

Contents



Preface	viii	
Acknowledgements	x	
Chapter 1	Determination of molecular weights	1
	Calculation of molecular weight from chemical composition	2
	Elementary and amino acid analysis	2
	End-group analysis	4
	Physico-chemical methods	4
	Osmotic pressure	7
	Sedimentation	10
	Diffusion	17
	Gel filtration	20
	Light scattering	24
	Other methods	29
	References and suggested reading	29
	Problems	30
Chapter 2	Acid-base relationships and electrolyte behaviour of amino acids and proteins	39
	Acid-base equilibria	39
	The dipolar ion form and electrolyte behaviour of amino acids	50
	Electrolyte behaviour of proteins	56
	References and suggested reading	59
	Problems	59
Chapter 3	Thermodynamics and biochemical energetics	64
	The first law of thermodynamics	64
	The second law	69
	The third law (Nernst Heat Theorem)	79
	References and suggested reading	81
	Problems	81

Chapter 4	Equilibria	84
	Ligand binding	88
	Effect of temperature on the equilibrium constant	91
	Activities and concentrations	92
	Apparent equilibrium constants	92
	Coupled reactions	94
	References	97
	Problems	97
Chapter 5	Reaction kinetics	104
	Zero-order reactions	105
	First order reactions	105
	Second order reactions	107
	Higher orders of reaction	110
	Consecutive reactions	111
	Effect of temperature on reaction rates	112
	The collision theory of reaction rates	114
	The theory of absolute reaction rates	115
	References and suggested reading	120
	Problems	120
Chapter 6	Enzyme kinetics	126
	Multi-substrate systems	135
	Enzyme inhibition	143
	Allosterism and the regulation of enzyme activity	152
	Units of enzyme activity	158
	References and suggested reading	158
	Problems	158
Chapter 7	Optical and photometric analysis	175
	Photometric analysis	175
	Theoretical background	175
	The Laws of Lambert and Beer	178
	Spectrophotometry	181
	Analysis of mixtures	184
	Nephelometry	188
	Fluorimetry	188
	Flame photometry	189
	Optical activity	190
	Suggested reading	193
	Problems	193
Chapter 8	Oxidation–reduction potentials	199
	Free energy of oxidation–reduction reactions	205
	Potentiometric titration	207
	Effect of pH on electrode potentials	209
	Redox indicators	212
	Thiol compounds	212

Oxidative phosphorylation	215
References and suggested reading	221
Problems	222
Chapter 9 Isotopes in biochemistry	226
Stable isotopes	226
Radioactive isotopes	228
Units and definitions	230
Measurements of radioactivity	232
Corrections to observed counts	236
Statistical aspects of radioactive decay	237
Isotope dilution	241
Radioimmunoassay	244
Determination of metabolic pathways	246
Radiorespirometry	260
Limitations and precautions	266
References and suggested reading	267
Problems	267
Chapter 10 Bacterial growth	276
The bacterial growth cycle	276
The exponential growth phase	276
The lag phase	280
Total growth	282
Diauxic growth cycles	283
Continuous cultivation of micro-organisms	284
References and suggested reading	290
Problems	290
Chapter 11 Membrane bioenergetics: transport systems and the chemiosmotic hypothesis	294
General considerations of transport processes	295
Transport of ions across membranes	297
The chemiosmotic hypothesis	303
Primary and secondary active transport	311
References and suggested reading	314
Problems	314
Appendices	
Appendix 1: Symbols	317
Appendix 2: The International System of Units (SI)	319
Appendix 3: Prefixes for SI units	319
Appendix 4: The gas constant	320
Appendix 5: The graphical solution of problems	321
Appendix 6: Angular velocity	323
Appendix 7: Solution of quadratic equations	323
Answers	324
Index	331