



ELSEVIER
CHURCHILL
LIVINGSTONE

FIFTH EDITION

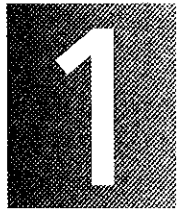
Biochemistry ILLUSTRATED

Biochemistry and
Molecular Biology
in the Post-genomic Era

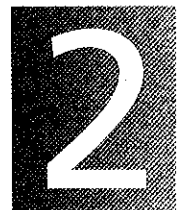
PETER N. CAMPBELL
ANTHONY D. SMITH
TIMOTHY J. PETERS

Contents

The cellular basis of biochemistry	1
Types of living cells	2
The structure of prokaryotic and eukaryotic cells	2
Endocytosis and exocytosis through the plasma membrane	2
The nucleus	2
Mitochondria	3
Lysosomes	3
Peroxisomes	3
The endoplasmic reticulum	3
The cytoskeleton	3
Subcellular fractionation	4
The microsome fraction	5
Marker enzymes	5
Metabolic functions of organelles	6

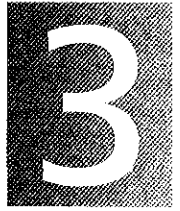


An introduction to proteins and peptides	7
The role of amino acids in the cell	8
Structure of amino acids	8
Asymmetry in biochemistry	9
Ionic properties of amino acids	9
Peptide structure and the peptide bond	11
Ionic properties of peptides	11
Purification of proteins and determination of relative molecular mass	12
The determination of the amino acid sequence of proteins	14
Protein structural hierarchies	14
Protein denaturation and renaturation	14
Peptides, structure and biological activity	15



Nucleic acids and protein synthesis

17



Introduction: Replication, transcription and translation

18

Nucleic acid structure and synthesis

18

Other enzymes with DNA synthetic activity

24

Biosynthesis of proteins: translation

31

Molecular cell biology

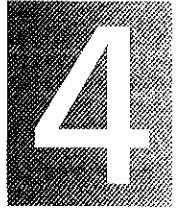
44

Recombinant DNA (genetic engineering)

49

Protein structure and function with hemoglobin as an example

55



The properties of proteins

56

The folding of globular proteins

56

General principles of protein folding

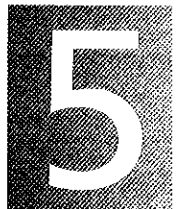
57

Structure and properties of myoglobin and hemoglobin

61

Proteins: specialized functions

67



Plasma proteins

68

The immune system and the immunoglobulins

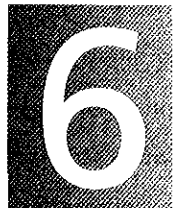
73

Proteins of molecular motors

78

The structure and function of enzymes

83



The properties of enzymes

84

Enzyme kinetics

85

Metabolic regulation and control

89

Enzyme phosphorylation and dephosphorylation

91

Second messengers

93

Allosteric properties of enzymes

94

Metabolic control analysis

96

Genetic diversity of enzymes

96

Coenzymes and water-soluble vitamins

100

Carbohydrates: structures and interconversions

Monosaccharides and disaccharides

Polysaccharides

Interconversions of monosaccharides

Detoxification mechanisms

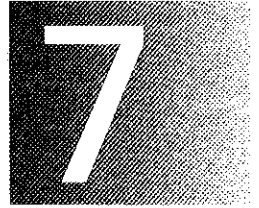
109

110

111

112

114



Nitrogen metabolism

Protein breakdown and excretion of nitrogen

The supply of amino acids

Catabolism of essential amino acids and the formation of adrenaline, histamine, thyroxine and serotonin

The biosynthesis and metabolism of heme

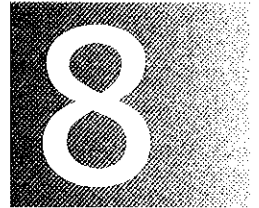
117

118

120

122

126



Oxidative catabolism of glucose and fatty acids

β -Oxidation and glycolysis

The citric acid cycle

The electron transport chain

Oxidative phosphorylation

Other mitochondrial topics

131

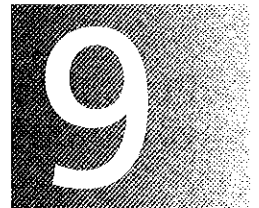
132

136

137

139

141



Carbohydrate and lipid metabolism in the fasting state

Metabolism in the fasting state

Glycogen and its degradation

Gluconeogenesis

Ketone body formation and utilization

Control of the blood glucose in health and disease

145

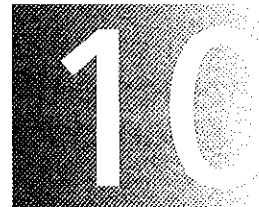
146

146

148

149

150



Carbohydrate and lipid metabolism in the absorptive state

The process of absorption

Glycogenesis

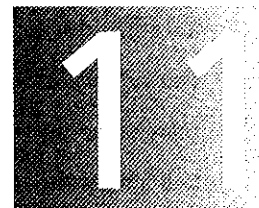
Lipogenesis

153

154

156

157

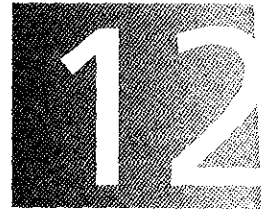


Plasma lipoproteins, cholesterol metabolism and atherosclerosis

Plasma lipoproteins and cholesterol metabolism

163

164



The action of hormones and other effectors in regulating glycogen and glucose metabolism, ketogenesis and lipogenesis

Whole-body interactions

The regulation of glycogen metabolism

Regulation of glycolysis and gluconeogenesis

Regulation of lipid metabolism

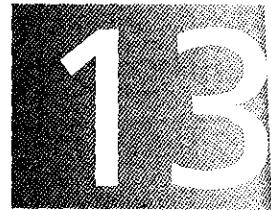
175

176

176

178

181



Phospholipids, other lipid substances and complex carbohydrates

Phospholipids

Lipid-soluble vitamins

Other lipid compounds

Complex carbohydrates

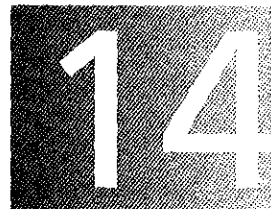
185

186

188

191

194



Biomembranes, receptors and signal transduction

The basis of membrane structure

Structure of the phospholipid bilayer

Membrane receptors

G proteins

Cell signalling systems

Receptor traffic

The cytoskeleton

Membrane transport

Cell adhesion

199

200

200

201

204

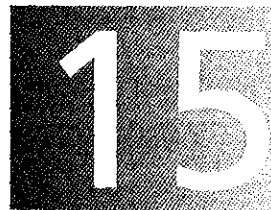
206

209

211

212

212



The post-genomic era and its impact on the future of biochemistry and molecular biology

Introduction

Bioinformatics

Apoptosis

Telomeres and telomerases

Growth control and cancer

Further Reading

Index

217

218

218

219

220

221

225

227

