

CONTENTS

Introduction	1
GENERAL PART	5
General reviews and books	7
Books on analytical chemistry (containing chapters on chromatography) (1-5)	7
Books on chromatography (including paper and thin-layer chromatography) (6-21)	7
Books on paper and thin-layer chromatography (22-38)	8
General reviews on chromatography (39-46)	9
General reviews on paper and thin-layer chromatography (47-73)	10
Teaching and experiments in chromatography (74-80)	11
Reviews on the application to various fields of science and technology (81-102)	12
Principles, theory and information of general interest in PC and TLC	14
History (103-115)	14
Nomenclature (116-117)	15
General theory of chromatography (118-131)	15
Relations between various chromatographic techniques (132-137)	16
Mechanisms and development phenomena in paper chromatography (138-147)	17
Mechanisms and development phenomena in thin-layer chromatography (148-172)	18
Resolution of compounds in PC and TLC (173-176)	20
Relations between chemical structure (or biological activity) and chromatographic behaviour (177-191)	20
Theory of quantitative analysis <i>in situ</i>	22
Techniques used in both PC and TLC	23
Laboratory and aids for PC and TLC (192-199)	23
Preparation of sample (200-203)	23
Application of sample (204-224)	24
Automation (225-231)	25
Preservation, photography and recording of chromatograms (232-235)	26
Combination of PC or TLC with other chromatographic techniques (236-239)	26
Techniques of paper chromatography	27
Chromatographic papers and membranes	27
New types of papers; properties and purification of papers (240-244)	27
Ion-exchange papers (including papers impregnated with liquid ion exchangers) (245-248)	27
Chromatography on membranes (249-251)	28
Development	28
Solvent systems and impregnation of paper (252-253)	28
Chromatographic tanks and development techniques (254-259)	29
Detection (260-263)	30
Quantitative analysis (264-270)	30
Identification of substances and systematic analysis	31
General papers (271-278)	31

Reproducibility of R_F values (279–280)	31
Combination of PC with other methods of identification (281–282)	32
Techniques of thin-layer chromatography	33
Sorbents for TLC	33
Reviews and some general papers (283–291)	33
Silica gel (292–298)	34
Alumina (299–301)	34
Other inorganic sorbents (302–315)	34
Cellulose and cellulose acetate (316–317)	36
Ion-exchange sorbents (318–319)	36
Polyamides (320–324)	36
Sorbents for gel permeation chromatography (325–328)	37
Other organic sorbents (329–334)	37
Mixed bed layers (335–337)	38
Supports for TLC (338–349)	38
Preparation of layers (350–362)	39
Binders (363–365)	40
Multiple layers (366–371)	41
Precoated sheets and ready-for-use plates (372–379)	41
Development	42
Solvent systems and impregnation of layers (380–389)	42
Tanks for TLC and their equipment (390–414)	43
Saturation of tanks (415–421)	45
Development techniques in TLC (422–438)	45
Effects of the temperature of development (439–441)	47
Detection	47
Reviews and general papers (442–444)	47
Physical detection methods in TLC (445–455)	47
Chemical detection methods in TLC (456–471)	48
Biological and enzymatic methods in TLC (472–474)	50
Quantitative analysis	50
Reviews (475–477)	50
Subjective assessment and spot area methods. Ancillary equipment (478–484)	50
<i>In situ</i> light absorption methods (485–521)	51
<i>In situ</i> fluorescence methods (522–528)	53
Other techniques (529)	54
Computers in quantitative TLC (530–534)	54
Estimation following removal from the plate (535–538)	55
Elution from layers and various forms of spot transfer (539–545)	55
Identification of compounds	56
Identification procedures (546–549)	56
Measurement and reproducibility of R_F values; standardization (550–558)	56
Identification of substances by chemical treatment before, during or after chromatography (559–563)	57
Combination of TLC with other methods of identification (564–573)	57
Preparative layer (and paper) chromatography (574–586)	58
 SPECIAL PART	
Hydrocarbons	63
Aliphatic hydrocarbons and their halogen derivatives; mineral oils (587–604)	63
Cyclic hydrocarbons	64
Techniques (605–623)	64
Applications (624–638)	66

Alcohols	67
Aliphatic alcohols and general techniques for alcohols (639–651)	67
Glycols (652–660)	68
Polyethylene glycols and related substances (661–673)	69
Cyclic alcohols (674–678)	70
Phenols	71
Theory and techniques (679–718)	71
Applications	74
Water and other non-biological applications (719–744)	74
Phenols in microorganisms, plants and vegetable products (745–752)	76
Phenolic glycosides (753–758)	77
Oxo compounds	78
Aliphatic aldehydes and ketones	78
Techniques (759–767)	78
Applications (768–782)	79
Cyclic aldehydes and ketones	80
Techniques (783–793)	80
Applications in the chemistry of lignin (794–803)	81
Other applications (804–812)	81
Quinones (813–825)	82
Ubiquinones (coenzymes Q), plastoquinones (826–839)	83
Anthraquinones (840–856)	84
Carbohydrates	86
Reviews (857–860)	86
Relationship between structure and R_F values (861–862)	86
Techniques	86
Preparation of samples (863–864)	86
Detection of carbohydrates (865–872)	87
Sorbents, solvent systems and development techniques (873–892)	87
Quantitative analysis (893–907)	89
Applications	90
Non-biological applications of carbohydrates (908–915)	90
Applications to food products (916–921)	91
Bound carbohydrates in microorganisms (922–926)	91
Applications to vegetable materials (927–938)	92
Carbohydrates in milk (939–941)	93
Free carbohydrates in urine, blood, semen and faeces (942–954)	93
Enzymatic reactions and carbohydrate metabolism (955–970)	94
Sugar alcohols (971–977)	95
Acids and lactones of the carbohydrate series (978–986)	96
Deoxy sugars (987–994)	96
Methylated sugars (ethers and methyl glycosides) (995–1002)	97
Amino sugars	97
Techniques (1003–1006)	97
Amino sugars in microbiological material; metabolism of amino sugars (1007–1016)	98
Amino sugars in animal material (1017–1031)	99
Other applications (1032–1039)	100
Sulphur containing carbohydrates (1040–1043)	100
Other sugar derivatives (1044–1059)	100
Chromatography of polysaccharides and starch components (1060–1078)	102
Structure investigations of oligo- and polysaccharides	103
Structure of oligo- and polysaccharides from microorganisms (1079–1094)	103
Structure of fungal and vegetable polysaccharides (1095–1101)	104
Structure of polysaccharides from animal material (1102–1115)	105

Carboxylic acids	106
Lower fatty acids	106
Techniques (1116–1123)	106
Applications (1124–1132)	107
Higher fatty acids	107
Techniques (1133–1145)	108
Applications	109
Non-biological and microbiological applications (1146–1152)	109
Higher fatty acids in plants and plant products (1153–1161)	109
Higher fatty acids in animals (1162–1166)	110
Aliphatic hydroxy acids, di- and tricarboxylic acids	110
Techniques (1167–1186)	110
Applications	112
Non-biological applications (1187–1196)	112
Applications to microbiology and enzymology (1197–1199)	113
Non-volatile lower aliphatic acids in plants and vegetable products (1200–1212)	113
Non-volatile lower aliphatic acids in animals (1213–1215)	114
Oxo acids (1216–1223)	114
Cyclic acids	115
Techniques (1224–1246)	115
Applications	117
Non-biological applications (1247–1255)	117
Cyclic acids in microbiological material (1256–1263)	118
Cyclic acids in plants, vegetable and fermented products (1264–1280)	119
Animal material (including catecholamine metabolites) (1281–1308)	120
Lichen acids (1309–1315)	122
Gibberellins and gibberellin-like compounds (1316)	123
Prostaglandins (1317–1329)	123
Lipids	124
Reviews (1330–1340)	124
Techniques	125
PC techniques for lipids (1341–1342)	125
TLC techniques for lipids	125
Preparation of lipid samples for TLC (1343–1347)	125
General detection techniques (1348–1349)	125
TLC systems for the separation of lipids belonging to several chemical classes (1350–1364)	126
General estimation techniques (1365–1387)	127
Techniques for individual lipid classes	128
Waxes	128
Simple glycerides (1388–1395)	128
Phospholipids (1396–1422)	129
Glycolipids (1423–1431)	131
Applications	132
Non-biological applications (1432–1452)	132
Lipids of microorganisms (1453–1497)	133
Plant lipids (1498–1529)	136
Animal lipids	138
Lipids in invertebrates (1530–1538)	138
Blood plasma or serum lipids (1539–1559)	139
Lipids in blood cells (1560–1571)	140
Lipids of milk and butter (1572–1573)	141
Lipids in the nerve tissue (1574–1598)	141
Lipids of the eye (1599–1603)	143

Lipids of the skin and of the glands of ectodermal origin (1604–1612)	143
Lipids of the sex organs, placenta and fetus (1613–1621)	144
Liver lipids (1622–1637)	144
Lipids of the gastrointestinal tract and faeces (1638–1641)	145
Lipids of animal tumours (1642–1646)	146
Muscle lipids (1647–1649)	146
Lipids in cell cultures (1650–1658)	146
Lipids from miscellaneous vertebrate sources (1659–1682)	147
Enzymatic reactions of lipids (1683–1704)	148
Peroxides (1705–1716)	150
Compounds containing heterocyclic oxygen	151
Coumarins (1717–1746)	151
Derivatives of γ -pyrone (chromones, flavones, aurones, etc.)	153
Reviews and techniques (1747–1765)	153
Applications (1766–1805)	154
Anthocyanins and anthocyanidins (1806–1816)	157
Catechins and tannins (1817–1829)	157
Aflatoxins and related mycotoxins	158
Reviews and techniques (1830–1856)	158
Applications (1857–1890)	160
Other heterocyclic oxygen containing compounds (1891–1902)	162
Steroids	164
Reviews (1903–1912)	164
General techniques for steroids (1913–1936)	164
Detection reagents (1937–1945)	166
Estrogens	167
Techniques (1946–1965)	167
Applications	169
Non-biological and microbiological applications (1966–1976)	169
Applications in animal material (1977–1988)	169
Oral contraceptives (1989–1998)	170
Androstane derivatives	171
Techniques (1999–2020)	171
Applications	173
Androstane derivatives in synthetic organic chemistry and pharmacy; transformations by microorganisms and plants (2021–2026)	173
Androstane derivatives in animal material (2027–2060)	174
Androstane derivatives in urine (2061–2065)	176
Pregnane derivatives	176
Techniques (2066–2085)	176
Applications	178
Non-biological and microbiological applications (2086–2095)	178
Pregnane derivatives in animal material (2096–2121)	179
Pregnane derivatives in urine (2122–2133)	180
Bile acids and other steroid acids and lactones. Bile alcohols	181
Techniques (2134–2148)	181
Applications	182
Non-biological applications (2149–2151)	182
Applications for animal material (2152–2168)	183
Sterols	184
Techniques (2169–2181)	184
Applications	185
Non-biological applications (2182–2188)	185
Plant and yeast sterols, microbiological applications (2189–2199)	185
Sterols in animal material (2200–2216)	186

Alkaloids	278
Reviews (3323–3324)	278
General techniques and theory (3325–3335)	278
Individual groups of alkaloids	279
Tobacco alkaloids (3336–3341)	279
Colchicum alkaloids (3342–3347)	280
Tropine alkaloids (3348–3371)	280
Cinchona alkaloids (3372–3381)	282
Alkaloids of Papaveraceae (excluding opium alkaloids) (3382–3390)	282
Opium alkaloids (3391–3423)	283
Quinolizidine alkaloids (3424–3429)	285
Strychnine group; curare alkaloids (3430–3431)	286
Protoberberine alkaloids (3432–3439)	286
Rauwolfia alkaloids (3440–3449)	287
Harman alkaloids (3450)	287
Ergot alkaloids (3451–3481)	288
Xanthine alkaloids (3482–3491)	289
Ipecacuanha alkaloids (3492–3498)	290
Various steroid alkaloids (3499–3504)	291
Other alkaloid groups (3505–3542)	291
Separation of alkaloids of different groups; systematic analysis (3543–3559)	293
Other compounds with heterocyclic nitrogen	295
Pyrroles	295
Porphyrins and other pyrroles (3560–3586)	295
Bile pigments (3587–3600)	297
Pyrazole derivatives (3601–3606)	298
Imidazoles and benzimidazoles (3607–3621)	298
Indoles	299
Techniques (3622–3639)	299
Applications	301
Non-biological applications (3640–3645)	301
Indoles in plants and microorganisms (3646–3650)	301
Indoles in animals (3651–3657)	301
Pyridine derivatives (3658–3667)	302
Pyridinecarboxylic and piperidinecarboxylic acids and their derivatives (3668–3678)	303
Quinoline, acridine, isoquinoline and quinolizidine derivatives (3679–3686)	304
Other substances containing heterocyclic nitrogen (3687–3707)	304
Organic sulphur compounds	307
Detection reagents for sulphur compounds (3708–3710)	307
Thiols, sulphides, sulphonium salts, sulfoxides, sulphones (3711–3724)	307
Aliphatic sulphonic acids, sulphinic acids, sulphates, thiophosphates and their selenium analogues (3725–3727)	308
Thiourea derivatives, thiocarbamates, dithiocarbamates, thioamides, thiosemicarbazones, thiuram compounds, isothiocyanates and their glycosides (3728–3740)	309
Aromatic sulphonic acids, sulphinic acids and sulphates (3741–3752)	310
Sulphur-containing ring system (3753–3759)	311
Organic phosphorus compounds	312
Reviews, techniques and theory (3760–3776)	312
Applications	313
Non-biological applications (3777–3792)	313
Enzymatic reactions of phosphorus compounds (3793–3798)	315
Phosphorus compounds in plant material (3799–3800)	315
Phosphorus compounds in animal material (3801–3804)	315

Organometallic and related compounds (3805–3822)	316
Organomercurials (3823–3831)	317
Organic silicon compounds (3832–3835)	318
Boranes and carboranes (3836)	318
Vitamins	319
Reviews (3837–3839)	319
Mixture of fat-soluble and water-soluble vitamins (3840)	319
Fat-soluble vitamins	319
Mixtures of fat-soluble vitamins (3841–3844)	319
Vitamin A group (3845–3851)	320
Calciferols (3852–3860)	320
Tocopherol group (3861–3875)	321
Vitamin K group (3876–3883)	322
Water-soluble vitamins	323
Mixtures of water-soluble vitamins (3884–3891)	323
Thiamine (3892–3900)	323
Riboflavin and other flavins (3901–3912)	324
Nicotinic acid and its derivatives	325
Pyridoxine group (3913–3917)	325
Biotin group (3918–3919)	326
Pantothenic acid and coenzyme A (3920–3921)	326
Folic acid and other pteridine derivatives	326
Folic acid, its derivatives and analogues (3922–3932)	326
Pterins and other pteridines (3933–3944)	327
Cobalamin group (3945–3951)	328
Pangamic acid (3952–3954)	329
Ascorbic acid group (3955–3963)	329
Various growth factors (3964–3965)	329
Antibiotics	330
Reviews; general techniques and theory; antibiotic mixtures (3966–3977)	330
Penicillins and cephalosporins (3978–4007)	331
Aminoglycosides and related antibiotics (4008–4028)	333
Chloramphenicol (4029–4030)	334
Tetracyclines and related antibiotics (4031–4048)	335
Macrolide antibiotics; erythromycin group (4049–4059)	336
Peptidic antibiotics (4060–4072)	337
Miscellaneous and unidentified antibiotics (4073–4116)	337
Pesticides	341
Reviews (4117–4121)	341
General techniques for synthetic pesticides (4122–4145)	341
Natural insecticides and their synergists (4146–4149)	343
Chlorinated insecticides	343
Reviews and techniques (4150–4173)	343
Applications (4174–4214)	345
Polychlorinated biphenyls (4215–4224)	348
Phosphorus insecticides	349
Reviews, techniques and theory (4225–4249)	349
Applications (4250–4295)	350
Carbamates (4296–4331)	354
Herbicides (4332–4365)	356
Fungicides (4366–4373)	358
Other types of pesticides (4374–4378)	359
Dyes and pigments	360
Synthetic dyes	360
Reviews (4379–4383)	360

Techniques and papers of general interest (4384–4416)	360
Optical bleaching agents (4417–4418)	362
Non-biological applications of chromatography of synthetic dyes (4419–4442)	363
Biological applications of chromatography of synthetic dyes (4443–4446)	364
Dyes used in food industry and pharmacy (4447–4480)	365
Dyes used in cosmetics (4481–4490)	367
Chromatography of inks (4491–4494)	368
Natural pigments	368
Chloroplast pigments	368
Reviews and techniques (4495–4513)	368
Applications (4514–4542)	370
Various natural pigments and fluorescent substances (4543–4555)	372
Humic acids (4556)	372
Plastics	373
Accelerators, plasticizers and stabilizers in plastic material (4557–4574)	373
Reviews and general techniques for polymers and plastics (4575–4580)	374
Phenolic resins (4581–4584)	375
Aminoaldehyde resins (4585–4586)	375
Polyester resins and related compounds (4587–4590)	375
Epoxy resins (4591–4595)	376
Polyamides and their intermediates (4596–4600)	376
Other types of resins (4601–4609)	376
Pharmaceutical and toxicological applications	378
Reviews (4610–4620)	378
Synthetic drugs	379
General techniques (4621–4638)	379
Complex mixtures; systematic analysis of drugs (4639–4666)	380
Auxiliary compounds in pharmaceutical products (4667–4673)	382
Artificial sweeteners (4674–4691)	383
Fate of sweeteners in organisms (4692–4694)	384
Psychotropic drugs (4695–4728)	384
Fate of psychotropic drugs in organisms (4729–4741)	387
Phenothiazines (4742–4756)	388
Fate of phenothiazines in organisms (4757–4767)	389
Hallucinogenic drugs (4768–4799)	389
Some other drugs of abuse (4800–4803)	391
Narcotic antagonists and their metabolism (4804–4811)	392
Antihistamines (4812–4816)	392
Fate of antihistamines in organisms (4817–4818)	393
Antipyretics, analgesics, antiinflammatory agents and antitussives (4819–4864)	393
Fate of the drugs in organisms (4865–4869)	396
Sedatives, hypnotics and narcotics (4870–4882)	396
Fate of the drugs in organisms (4883–4887)	397
Barbiturates (4888–4906)	398
Fate of barbiturates in organisms (4907–4910)	399
Local anesthetics (4911–4919)	399
Adrenergic and cholinergic substances (4920–4934)	400
Metabolism of the drugs (4935)	401
Diuretics and their disposition in animals (4936–4939)	401
Oral antidiabetics and their transformations in animals (4940–4945)	402
Cytostatics and their fate in organisms (4946–4949)	402
Chemotherapeutics, disinfectants and antiseptics (4950–4964)	402
Fate of the drugs in organisms (4965)	404
Sulphonamides (4966–4984)	404

Fate of sulphonamides in the organisms (4985–4987)	405
Other groups of synthetic drugs (4988–5011)	405
Fate of miscellaneous drugs and some other foreign compounds in organisms (5012–5022)	407
Toxicological analysis and some studies on the fate of foreign substances in organisms	408
Reviews and general techniques (5023–5046)	408
Applications (5047–5059)	410
Plant (and animal) extracts and applications to pharmacognosy	411
Reviews and general techniques (5060–5068)	411
Applications (5069–5112)	412
Capsaicin (5113–5120)	415
Applications in clinical biochemistry	416
Some technical products and complex mixtures	417
Surfactants (5121–5138)	417
Antioxidants and preservatives (5139–5171)	418
Complex mixtures and non-identified compounds (5172–5183)	420
Inorganic compounds	422
Books and reviews (5184–5193)	422
Analysis of cations	423
Techniques (sample preparation and development) and theory	423
Paper chromatography (5194–5209)	423
Thin-layer chromatography (5210–5247)	424
Liquid ion exchangers and reversed-phase systems in PC and TLC (5248–5270)	426
Solid ion exchangers in PC and TLC (5271–5291)	428
Precipitation chromatography (5292)	430
Detection of cations (5293–5299)	430
Quantitative analysis of cations (5300–5309)	430
Individual groups of cations	431
Analytical groups I and IIa (Ag, Bi, Cd, Cu, Hg, Pb, Pd, Tl) (5310–5326)	431
Analytical group IIb (As, Mo, Re, Sb, Sn, Tc, Te, V, W) (5327–5354)	433
Platinum (noble) metals and gold (5355–5379)	435
Analytical group III (Al, Be, Co, Cr, Fe, Ga, Mn, Nb, Ni, Ta, Th, Ti, Zn, Zr) (5380–5419)	437
Uranium, transuranium elements and actinides (5420–5424)	439
Rare earths (5425–5442)	440
Analytical group IV (alkaline earths) (5443–5448)	441
Analytical group V (alkali metals) (5449–5458)	442
Mixtures of cations of different groups. Various applications (5459–5471)	443
Analysis of anions (5472–5487)	444
Inorganic sulphur-containing anions (5488–5493)	445
Inorganic halogen compounds (5494–5497)	445
Inorganic phosphorus compounds (5498–5515)	445
Radioactive substances	447
Reviews (5516–5519)	447
Autoradiography, scintillation autography, spark chambers, quantitative evaluation of autoradiograms (5520–5524)	447
Radiometry	448
<i>In situ</i> scanning (5525–5436)	448
Liquid scintillation after removal from paper or plate (5537–5544)	449
Activation analysis (5545–5548)	449
Use of radioactive standards and reagents for the analysis of non-radioactive substances (5549–5551)	450
Tritium ^3H (5552)	450
Carbon ^{14}C	450

Techniques and various non-biological applications (5553–5560)	450
Applications of radiocarbon in microorganisms and plants (5561)	451
Radiocarbon in animals (5562–5563)	451
Phosphorus ^{32}P (5564–5567)	452
Sulphur ^{35}S and radioselenium (5568–5571)	452
Radioiodine (5572–5576)	452
Radiopharmaceuticals (5577–5583)	453
Other radioactive elements (5584–5600)	453
Rare non-radioactive isotopes (5601)	455
AUTHOR INDEX	457
LIST OF SUBSTANCES CHROMATOGRAPHED	543