

TREATISE ON ANALYTICAL CHEMISTRY

Edited by
I.M. KOLTHOFF
University of Minnesota
and
PHILIP J. ELVING
University of Michigan

**A
COMPREHENSIVE
ACCOUNT
IN
THREE
PARTS**

**PART II:
ANALYTICAL CHEMISTRY OF INORGANIC
AND ORGANIC COMPOUNDS
VOLUME 17**

TREATISE ON ANALYTICAL CHEMISTRY

PART II

ANALYTICAL CHEMISTRY OF INORGANIC AND ORGANIC COMPOUNDS

VOLUME 17

Index: Volumes 1-16

Edited by I. M. KOLTHOFF

School of Chemistry, University of Minnesota

and PHILIP J. ELVING

Department of Chemistry, University of Michigan

AN INTERSCIENCE® PUBLICATION

JOHN WILEY & SONS New York—Chichester—Brisbane—Toronto

An Interscience® Publication

Copyright ©1980 by John Wiley & Sons, Inc.

All rights reserved. Published simultaneously in Canada.

Reproduction or translation of any part of this work beyond that permitted by Sections 107 or 108 of the 1976 United States Copyright Act without the permission of the copyright owner is unlawful. Requests for permission or further information should be addressed to the Permissions Department, John Wiley & Sons, Inc.

Library of Congress Cataloging in Publication Data:

Kolthoff, Izaak Maurits, 1894-

Treatise on analytical chemistry.

Errata slip for various vols, in pt. 1, v. 4.

Pt. 3, v. 1 edited by I. M. Kolthoff, P. J. Elving,
and F. H. Stross.

Publisher varies: 1961-68, Interscience Publishers;
1971- Wiley-Interscience and Wiley (an Interscience publication)

Includes bibliographies and index.

CONTENTS: pt. 1. Theory and practice.—pt. 2. Analytical chemistry of the elements (Analytical chemistry of inorganic and organic compounds) [etc.]

1. Chemistry, Analytic. I. Elving, Philip Juliber,

1913- joint author II. Title

QD75.K6 543 59-12439

ISBN 0-471-06481-5 (pt. 2, v. 17)

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

TREATISE ON ANALYTICAL CHEMISTRY

A comprehensive account in three parts

PART I

THEORY AND PRACTICE

PART II

**ANALYTICAL CHEMISTRY OF INORGANIC
AND ORGANIC COMPOUNDS**

PART III

ANALYTICAL CHEMISTRY IN INDUSTRY

TREATISE ON ANALYTICAL CHEMISTRY

A comprehensive account in three parts

PART I

THEORY AND PRACTICE

PART II

**ANALYTICAL CHEMISTRY OF INORGANIC
AND ORGANIC COMPOUNDS**

PART III

ANALYTICAL CHEMISTRY IN INDUSTRY

Authors

	VOLUME	PAGE
Alicino, Joseph F.; Cohen, Allen I.; and Everhard, Martin E., <i>Organic Analysis: Sulfur</i>	12	57
Archibald, R. M., <i>Organic Analysis: Biological and Biochemical</i>	11	137
Armstrong, G. W.; Gill, H. H.; and Rolf, R. F., <i>The Halogens</i>	7	335
Baldinus, Joseph G., <i>Sulfur-Based Functions Other Than Divalent</i> ..	15	9
Banks, Charles V., <i>see</i> Dale, John M.	2	311
Banks, Charles V., <i>see</i> Dale, John M.	2	377
Beeghly, H. F., <i>Hydrogen</i>	1	45
Bernhart, D. N., <i>Phosphorus-Based Functions</i>	13	301
Beukenkamp, John, <i>see</i> Rieman, William III.....	5	317
Bolter, Ernst, <i>see</i> Turekian, Karl K.	4	107
Bolter, Ernst, <i>see</i> Turekian, Karl K.	4	153
Booman, Glenn L., and Rein, James E., <i>Uranium</i>	9	1
Braman, Robert S., <i>Boron</i>	10	3
Cagle, F. William Jr., <i>see</i> Eyring, Henry.....	11	45
Capell, Leonard T., and Loening, Kurt L., <i>Principles of Organic Nomenclature</i>	11	1
Carlson, A. M., <i>see</i> Wengert, G. B.	3	43
Chambers, W. E.; Coulter, Paul D.; and Greinke, Ronald A., <i>Carbon</i>	10	105
Clear, A. J., and Roth, Milton, <i>Nitrogen</i>	5	217
Cobble, James W., <i>Technetium</i>	6	407
Coetzee, J. F., <i>Mercury</i>	3	231
Cohen, Allen I., <i>see</i> Alicino, Joseph F.	12	57
Cook, Gerhard A., <i>The Inert Gases (Group O)</i>	1	207
Cooper, M. D., and Winter, Paul K., <i>Manganese</i>	7	425
Cooper, W. Charles, <i>Copper</i>	3	1
Coulter, Paul D., <i>see</i> Chambers, W. E.	10	105
Critchfield, Frank E., and Ruch, James E., <i>Amines</i>	15	179
Dale, John M., and Banks, Charles V., <i>Cobalt</i>	2	311
Dale, John M., and Banks, Charles V., <i>Nickel</i>	2	377
Everhard, Martin E., <i>see</i> Alicino, Joseph F.	12	57
Eyring, Henry, and Cagle, F. William Jr., <i>The Stability of Organic Compounds and The Nature of Chemical Change</i>	11	45
Farnsworth, Marie and Pekola, Joseph, <i>Tin</i>	3	327
Farrah, G. H., and Moss, M. L., <i>Aluminium</i>	4	367
Fernando, Quintus, and Freiser, Henry, <i>Cadmium</i>	3	171
Fernelius, W. Conard, <i>Principles of Inorganic Nomenclature</i>	1	1
Freiser, Henry, <i>see</i> Fernando, Quintus.....	3	171
Fritz, James S., <i>Bismuth</i>	8	147
Gilbert, T. W., Jr., <i>Lead</i>	6	69
Gill, H. H., <i>see</i> Armstrong, G. W.	7	335
Gorsuch, T. T., <i>Organic Analysis: Determination of Other Elements</i>	12	295

	VOLUME	PAGE
Grady, H. R., <i>Vanadium</i>	8	177
Green, Thomas E., and Turley, Max, <i>Selenium and Tellurium</i>	7	137
Greinke, Ronald A., <i>see</i> Chambers, W. E.	10	105
Grimaldi, F. S., <i>Thorium</i>	5	139
Grimes, M. D., <i>see</i> Heinrich, B. J.	7	1
Gustin, Grant M., and Ogg, Clyde L., <i>Organic Analysis: Nitrogen. Introduction</i>	11	405
Gustin, Grant M., <i>Organic Analysis: Nitrogen. Part 1: Dumas Method</i>	11	408
Hahn, Richard B., <i>Antimony</i>	10	273
Hahn, Richard B., <i>Zirconium and Hafnium</i>	5	61
Hahn, Richard B., <i>see</i> Skonieczny, Richard F.	10	206
Hall, Robert T., and Mair, Robert D., <i>Determination of Ethers and Epoxides</i>	14	260
Hall, Robert T., <i>see</i> Mair, Robert D.	14	297
Hammond, George S., <i>Reaction Kinetics in Organic Chemistry</i>	11	59
Hanna, J. Gordon, and Siggia, Sidney, <i>Carbonyl and Derived Functions</i>	13	131
Hanna, J. Gordon, and Siggia, Sidney, <i>Reaction Kinetics in Organic Chemistry. Appendix. Practical Applications to Quantitative Analysis</i>	11	94
Harris, Ray E., <i>see</i> Woyski, Mark M.	8	1
Hartford, Winslow H., <i>Chromium</i>	8	273
Hausman, Eugene A., <i>see</i> Walsh, Thomas J.	8	379
Heinrich, B. J.; Grimes, M. D.; and Puckett, J. E., <i>Sulfur</i>	7	1
Herz, Nathaniel, <i>Gold</i>	4	71
Hirozawa, Stanley T., <i>Unsaturation</i>	14	25
Hoffman, James I., <i>Determination of the Elements: General Concepts</i>	1	35
Horner, H. J., <i>Organic Analysis: Silicon</i>	12	241
Horton, Charles A., <i>Fluorine</i>	7	207
Huffman, E. W. D., and Mitchell, J., Jr., <i>Organic Analysis: Chemical and Physical</i>	11	115
Huffman, E. W. D., <i>Organic Analysis: Elemental Analysis</i>	11	207
Inglis, Adam S., <i>Determination of Acyl Groups</i>	14	162
Inglis, Adam S., <i>O-Alkyl, N-Alkyl, and S-Alkyl</i>	14	200
Ingram, G., and Lonsdale, M., <i>Organic Analysis: Carbon and Hydrogen</i>	11	297
Kallmann, Silve, <i>The Alkali Metals</i>	1	301
Kallmann, Silve, <i>Niobium and Tantalum</i>	6	177
Kanzelmeyer, James H., <i>Zinc</i>	3	95
Karchmer, J. H., <i>Divalent Sulfur-Based Functions</i>	13	337
Kjellgren, B. R. F.; Schwenzfeier, C. W., Jr.; and Melick, E. Stanley, <i>Beryllium</i>	6	1
Laws, E. Q., <i>Organic Analysis: Phosphorus</i>	11	499
Loening, Kurt L., <i>see</i> Capell, Leonard T.	11	1
Lonsdale, M., <i>see</i> Ingram, G.	11	297
Ma, T. S., <i>Organic Analysis: Fluorine</i>	12	117
Mair, Robert D., and Hall, Robert T., <i>Determination of Organic Peroxides</i>	14	297
Mair, Robert D., <i>see</i> Hall, Robert T.	14	260

	VOLUME	PAGE
Melick, E. Stanley, <i>see</i> Kjellgren, B. R. F.	6	1
Melnick, L. M., <i>Iron</i>	2	247
Metz, Charles F., and Waterbury, Glenn R., <i>The Transuranium Actinide Elements</i>	9	189
<i>Part I - Neptunium, Plutonium, and Americium</i>	9	226
<i>Part II - Curium and the Transcurium Actinides: Berkelium, Californium, Einsteinium, Fermium, Mendelevium, Nobelium, and Lawrencium</i>	9	403
Mitchell, John Jr., <i>Functional Groups</i>	13	1
Mitchell, John Jr., <i>Water</i>	1	69
Mitchell, John, Jr., <i>see</i> Huffman, E. W. D.	11	115
Moss, M. L., <i>see</i> Farrah, G. H.	4	367
Muraca, R. F., <i>Azo Group</i>	15	386
Muraca, R. F., <i>Aoxy Group</i>	16	1
Muraca, R. F., <i>Detection of Nitrogen in Samples</i>	15	161
Muraca, R. F., <i>Diazo Group</i>	15	348
Muraca, R. F., <i>Diazonium Group</i>	15	252
Muraca, R. F., <i>Nitrate and Nitrite Ester Groups</i>	16	286
Muraca, R. F., <i>Nitrile, Isocyanide, Cyanamide, and Carbodiimide Groups</i>	16	407
Muraca, R. F., <i>Nitro and Nitroso Groups</i>	16	47
Musgrave, John R., <i>Germanium</i>	2	207
Ogg, Clyde L., <i>Organic Analysis: Nitrogen. Part 2: Kjeldahl Method</i>	11	457
Ogg, Clyde L., <i>Organic Analysis: Nitrogen. Part 3: Other Methods</i>	11	489
Ogg, Clyde L., <i>see</i> Gustin, Grant M.	11	405
Olson, Edward C., <i>Chlorine, Bromine, and Iodine</i>	14	2
Onishi, Hiroshi, <i>Gallium, Indium, and Thallium</i>	2	1
Parker, Gordon A., <i>Molybdenum</i>	10	341
Parker, Gordon A., <i>Tungsten</i>	10	449
Pekola, Joseph, <i>see</i> Farnsworth, Marie.....	3	327
Przybylowicz, Edwin P., and Zuehlke, Carl W., <i>Silver</i>	4	1
Puckett, J. E., <i>see</i> Heinrich, B. J.	7	1
Reigler, P. F., <i>see</i> Wengert, G. B.	3	43
Rein, James E., <i>see</i> Booman, Glenn L.	9	1
Rieman, William III, and Beukenkamp, John, <i>Phosphorus</i>	5	317
Rolf, R. F., <i>see</i> Armstrong, G. W.	7	335
Roth, Milton, <i>see</i> Clear, A. J.	5	217
Ruch, James E., <i>see</i> Critchfield, Frank E.	15	179
Rulfs, Charles L., <i>Rhenium</i>	7	503
Scheffer, Edward R., <i>Titanium</i>	5	1
Schwenzfeier, C. W., Jr., <i>see</i> Kjellgren, B. R. F.	6	1
Sedlet, Jacob, <i>Actinium, Astatine, Francium, Polonium, and Protactinium</i>	6	435
Sedlet, Jacob, <i>Radon and Radium</i>	4	219
Shell, H. R., <i>Silicon</i>	2	107
Siggia, Sidney, <i>see</i> Hanna, J. Gordon.....	11	94
Siggia, Sidney, <i>see</i> Hanna, J. Gordon.....	13	131
Skonieczny, Richard F., and Hahn, Richard B., <i>Arsenic</i>	10	206
Steyermark, Al, <i>Organic Analysis: Oxygen</i>	12	1

	VOLUME	PAGE
Stone, Kenneth G., <i>The C-Methyl Group</i>	13	95
Strahm, R. Donald, <i>Organic Analysis: Boron</i>	12	169
Turekian, Karl K., and Bolter, Ernst, <i>Calcium</i>	4	107
Turekian, Karl K., and Bolter, Ernst, <i>Strontium and Barium</i>	4	153
Turley, Max, <i>see</i> Green, Thomas E.	7	137
Veibel, Stig, <i>Carboxyl and Derived Functions</i>	13	223
Walsh, Thomas J., and Hausman, Eugene A., <i>The Platinum Metals</i> ..	8	379
Waterbury, Glenn R., <i>see</i> Metz, Charles F.	9	189
Weiss, F. T., <i>Determination of Active Hydrogen in Organic Compounds</i>	13	33
Wengert, G. B.; Reigler, P. F.; and Carlson, A. M., <i>Magnesium</i>	3	43
Williams, M., <i>Organic Analysis: Ultramicro Methods</i>	11	219
Winter, Paul K., <i>see</i> Cooper, M. D.	7	425
Woyski, Mark M., and Harris, Ray E., <i>The Rare Earths</i>	8	1
Zuehlke, Carl W., <i>see</i> Przybylowicz, Edwin P.	4	1

PART II. ANALYTICAL CHEMISTRY OF INORGANIC AND ORGANIC COMPOUNDS

CONTENTS—VOLUME 1

SECTION A. Systematic Analytical Chemistry of the Elements

1. Principles of Inorganic Nomenclature. By <i>W. Conard Fernelius</i>	1
2. Determination of the Elements: General Concepts. By <i>James I. Hoffman</i>	35
3. Hydrogen. By <i>H. F. Beeghly</i>	45
4. Water. By <i>John Mitchell, Jr.</i>	69
5. The Inert Gases (Group O). By <i>Gerhard A. Cook</i>	207
6. The Alkali Metals. By <i>Silve Kallmann</i>	301

CONTENTS—VOLUME 2

7. Gallium, Indium, and Thallium. By <i>Hiroshi Onishi</i>	1
8. Silicon. By <i>H. R. Shell</i>	107
9. Germanium. By <i>John R. Musgrave</i>	207
10. Iron. By <i>L. M. Melnick</i>	247
11. Cobalt. By <i>John M. Dale and Charles V. Banks</i>	311
12. Nickel. By <i>John M. Dale and Charles V. Banks</i>	377

CONTENTS—VOLUME 3

13. Copper. By <i>W. Charles Cooper</i>	1
14. Magnesium. By <i>G. B. Wengert, P. F. Reigler, and A. M. Carlson</i>	43
15. Zinc. By <i>James H. Kanzelmeyer</i>	95
16. Cadmium. By <i>Quintus Fernando and Henry Freiser</i>	171
17. Mercury. By <i>J. F. Coetzee</i>	231

18. Tin.		
By <i>Marie Farnsworth and Joseph Pekola</i>		327

CONTENTS—VOLUME 4

19. Silver.		
By <i>Edwin P. Przybylowicz and Carl W. Zuehlke</i>		1
20. Gold.		
By <i>Nathaniel Herz</i>		71
21. Calcium.		
By <i>Karl K. Turekian and Ernst Bolter</i>		107
22. Strontium and Barium.		
By <i>Karl K. Turekian and Ernst Bolter</i>		153
23. Radon and Radium.		
By <i>Jacob Sedlet</i>		219
24. Aluminum.		
By <i>G. H. Farrah and M. L. Moss</i>		367

CONTENTS—VOLUME 5

25. Titanium.		
By <i>Edward R. Scheffer</i>		1
26. Zirconium and Hafnium.		
By <i>Richard B. Hahn</i>		61
27. Thorium.		
By <i>F. S. Grimaldi</i>		139
28. Nitrogen.		
By <i>A. J. Clear and Milton Roth</i>		217
29. Phosphorus.		
By <i>William Rieman III and John Beukenkamp</i>		317

CONTENTS—VOLUME 6

30. Beryllium.		
By <i>B. R. F. Kjellgren, C. W. Schwenzfeier, Jr., and E. Stanley Melick</i>		1
31. Lead.		
By <i>T. W. Gilbert, Jr.</i>		69
32. Niobium and Tantalum.		
By <i>Silve Kallmann</i>		177
33. Technetium.		
By <i>James W. Cobble</i>		407
34. Actinium, Astatine, Francium, Polonium and Protactinium.		
By <i>Jacob Sedlet</i>		435

CONTENTS—VOLUME 7

35. Sulfur.		
By <i>B. J. Heinrich, M. D. Grimes, and J. E. Puckett</i>		1
36. Selenium and Tellurium.		
By <i>Thomas E. Green and Max Turley</i>		137
37. Fluorine.		
By <i>Charles A. Horton</i>		207

Contents	xi
-----------------	-----------

38. The Halogens.	
By <i>G. W. Armstrong, H. H. Gill, and R. F. Rolf</i>	335
39. Manganese.	
By <i>M. D. Cooper and Paul K. Winter</i>	425
40. Rhenium.	
By <i>Charles L. Rulfs</i>	503

CONTENTS—VOLUME 8

41. The Rare Earths.	
By <i>Mark M. Woyski and Ray E. Harris</i>	1
42. Bismuth.	
By <i>James S. Fritz</i>	147
43. Vanadium.	
By <i>H. R. Grady</i>	177
44. Chromium.	
By <i>Winslow H. Hartford</i>	273
45. The Platinum Metals.	
By the late <i>Thomas J. Walsh and Eugene A. Hausman</i>	379

CONTENTS—VOLUME 9

46. Uranium.	
By <i>Glenn L. Boaman and James E. Rein</i>	1
47. The Transuranium Actinide Elements.	
By <i>Charles F. Metz and Glenn R. Waterbury</i>	189
Part I - Neptunium, Plutonium, and Americium.....	226
Part II - Curium and the Transcurium Actinides: Berkelium, Californium, Einsteinium, Fermium, Mendelevium, Nobelium, and Lawrencium.....	403

CONTENTS—VOLUME 10

48. Boron.	
By <i>Robert S. Braman</i>	3
49. Carbon.	
By <i>W. E. Chambers, Paul D. Coulter and Ronald A. Greinke</i>	105
50. Arsenic.	
By <i>Richard F. Skonieczny and Richard B. Hahn</i>	206
51. Antimony.	
By <i>Richard B. Hahn</i>	273
52. Molybdenum.	
By <i>G. A. Parker</i>	341
53. Tungsten.	
By <i>G. A. Parker</i>	449

CONTENTS—VOLUME 11

SECTION B. Organic Analysis

54. Principles of Organic Nomenclature.	
By <i>Leonard T. Capell and Kurt L. Loening</i>	1

55. The Stability of Organic Compounds and the Nature of Chemical Change.	45
By <i>Henry Eyring</i> and <i>F. William Cagle, Jr.</i>	
56. Reaction Kinetics in Organic Chemistry.	59
By <i>George S. Hammond</i>	
Appendix. Practical Applications to Quantitative Analysis	
By <i>J. Gordon Hanna</i> and <i>Sidney Siggia</i>	94
57. Organic Analysis: Chemical and Physical.	115
By <i>E. W. D. Huffman</i> and <i>John Mitchell, Jr.</i>	
58. Organic Analysis: Biological and Biochemical.	137
By <i>R. M. Archibald</i>	

SECTION B-1. Organic Analysis I. The Elements

59. Organic Analysis: Elemental Analysis.	207
By <i>E. W. D. Huffman</i>	
60. Organic Analysis: Ultramicro Methods.	219
By <i>M. Williams</i>	
61. Organic Analysis: Carbon and Hydrogen.	297
By <i>G. Ingram</i> and <i>M. Lonsdale</i>	
62. Organic Analysis: Nitrogen. Introduction.	405
By <i>Grant M. Gustin</i> and <i>Clyde L. Ogg</i>	
Part 1: Dumas Method	
By <i>Grant M. Gustin</i>	408
Part 2: Kjeldahl Method	
By <i>Clyde L. Ogg</i>	457
Part 3: Other Methods	
By <i>Clyde L. Ogg</i>	489
63. Organic Analysis: Phosphorus.	499
By <i>E. Q. Laws</i>	

CONTENTS—VOLUME 12

64. Organic Analysis: Oxygen.	1
By <i>Al Steyermark</i>	
65. Organic Analysis: Sulfur.	57
By <i>Joseph F. Alicino, Allen I. Cohen, and Martin E. Everhard</i>	
66. Organic Analysis: Fluorine.	117
By <i>T. S. Ma</i>	
67. Organic Analysis: Boron.	169
By <i>R. Donald Strahm</i>	
68. Organic Analysis: Silicon.	241
By <i>H. J. Horner</i>	
69. Organic Analysis: Determination of Other Elements.	295
By <i>T. T. Gorsuch</i>	

CONTENTS—VOLUME 13

SECTION B-2. Organic Analysis II. Functional Groups

70. Functional Groups.	1
By <i>John Mitchell, Jr.</i>	

71. Determination of Active Hydrogen in Organic Compounds. By <i>F. T. Weiss</i>	33
72. The C-Methyl Group. By <i>Kenneth G. Stone</i>	95
73. Carbonyl and Derived Functions. By <i>J. Gordon Hanna and Sidney Siggia</i>	131
74. Carboxyl and Derived Functions. By <i>Stig Veibel</i>	223
75. Phosphorus-Based Functions. By <i>D. N. Bernhart</i>	301
76. Divalent Sulfur-Based Functions. By <i>J. H. Karchmer</i>	337

CONTENTS—VOLUME 14

SECTION B-1. Organic Analysis I. The Elements

77. Chlorine, Bromine, and Iodine. By <i>Edward C. Olson</i>	2
---	---

SECTION B-2. Organic Analysis II. Functional Groups

78. Unsaturation. By <i>Stanley T. Hirozawa</i>	25
79. Determination of Acyl Groups. By <i>Adam S. Inglis</i>	162
80. O-Alkyl, N-Alky, and S-Alkyl. By <i>Adam S. Inglis</i>	200
81. Determination of Ethers and Epoxides. By <i>Robert T. Hall and Robert D. Mair</i>	260
82. Determination of Organic Peroxides. By <i>Robert D. Mair and Robert T. Hall</i>	297

CONTENTS—VOLUME 15

83. Sulfur-Based Functions Other Than Divalent. By <i>Joseph G. Baldinus</i>	9
84. Detection of Nitrogen in Samples. By <i>R. F. Muraca</i>	161
85. Amines. By <i>Frank E. Critchfield and James E. Ruch</i>	179
86. Diazonium Group. By <i>R. F. Muraca</i>	252
87. Diazo Group. By <i>R. F. Muraca</i>	348
88. Azo Group. By <i>R. F. Muraca</i>	386

CONTENTS—VOLUME 16

89. Azoxy Group. By R. F. Muraca.....	1
90. Nitro and Nitroso Groups. By R. F. Muraca.....	47
91. Nitrate and Nitrite Ester Groups. By R. F. Muraca.....	286
92. Nitrile, Isocyanide, Cyanamide, and Carbodiimide Groups. By R. F. Muraca.....	407

CONTENTS—VOLUME 17

93. Index: Volumes 1-16	1
-------------------------------	---

A

Absorption:

- infrared, VII, 254, 392-393
- of manganese, VII, 459
- ultraviolet, VII, 58, 254, 393, 509
- x-ray:
 - determination of bismuth by, VIII, 168
 - of fluorine, VII, 222-223
 - of halides, VII, 360
 - of halogens, VII, 345, 383-384
 - of manganese, VII, 440
 - molecular, of halogen compounds, VII, 392-394

Absorption bands, IX, 225, 226, 232, 286, 341, 420-421

- absorption maxima:
 - of curium (III), IX, 405 (table)
 - of tri- and tetrafluorides of curium, IX, 406 (table)
- of americium, analytically important, IX, 235 (table)
- of americium trifluoride and tetrafluoride, IX, 235 (table)
- of neptunium, analytically useful, IX, 233 (table)
- of plutonium, analytically useful, IX, 234 (table)

Absorption coefficients, of compounds

- as a function of x-ray voltage, IX, 400 (table)

Absorption spectroscopy,
*see Spectrophotometry***Absorption spectrum:**

- of cerium (III) perchlorate, VIII, 103 (figure)
- of dysprosium (III) perchlorate, VIII, 107 (figure)
- of erbium (III) perchlorate, VIII, 108 (figure)
- of europium (III) perchlorate, VIII, 106, (figure)
- of gadolinium (III) perchlorate, VIII, 106 (figure)
- of holmium (III) perchlorate, VIII, 108 (figure)
- of neodymium (III) perchlorate, VIII, 105 (figure)
- of osmium (VIII) oxide, VIII, 467
- of praseodymium (III) perchlorate, VIII, 104, (figure)
- of rare earth (II) ions, VIII, 117-118
- of rare earth mixture, VIII, 104-105, 109 (figure)

Roman numerals preceding page numbers indicate volume numbers.

- Absorption spectrum (Cont'd)*
- of samarium (III) perchlorate, VIII, 105 (figure)
 - of terbium (III) perchlorate, VIII, 107 (figure)
 - of thulium (III) perchlorate, VIII, 108 (figure)
 - of vanadium, VIII, 192
 - of ytterbium (III) perchlorate, VIII, 109 (figure)
- Absorption tests for fluorides**, VIII, 254-255
- Absorptivity:**
- measurements, IX, 113-114
 - spectra, IX, 15, 17, 286, 405, 406, 420
 - crystals, IX, 341
 - uranium compounds, IX, 95, 96, 97, 98, 99, 100, 101
- Acetaldehyde:**
- emission spectra of, XIII, 144
 - test for, XIV, 169-170
 - volumetric determination of, XIII, 199
- Acetals:**
- determination of, XIII, 159
 - physical properties of, XIII, 138 (table)
- Acetamidoxime**, XVI, 191, 194
- Acetate**, IX, 44, 67, 69, 77, 81, 83, 116, 121, 147, 149, 246
- acetic acid, IX, 318, 319
 - buffer, IX, 81, 116, 121, 150
 - ethyl-, IX, 98
 - in formate, test for, XIV, 170
 - monochloro-, IX, 121, 415
 - pentyl-, IX, 327
- Acethydroxamic acid oxime**, XVI, 191, 194
- Acetic acid**, II, 12, 14, 15, 18, 20, 28, 32, 35, 39, 41, 42, 46, 47, 48, 50, 53, 67, 86, 87, 88, 89, 92, 162, 256, 264, 276, 288, 321, 332, 333, 336, 346, 348, 350, 351, 356, 370, 386, 401, 406, 411; VII, 48-59, 67, 107, 118, 257, 372-373, 519; IX, 25, 35, 40, 54, 61, 62, 90, 121, 393
- acetate, IX, 318, 319
 - ammonium acetate, IX, 121
 - amyl alcohol, IX, 53
 - bioassay of, XI, 149
 - m*-cresoxy, IX, 148
 - 2,4-dichlorophenoxy, IX, 151
 - diethyl ether, IX, 54
 - glacial, II, 89, 177, 330, 363; IX, 121, 128
 - Kjeldahl apparatus for distillation of, XIV, 182 (figure)
 - lithium perchlorate, IX, 121, 128
 - monochloro-, II, 62, 172
 - nitrilotriacetic acid, IX, 100
 - odor of, XI, 124
 - sodium acetate, IX, 121
- Acetone**, II, 35, 36, 43, 44, 52, 73, 92, 286, 330, 331, 332, 333, 348, 349, 400, 402, 428, 429; VII, 73, 377-378; IX, 23, 25, 54, 69, 73, 97, 98, 113, 326, 354, 360, 393
- determination of, XIII, 151
 - dry ice-, IX, 23
 - emission spectra of, XIII, 144
 - hydrochloric acid, IX, 324
 - isopropyl-, see Hexone
 - oxidation of, XIII, 99
 - TAA-xylene, IX, 265
 - volumetric determination of, XIII, 189-190
- Acetonecyanohydrin nitrate**, XVI, 52
- Acetonitrile**, XVI, 426, 438
- determination of, XVI, 486
 - gas chromatography of, XVI, 470
 - hydrolysis of, XVI, 431
 - infrared spectrum of, XVI, 446
 - mass spectrum of, XVI, 469
 - physical properties of, XVI, 416
 - reduction of, XVI, 464
 - by lithium aluminum hydride, XVI, 479
 - ultraviolet spectrum of, 449