

**THE ESSENTIALS OF
CHEMICAL
PHYSIOLOGY**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649107315

The essentials of chemical physiology by W. D. Halliburton

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

www.triestepublishing.com

W. D. HALLIBURTON

**THE ESSENTIALS OF
CHEMICAL
PHYSIOLOGY**

Alice Rohde.

CHEMICAL PHYSIOLOGY

QP514
H18
1907

PREFACE

TO

THE SIXTH EDITION

I HAVE again subjected the book to a thorough revision, and the changes which are now introduced into the practical exercises are those which experience has shown to be advisable. In the large text it has been necessary to rewrite a good many parts, mainly on account of our increased knowledge of the proteins and of the way they are utilised in the body. The sections relating to blood coagulation and to respiration have been much amplified in order to include many facts which are the result of recent research.

In my endeavour to bring the work abreast of advances in science, and at the same time to keep it within moderate limits, I have to acknowledge help and valuable suggestions from Mr. J. Barcroft, M.A. (especially in connection with Respiration), from Professor T. G. Brodie, F.R.S., and from my two colleagues at King's College, Dr. Lyle and Dr. O. Rosenheim; both of these have been of great assistance to me in reading the proof-sheets, and Dr. Lyle is again responsible for the Index.

W. D. HALLIBURTON.

KING'S COLLEGE, 1907.

11083

CONTENTS

INTRODUCTION	PAGE 1
------------------------	-----------

ELEMENTARY COURSE

LESSON

I. THE ELEMENTS CONTAINED IN PHYSIOLOGICAL COMPOUNDS	9
II. THE CARBOHYDRATES	13
III. THE FATS	22
IV. THE PROTEINS	27
V. THE PROTEINS (continued)	29
VI. FOODS	49
VII. THE DIGESTIVE JUICES—SALIVA AND GASTRIC DIGESTION	62
VIII. THE DIGESTIVE JUICES (continued)—PANCREATIC DIGESTION AND BILE	78
IX. THE BLOOD AND RESPIRATION	101
X. URINE	141
XI. URINE (continued)	156
XII. PATHOLOGICAL URINE	166
SCHEME FOR DETECTING PHYSIOLOGICAL PROXIMATE PRINCIPLES	171

ADVANCED COURSE

INTRODUCTION	175
LESSON	
XIII. CARBOHYDRATES	176
XIV. ACTION OF MALT UPON STARCH	179
XV. CRYSTALLISATION OF EGG ALBUMIN	180
XVI. MILK	181
XVII. THE PROTEOSES	182

LISSEN	PAGE
XVIII. DIGESTION	184
XIX. HÆMOGLOBIN AND ITS DERIVATIVES	188
XX. SERUM	192
XXI. COAGULATION OF BLOOD	194
XXII. MUSCLE AND NERVOUS TISSUE	197
XXIII. UREA AND CHLORIDES IN URINE	204
XXIV. PHOSPHATES AND SULPHATES IN URINE	207
XXV. URIC ACID AND CREATININE	210
XXVI. THE PIGMENTS OF THE URINE	213

APPENDIX

HEMACYTOMETERS	217
HÆMOGLOBINOMETERS	219
POLARISATION OF LIGHT	222
POLARIMETERS	226
THE SPECTRO-POLARIMETER	229
RELATION BETWEEN CIRCULAR POLARISATION AND CHEMICAL CONSTITUTION	230
MERCURIAL AIR-PUMPS	231
ANALYSIS OF GASES	234
KJELDAHL'S METHOD OF ESTIMATING NITROGEN	235
SOLUTIONS, DIFFUSION, DIALYSIS, OSMOSIS	236
INDEX	245

LIST OF ILLUSTRATIONS

FIG.		PAGE
1.	DEXTROSE CRYSTALS	<i>Frey</i> 17
2.	INOSITE CRYSTALS	<i>Frey</i> 18
3.	MILK-SUGAR CRYSTALS	<i>Frey</i> 19
4.	SECTION OF PEA, SHOWING STARCH GRAINS	<i>Yeo, after Sachs</i> 20
5.	FAT CELLS	<i>Schäfer</i> 23
6.	SIMPLE WARM BATH	29
7.	DIALYSER.	37
8.	DIALYSER.	37
9.	DIAGRAM OF A CELL	<i>Schäfer</i> 45
10.	MILK	- <i>Yeo</i> 53
11.	COLOSTRUM CORPUSCLES	<i>Heidenhain</i> 53
12.	YEAST CELLS	<i>Yeo's Physiology</i> 63
13.	SCHIZOMYCETES	<i>After Zopf</i> 64
14.	BACILLUS ANTHRACIS	<i>Koch</i> 65
15.	ALVEOLI OF SEROUS GLAND	- <i>Langley</i> 69
16.	MUCOUS CELLS	- <i>Langley</i> 69
17.	SUBMAXILLARY GLAND	<i>Heidenhain</i> 69
18.	FUNDUS GLAND	- <i>Klein</i> 71
19.	PYLORIC GLAND	- <i>Ebstein</i> 71
20.	FUNDUS GLAND	- <i>Langley</i> 72
21.	ALVEOLUS OF PANCREAS	<i>Kühne and Lea</i> 80
22.	LEUCINE CRYSTALS	- <i>Kühne</i> 86
23.	TYROSINE CRYSTALS	<i>Frey</i> 86
24.	HEMATOIDIN CRYSTALS	<i>Frey</i> 89
25.	CHOLESTERIN CRYSTALS	<i>Frey</i> 93

FIG.	PAGE
26. VILLUS OF RAT KILLED DURING FAT ABSORPTION	<i>Schäfer</i> 98
27. MUCOUS MEMBRANE OF FROG'S INTESTINE DURING FAT ABSORPTION	<i>Schäfer</i> 99
28. FIBRIN FILAMENTS AND BLOOD PLATELETS	<i>Schäfer</i> 103
29. ACTION OF REAGENTS ON BLOOD CORPUSCLES	<i>Schäfer</i> 111
30. OXYHEMOGLOBIN CRYSTALS	<i>Quain's Anatomy</i> 112
31. HEMIN CRYSTALS	<i>Freyer</i> 113
32. DIAGRAM OF SPECTROSCOPE	116
33. FIGURE OF SPECTROSCOPE AND ACCESSORIES	<i>McKendrick</i> 116
34. ARRANGEMENT OF PRISMS IN DIRECT-VISION SPECTROSCOPE	<i>Gscheidlen</i> 117
35. STAND FOR DIRECT-VISION SPECTROSCOPE	118
36. ABSORPTION SPECTRA	<i>Rollett</i> 118
37. ABSORPTION SPECTRA	119
38. LOEWY'S AEROTONOMETER	132
39. DISSOCIATION CURVES OF BLOOD AND HEMOGLOBIN	<i>Dohr</i> 133
40. BARCROFT'S BLOOD GAS APPARATUS	135
41. DUPRÉ'S UREA APPARATUS	<i>Gangee</i> 142
42. URENOMETER	<i>McKendrick</i> 144
43. UREA CRYSTALS	<i>Frey</i> 144
44. UREA NITRATE AND OXALATE	<i>Frey</i> 146
45. TRIPLE PHOSPHATE CRYSTALS	<i>Frey</i> 155
46. URIC ACID CRYSTALS	<i>Frey</i> 157
47. ACID SODIUM URATE	<i>Frey</i> 163
48. ACID AMMONIUM URATE	<i>Frey</i> 163
49. ENVELOPE CRYSTALS OF CALCIUM OXALATE	<i>Frey</i> 164
50. CYSTIN CRYSTALS	<i>Frey</i> 164
51. TRIPLE PHOSPHATE CRYSTALS	<i>Bryant's Surgery</i> 164
52. CALCIUM PHOSPHATE CRYSTALS	<i>Bryant's Surgery</i> 164
53. ALBUMINOMETER OF ESBACH	166
54. TWO BURETTES ON STAND	<i>Sutton</i> 167
55. HOT-AIR OVEN WITH GAS REGULATOR	<i>Gscheidlen</i> 176
56. OBZONE CRYSTALS	<i>Coloured plate to face</i> 177
57. ABSORPTION SPECTRA OF HEMOGLOBIN, &C.	189
58. PHOTOGRAPHIC SPECTRUM OF HEMOGLOBIN AND OXYHEMOGLOBIN	<i>Gangee</i> 190

LIST OF ILLUSTRATIONS

xi

FIG.	PAGE
59. PHOTOGRAPHIC SPECTRUM OF OXYHEMOGLOBIN AND METHHEMO- GLOBIN	<i>Gamble</i> 190
60. CENTRIFUGAL MACHINE	195
61. ABSORPTION SPECTRA OF MYOHEMATIN	199
62. A DESICCATOR	<i>Gscheidlen</i> 199
63. ABSORPTION SPECTRA OF URINARY PIGMENTS	<i>After Hopkins</i> 215
64. GOWERS' HÆMACYTOMETER	217
65. OLIVER'S HÆMACYTOMETER	218
66. GOWERS' HÆMOGLOBINOMETER	219
67. VON FLEISCHL'S HÆMOMETER	220
68. OLIVER'S HÆMOGLOBINOMETER	221
69. MODEL TO ILLUSTRATE POLARISED LIGHT	223
70. MODEL TO ILLUSTRATE POLARISED LIGHT	223
71. MODEL TO ILLUSTRATE POLARISED LIGHT	224
72. DIAGRAM TO EXPLAIN POLARISATION OF LIGHT	225
73. DIAGRAM TO EXPLAIN POLARISATION OF LIGHT	226
74. SOLEIL'S SACCHARIMETER	227
75. DIAGRAM OF OPTICAL ARRANGEMENTS IN SOLEIL'S SACCHARIMETER	227
76. LAURENT'S POLARIMETER	228
77. SPECTRO-POLARIMETER OF VON FLEISCHL	229
78. DIAGRAM OF ASYMMETRIC CARBON ATOMS	231
79. DIAGRAM OF PFLÜGER'S PUMP	232
80. L. HILL'S AIR-PUMP	233
81. WALLER'S APPARATUS FOR GAS ANALYSIS	<i>Waller</i> 234
82. KJELDAHL'S METHOD, DISTILLING APPARATUS	235
83. DIAGRAM TO ILLUSTRATE OSMOSIS	239