 400018, Maharashtra Ph: +91-22-24902340 - 41; Fax: +91-22-24902342; E-mail: mumbai@cbspd.com
 - **Kolkata:** No. 6/B, Ground Floor, Rameswar Shaw Road, Kolkata - 700014 Ph: +91-33-22891126 - 28; E-mail: kolkata@cbspd.com

Representatives

-
- **Hyderabad**
 - **Pune**
 - **Nagpur**
 - **Manipal**
 - **Vijayawada**
 - **Patna**

Preface

Biochemistry, the branch of science concerned with the chemical and physico-chemical processes and substances which occur within living organisms. This is a rapidly progressing field with multiple applications. We are teaching microbiology and biochemistry to undergraduate and postgraduate courses in microbiology degree. I understand the students of microbiology are struggling to complete allied biochemistry. Hence we are intended to prepare a book for biochemistry for microbiology and biotechnology students in the name of exam companion in Biochemistry. This book covers almost all basic chapters of Biochemistry include carbohydrates, proteins, lipids, vitamins, nucleic acids, minerals, pigments, blood, hormones, enzymes, metabolism of organic matters, pH, Buffers, electrophoresis, centrifugation, etc. This book is prepared for the benefit of students for their university examinations. Question bank and practical part also included for the benefit of students. Salient features of this book include Simple language, Understandable Concepts, Proper illustrations, Student Exam friendly approach, Low cost, Practical, Unit wise Coverage and Question Bank. We are sure, this book will bring good motivation among the students. This book will also improve the skill of the students. We welcome suggestions from readers for improving the contents of the book. Please forward your comments to ksrajan99@gmail.com.

S Rajan
R Selvichristy

This Page is Intentionally Left Blank

Contents

Preface

iii

I. Carbohydrates	1–31
Definition	
Classification	
Monosaccharides—Trioses, Tetroses, Pentoses, Hexoses	
Structure of Glucose	
Structure of Fructose	
Structure of Galactose	
Structure of Ribose	
Properties of monosaccharides	
Functions of monosaccharides	
Occurrence of monosaccharides	
Oligosaccharides	
Disaccharides—Maltose, lactose, Sucrose, Cellobiose	
Reducing sugars	
Polysaccharides	
Starch	
Glycogen	
Cellulose	
Chitin	
Inulin	
Hyaluronic acid	
Chondroitin	
Heparin	
Agar agar	
Functions of Carbohydrates	
Common tests for carbohydrates	
Digestion and Absorption—Digestive system, digestion, Absorption	
II. Amino acid	32–37
Definition	
Structure	
D and L Amino acid	
Properties—Physical and Chemical	

Classification of amino acid based on polarity, nutrition, metabolic fate

Proteogenic amino acid

Functions of non protein amino acid

III. Proteins **38–51**

Definition

Classification based on shape, composition & Solubility, Function

Structure of proteins

Properties of protein

Protein conformation—Primary, secondary, tertiary and quaternary

Haemoglobin

Collagen

Biologically important protein

IV. Lipids **52–60**

Definition

Fatty acids

Classification

Importance

Essential fatty acids

Structure of tri acyl glyceride

Properties

Phospholipids

Sterol and cholesterol

Ergosterol

V. Nucleic Acids **61–70**

Introduction

Structure of nucleic acid

DNA

Structure—Double helix

Types of DNA

Functions

RNA

Types

mRNA

tRNA

rRNA

VI. Vitamins	71–89
Introduction	
Classification	
Fat soluble vitamins	
Vitamin A	
Vitamin D	
Vitamin E	
Vitamin K'	
Water soluble vitamins	
Vitamin B1–Thiamine	
Vitamin B2–Riboflavin	
Vitamin B3–Niacin	
Vitamin B6–Pyridoxine	
Vitamin B9–Folic acid	
Vitamin B12–Cyanocobalamine	
Vitamin B5–Pantothrin	
Vitamin B7–Biotin	
Vitamin C	
VII. Minerals	90–103
Introduction	
Classification	
Calcium	
Phosphorus	
Sodium	
Potassium	
Chlorine	
Magnecium	
Sulphur	
Iron	
Copper	
Iodine	
Fluorine	
Zinc	
Cobalt	
Manganecium	
Chromium	
Molybdenum	
Selenium	

VIII. Blood**104–115**

Introduction
Formation of blood
Composition of blood
Blood plasma
Physical characters of blood
Formed elements of blood
RBC
WBC—neutrophils, basophiles, eosinophiles, monocytes, macrophages, T cells, B cells, Plasma cells, NK cells, killer cells, Mast cells, dendritic cells, Platelets
Functions of blood
Blood clotting

IX. Hormone**116–131**

Introduction
Classification
Endocrine system
Hormone characters
Classification
Control of hormone secretion
Pituitary gland
 Growth hormone—Gigantism, agromegali, Dwafism
 Thyroid stimulating Hormone
 Adrenocarticotropic hormone
 Melanocyte stimulating hormone
 Gonodrotrophin
 Leutinizing hormone
 Follicle stimulating hormone
 Prolactin
 Antidiuretic hormone
Thyroid gland
Thyroid hormone—goiter, inflammation, cretinism, Graves disease
Parathyroid Gland
Parathyroid hormone
Pancrease gland
 Insulin, diabetes mellitus,
Adrenal gland—Adrenel cortex, medulla
Gonads—Testes, ovary, progesterone
Pineal gland
Placenta

X. Plant Hormone	132–135
Auxin	
Gibberlins	
Cytokinins	
Absicic acid	
XI. Pigments	136–140
Chlorophyll	
Carotenoids	
Phycobilins	
Anthocyanins	
XII. Secondary Metabolites	141–143
XIII. Enzymes	144–160
Characters of enzymes	
Active site in enzyme	
Naming of enzymes	
Classification of enzymes	
Chemical nature of enzymes	
Structure of enzyme	
Factors influencing enzymes	
Enzyme inhibition	
Mechanism of enzyme action	
Enzyme kinetics	
XIV. Metabolic Biochemistry	161–187
Carbohydrate metabolism	
Glycolysis	
Tricarboxylic acid cycle	
HMP Pathway	
ED Pathway	
Gluconeogenesis	
Generation of ATP	
Substrate level phosphorylation	
Oxidative phosphorylation	
Photo phosphorylation	
Electron transport chain	
Protein metabolism	
Protein synthesis	
Catabolism of amino acids	
Transamination	

Decarboxylation
Transmethylation
Biosynthesis of aminoacids
Ureacycle
Lipid metabolism
Oxidation of triglycerides
Oxidation of glyceroldehyde
Oxidation of fatty acids (α , β , γ oxidation)
Synthesis of fatty acids
Biosynthesis of triglycerides
Biosynthesis of cholesterol
Biosynthesis of lecithin / phospholipids

XV. Analytical Biochemistry **188–205**

Spectroscopy
Chromatography
Electrophoresis (gel, isoelectric focusing, immunoelectrophoresis)
Centrifugation
PH
Buffer
Acid and Bases

XVI. Question Bank **206–211**

XVII. Practicals **212–234**

- A. Qualitative Estimation of Carbohydrate
- B. Qualitative Test of Proteins
- C. Qualitative Test for Amino acids
- D. Qualitative estimation for Lipids
- E. Estimation of Protein by Biuret Method
- F. Estimation of Protein by Bradford Method
- G. Estimation of Carbohydrate by Anthrone Method
- H. Estimation of Protein by Lowry's Method
 - I. Estimation of DNA by Dipenylamine Method
 - J. Estimation of RNA by Orcinol Method
- K. Estimation of Amino acid by Ninhydrin Method