CONTENTS

a start and

P G A	reface lossar bbrev bout t	ry viations the Companion Website	vii ix xiii xvii
1	The 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.8	 Preparation of Solutions in Bioscience Research Introduction Concentration Using a Balance to Weigh Out Reagents Practical Considerations When Making a 1.0 M Solution Dilutions and the Use of Pipettes Water, Acids and Bases Buffers The Equilibrium/Dissociation Constant (K_a) for an Acid or Base and the Henderson–Hasselbalch Equation Summary Notes 	1 1 2 5 9 13 16 18 20 20
2	Mic 2.1 2.2 2.3 2.4 2.5 2.6	Introduction Microscopes – General Principles Principles of Image Formation Light Microscopy Electron Microscopy Summary	21 21 22 23 25 36 39
3	Spe 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9	ctrophotometry Introduction The Electromagnetic Spectrum The Absorbance of Light Absorption Spectrophotometry The Laws Governing the Absorbance of Light The Beer–Lambert Law Spectrophotometers Applications of Spectrophotometry in Bioscience Summary Notes	41 41 43 45 45 45 47 49 54 62 62
4	Data 4.1 4.2 4.3 4.4 4.5 4.6	a Analysis and Presentation Introduction Statistical Analysis of Data: Some Key Definitions Distributions Statistical Comparison of Data Presentation, Structure and Organization of Data in Laboratory Reports Summary	63 63 64 67 70 77 82

V

CONTENTS

5.1Introduction85.2Extraction85.3The Extraction Methods Used for Animal and Plant Tissue85.4The Extraction Methods for Bacteria85.5Clarification85.6Centrifugation Techniques95.7Points of Good Practice in Centrifugation95.8Summary9Notes9	33 33 34 16 7
5.2Extraction85.3The Extraction Methods Used for Animal and Plant Tissue85.4The Extraction Methods for Bacteria85.5Clarification85.6Centrifugation Techniques95.7Points of Good Practice in Centrifugation95.8Summary9Notes0	33 4 6 7
5.3 The Extraction Methods Used for Animal and Plant Tissue85.4 The Extraction Methods for Bacteria85.5 Clarification85.6 Centrifugation Techniques95.7 Points of Good Practice in Centrifugation95.8 Summary9Notes9	34 36 7
5.4The Extraction Methods for Bacteria85.5Clarification85.6Centrifugation Techniques95.7Points of Good Practice in Centrifugation95.8Summary9Notes0	36
5.5Clarification85.6Centrifugation Techniques95.7Points of Good Practice in Centrifugation95.8Summary9Notes0	37
 5.6 Centrifugation Techniques 5.7 Points of Good Practice in Centrifugation 5.8 Summary Notes 	2
 5.7 Points of Good Practice in Centrifugation 5.8 Summary Notes 	2
5.8 Summary Notes	13
Notac	14
INDICS	5
6 Electrophoresis of Proteins and Nucleic Acids	7
6.1 General Introduction	7
6.2 Separation of Protein Mixtures by Gel Electrophoresis	7
6.2 Other Electrophoretic Techniques Applied to Proteins	6
6.4 Separation of Nucleic Acids by Gel Electrophoresis	0
6.5 Applications of Gel Electrophoresis of Nucleic Acids	3
6.6 Summary	5
0.0 Summary	5
7 Chromatography 11	7
7.1 Introduction 11	7
7.2 The Theory of Chromatography 11	7
7.3 Factors to Consider in Chromatography 12	0
7.4 The Methods Used to Elute Samples in Chromatography 12	2
7.5 A Selection of Methods that Can be Used to Exchange Buffers and Concentrate	
Samples Prior to Chromatography 12	3
7.6 Vacuum Pumps 12	7
7.7 Different Types of Chromatography and What Properties Can be Used	
to Separate Molecules 12	8
7.8 Thin-layer Chromatography (TLC) 13	0
7.9 High-Pressure Liquid Chromatography (HPLC) 13	1
7.10 Gas/Liquid Chromatography (GLC) 13	3
7.11 Ion Exchange Chromatography (IEX)	4
7.12 Size Exclusion Chromatography (SEC) 13	6
7.13 Affinity Chromatography 13	8
7.14 Summary 13	9
Notes 13	9
8 Cell Culture Techniques 14	1
8.1 Introduction 14	1
8.2 Growth and Maintenance of Cells in Culture 14.	5
8.3 Summary 15	7
Notes 15	7
9 Antibody-Based Assays (Immunoassays) 15	9
9.1 Antibody Structure and Uses	9
9.2 Antibody Purification, Labelling and Detection 16	0
9.3 Immunoassay Methods	2
9.4 Controls	5
9.5 Summary 17:	5
Suggestions for Further Reading 17	7
Index 181	1

vi