INTRODUCTION

Chromatography has often been compared to distillation when considering its importance in organic chemistry as a method of purification. There is, however, a fundamental difference between chromatography and electrophoresis on the one hand and other physical methods of analysis such as distillation or spectrography on the other, in that chromatographic methods depend on the chemical environment produced during the separation (adsorbent, solvent, etc.) while distillation, for example, has for a given compound only one physical constant, the boiling point, which varies solely with pressure.

The chromatographic data obtained by research workers are, for this reason, much more numerous, and it is becoming increasingly difficult to search the literature for the necessary information, especially since most abstracting journals give no or few data such as R_F values, retention volumes, or ionic mobilities, in their abstracts of publications.

We felt thus that a Journal of Chromatography should be set up, which would publish in Table form the most important data selected or collected from all scientific journals, instead of abstracting literature as do many journals, e.g. *Analytical Abstracts* or *Z. Anal. Chem.*, to mention only a few.

Some explanation is still required for pages ii and iii of this section. They are mathematical tables for the conversion of R_F to R_M values and an alignment chart for obtaining R_M directly from two R_F values. We begin with these two tables intentionally, since we firmly believe that the use of R_M values for structural problems and other theoretical aspects of chromatography will be very great in the future.

The sections on Chromatographic Data are placed in each issue in such a position that they can be taken out and collected after completion of a Volume.

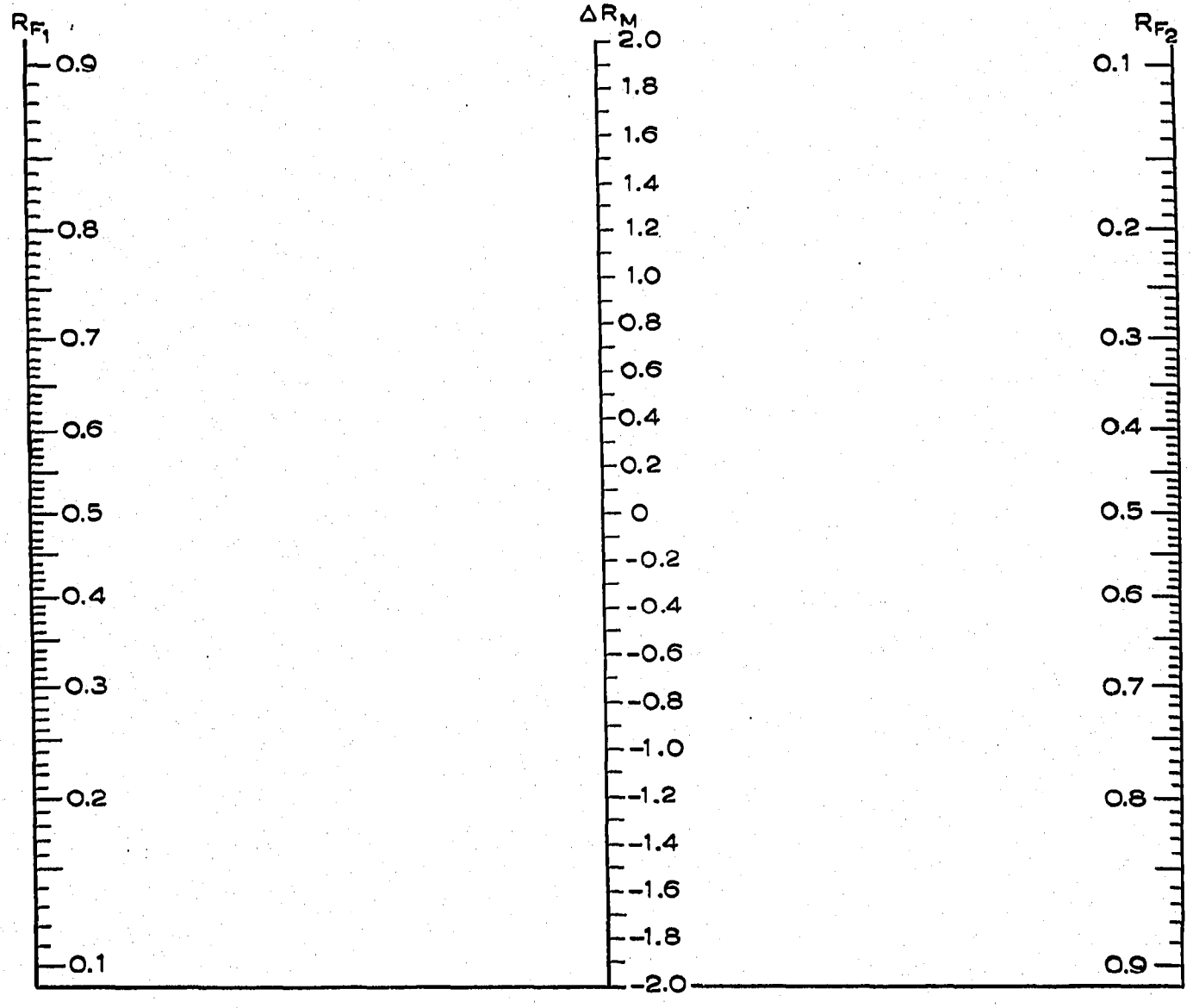
THE EDITOR

TABLE I

CONVERSION OF R_F TO R_M VALUES; $R_M = \log\left(\frac{1}{R_F} - 1\right)$

R_F	R_M	R_F	R_M	R_F	R_M	R_F	R_M
0.01	1.999	6	454	2	34	7	524
2	690	7	432	3	52	8	550
3	510	8	411	4	69	9	575
4	380	9	389	5	87	0.80	— 0.602
5	279	0.30	0.368	6	— 0.105	1	631
6	195	1	347	7	122	2	660
7	128	2	327	8	140	3	690
8	061	3	307	9	158	4	721
9	005	4	288	0.60	— 0.176	5	754
0.10	0.95	5	269	1	194	6	791
11	91	6	250	2	212	7	827
2	87	7	231	3	234	8	866
3	83	8	212	4	250	9	910
4	79	9	194	5	269	0.90	— 0.955
5	75	0.40	0.176	6	288	1	— 1.004
6	72	1	158	7	308	2	061
7	69	2	140	8	327	3	125
8	66	3	122	9	348	4	194
9	63	4	105	0.70	— 0.368	5	276
0.20	0.600	5	087	1	389	6	377
1	575	6	070	2	410	7	509
2	549	7	052	3	433	8	699
3	528	8	035	4	456	9	999
4	501	9	017	5	477		
5	477	0.50	0.000	6	500		
		1	— 0.017				

The editor is indebted to Dr. S. KERTES for compiling this table.



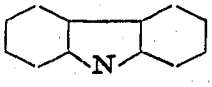
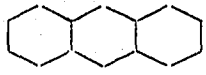
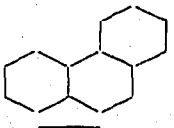
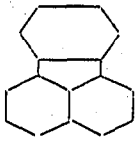
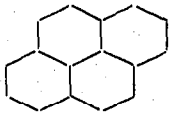
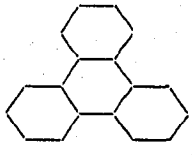
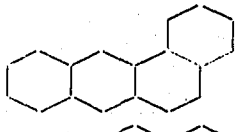
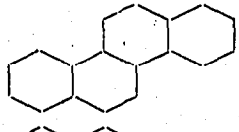
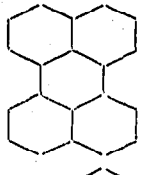
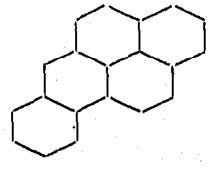
Alignment chart to calculate ΔR_M directly from R_{F_1} and R_{F_2}.

TABLE II

R_F VALUES OF AROMATIC HYDROCARBONS
(TH. WIELAND AND W. KRACHT, *Angew. Chem.*, 69 (1957) 172)

Paper: No. 2043b acetylated by its manufacturer Schleicher and Schuell, Dassel
Solvent: methanol 4, ether 4, water 1

$$R_B \text{ value} = \frac{\text{movement of 3,4-benzopyrene}}{\text{movement of substance}}$$

Substance	*Structure*	R_B *value*
Carbazole		5.35
Anthracene		4.5
Phenanthrene		4.12
Fluoranthene		4.0
Pyrene		3.78
Triphenylene		4.2
1,2-Benzanthracene		2.9
Chrysene		1.45
Perylene		3.3
3,4-Benzopyrene		1.0

See also D. S. TARBELL, E. G. BROOKER, A. VANTERPOOL, W. CONWAY, C. J. CLAUS AND T. J. HALL, *J. Am. Chem. Soc.*, 77 (1955) 767.

TABLE III

R_F VALUES OF GUANIDINE DERIVATIVES
(J. W. H. ZIJP, *Rec. trav. chim.*, 75 (1956) 1)

Solvent: acetone on paper buffered at pH 4 with a solution consisting of 61.45 ml 0.1 mol citric acid and 38.55 ml of 0.2 mol disodium phosphate
Reagent: 4% solution of sodium hypochlorite

Substance	*Colour of spot*	R_F *value*
*ortho*Tolylbiguanidine	yellow	0.35
Diphenylguanidine	red-brown	0.64
Di*ortho*tolylguanidine	red-brown	0.73
Triphenylguanidine	yellow-brown	0.85

TABLE IV

R_F VALUES OF SOME MERCAPTO COMPOUNDS (RUBBER ACCELERATORS AND ANTIOXIDANTS)
(J. W. H. ZIJP, *Rec. trav. chim.*, 75 (1956) 8)

Solvent: butanol saturated with water
Paper: Whatman No. 1 either untreated or buffered at pH 10
Reagent: 5% bismuth nitrate in 0.5 *N* HNO_3

Substance	R_F *values*	
	unbuffered paper	*buffered at pH 10*
2-Mercapto-imidazoline	0.56	0.54
2-Mercapto-thiazoline	0.76	0.78
2-Mercapto-benzimidazole	0.85	0.86
2-Mercapto-benzthiazole	0.91	0.54

TABLE V

R_F VALUES OF SOME HYDRAZINE DERIVATIVES
(R. L. HINMAN, *Anal. Chim. Acta*, 15 (1956) 125)

Reagents: ammoniacal silver nitrate or Ehrlich's reagent
Paper: Whatman No. 1

Compound	*Isoamyl alcohol* 10 *Acetic acid* 1.5 *Water* 10	*n-Butanol* 4 *Acetic acid* 1 *Water* 5	
	Cicular development	*Circular*	*Ascending*
1,2-Diformyl hydrazine	0.26		
1,2-Diacetyl hydrazine	0.48		
1,2-Dipropionyl hydrazine	0.81		
1,2-Dibutyryl hydrazine	0.91		
1,2-Diformyl-1,2-dimethyl hydrazine	0.60		
1,2-Diacetyl-1,2-dimethyl hydrazine	0.74		
1-Formyl-2,2-dimethyl hydrazine	0.72		
1-Acetyl-2,2-dimethyl hydrazine	0.76		
1-Benzoyl-2,2-dimethyl hydrazine	0.88		
Hydrazine dihydrochloride	0.00	0.39	0.16
1,1-Dimethylhydrazine hydrochloride	0.29	0.53	0.20
Trimethylhydrazine hydrochloride	—	0.42	0.23
1,2-Diethylhydrazine dihydrochloride	0.30	0.55	0.25
Ammonium chloride	—	0.33	
Methylamine hydrochloride	—	0.38	
Dimethylamine hydrochloride	—	0.41	

TABLE VI

R_F VALUES OF HYDRAZINE, HYDROXYLAMINE AND DERIVATIVES
(F. H. POLLARD AND A. J. BANISTER, *Anal. Chim. Acta*, 14 (1956) 70)

Solvent: water 15, HCl 4, diethyl ether 50 and methanol 50
Reagent: 0.5% picryl chloride in ethyl alcohol

$NH_2CO \cdot NH \cdot NH_2$	0.22
N_2H_4	0.23
NH_4Cl	0.36
NH_2OH	0.42
$C_6H_5 \cdot NH \cdot NH_2$	0.65
$C_6H_5 \cdot NH \cdot OH$	0.81, 0.95

TABLE VII

R_F VALUES OF DINITROTOLUENES, DINITRONAPHTHALENES AND DINITROANTHRAQUINONES
(J. FRANC, *Chem. Listy*, 49 (1955) 872)

Paper: Whatman No. 4 impregnated with paraffin (Bp 190–275°).
Solvent: 96% ethanol, water and acetic acid (20:14:1)

	R_F		R_F
o-Dinitrobenzene	0.76	1:5-Dinitroanthraquinone	0.00
m-Dinitrobenzene	0.56	1:8-Dinitroanthraquinone	0.77
1-Nitronaphthalene	0.33	1:6-Dinitroanthraquinone	0.43
1:5-Dinitronaphthalene	0.00	1:7-Dinitroanthraquinone	0.70
1:8-Dinitronaphthalene	0.80	Anthraquinone	0.28
1-Nitroanthraquinone	0.17		

TABLE VIII

R_F VALUES OF SUBSTITUTED HYDANTOINS
(J. P. VIGNE AND J. FONDARAI, *Bull. Soc. Chim.*, (1956) 124)

Paper: Whatman No. 1, allowed to reach equilibrium with a saturated atmosphere before development

	Butanol sat. with 1N HCl	*Butanol sat. with 4N NH_4OH*	*Pentane 100 Pyridine 1 sat. with benzyl alcohol and water*	*Hexane 100 Pyridine 1 sat. with benzyl alcohol and water*
5-Phenyl 5'-ethyl hydantoin	0.85	0.87	0.13	0.05
3-Methyl 5-phenyl 5'-ethyl hydantoin	0	1	0.75	0.80
5,5'-Diphenyl hydantoin		0.90	0	
3-Methyl 5,5'-diphenyl hydantoin		1	0	

TABLE IX

ELECTROMIGRATION OF FOOD COLOURS

(I. MORI AND M. KIMURA, *J. Pharm. Soc.*, 74 (1954) 179)

Paper: Toyo filter paper No. 50

Conditions:

	Electrolyte	*volts*	*mA/cm*	*hours*
I	30% acetic acid	700	0.5	4
II	10% acetic acid	700	0.6	1
III	1% borax	500	1.0	4
IV	0.1% NH_4OH	700	0.4	1
V	5% $NaH CO_3$	200	2.5	4

	I	*II*	*III*	*IV*	*V*
Acid green	13* (62**)		12* (76*)		
Amaranth	38	30 (71)	23*, 60**	80	21
Auramine conc.	—49	—30	—24	—18	5
Bismarck brown	—60	—10	— 3	0	
Diamond green	—36 (—59)	—16 (—38)	— 6	—3***	
Eosine	4	0	21	22 (38)	
Fluoresceine	12	— 8	46	74	
Guinea green	26	16	25	24	13
Indigo carmine	54	49	48, 75***	60	14
Haematoxylene	5		0		
Light green	49	41	70	74	
Light green SF yellow	33		55		
Malachite green	—42	—27	—10	0	
Naphthol green	23	21	28	28	
New coccine	73	82	90	81	54
Patent blue	27		20		
Patent blue A.O.O.	29		33		
Phloxine	0		33		
Rhodamine 6G	—35	—21	—13	8	
Solar pure blue XX	—15	—10	20	18	
Tartrazine	72	80	85		43
Toluidine blue	—36		— 3		
Wool blue SB Conc	65	57	50	4 (53***)	
G acid****	78				21
H acid****	51				19
R acid****	93				23

* Blue spot. ** Yellow spot. *** Small spot. **** 2 hours. ( ) Fluorescence.

TABLE X

R_F VALUES OF NAPHTHOLSULPHONIC ACIDS
(J. LATINAK, *Coll. Czech. Chem. Commun.*, 20 (1955) 1371)

Name	*Position of*		*n-Butanol 4 Acetic acid 1 Water 5*	*n-Butanol 3 Pyridine 1 Water 1*
	— OH	*— SO_3H*		
1-Naphthol-3,6,8-trisulphonic acid	1	3,6,8	0.02	0.02
ε-acid	1	3,8	0.10	0.14
δ-acid	1	4,8	0.09	0.21
1-Naphthol-2-sulphonic acid	1	2	0.79	0.80
1-Naphthol-3-sulphonic acid	1	3	0.61	0.69
Nevile-Winther acid	1	4	0.52	0.67
Naphthol-L-acid	1	5	0.50	0.67
Schöllkopf acid	1	8	0.72	0.77
1-Naphthol	1	—	0.95	0.93
2-Naphthol-3,6,8-trisulphonic acid	2	3,6,8	0.02	0.02
R-acid	2	3,6	0.04	0.11
G-acid	2	6,8	0.05	0.12
Oxy-Tobias acid	2	1	0.71	0.80
Schäffer acid	2	6	0.47	0.66
F-acid	2	7	0.48	0.66
Crocein acid	2	8	0.54	0.70
2-Naphthol	2	—	0.94	0.93

TABLE XI

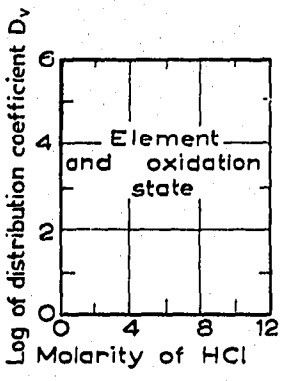
R_F VALUES OF ALKALI METALS IN MIXTURES OF PHENOL, METHANOL AND CONC. HCl
(R. J. MAGEE AND J. B. HEADRIDGE, *Analyst*, 82 (1957) 95)

Solvent			*R_F values of*					
phenol g	*methanol ml*	*conc. HCl ml*	Li^+	Na^+	K^+	Rb^+	Cs^+	NH_4^+
33	33	33	0.55	0.24	0.21	0.28	0.42	0.42
42	16	42	0.42	0.27	0.31	0.43	0.55	0.31
20	30	50	0.70	0.44	0.43	0.50	0.64	0.64
50	30	20	0.37	0.14	0.10	0.16	0.30	0.30
25	50	25	0.57	0.19	0.11	0.14	0.23	—
40	50	10	0.51	0.11	0.05	0.08	0.15	—
50	40	10	0.37	0.06	0.04	0.06	0.13	—
40	40	20	0.45	0.12	0.08	0.12	0.21	—
60	20	20	0.27	0.11	0.12	0.19	0.38	0.24

TABLE XII

ION EXCHANGE DATA FOR DOWEX-1 WITH HCl

(K. A. KRAUS AND F. NELSON, *Peaceful Uses of Atomic Energy Conference, Geneva*, 1955, Vol. VII)



Li no ads.	Be no ads.							
Na no ads.	Mg no ads.							
K no ads.	Ca no ads.	Sc III sl. ads.	Ti III sl. ads. IV	V IV sl. ads. V	Cr III sl. ads. VI str. ads	Mn II	Fe III II	
Rb no ads.	Sr no ads.	Y no ads.	Zr IV	Nb V	Mo VI	Tc VII	Ru IV	
Cs no ads.	Ba no ads.	RE III no ads.	Hf IV	Ta V	W VI	Re VII	Os III	
Fr no ads.	Ra no ads.	Ac no ads.	Th IV no ads.	Pa V	U VI IV			

no ads. = no adsorption in 0.1–12 *N* HCl
sl. ads. = slight adsorption in 12 *N* HCl
str. ads. = strong adsorption, $D_v \gg 1$.

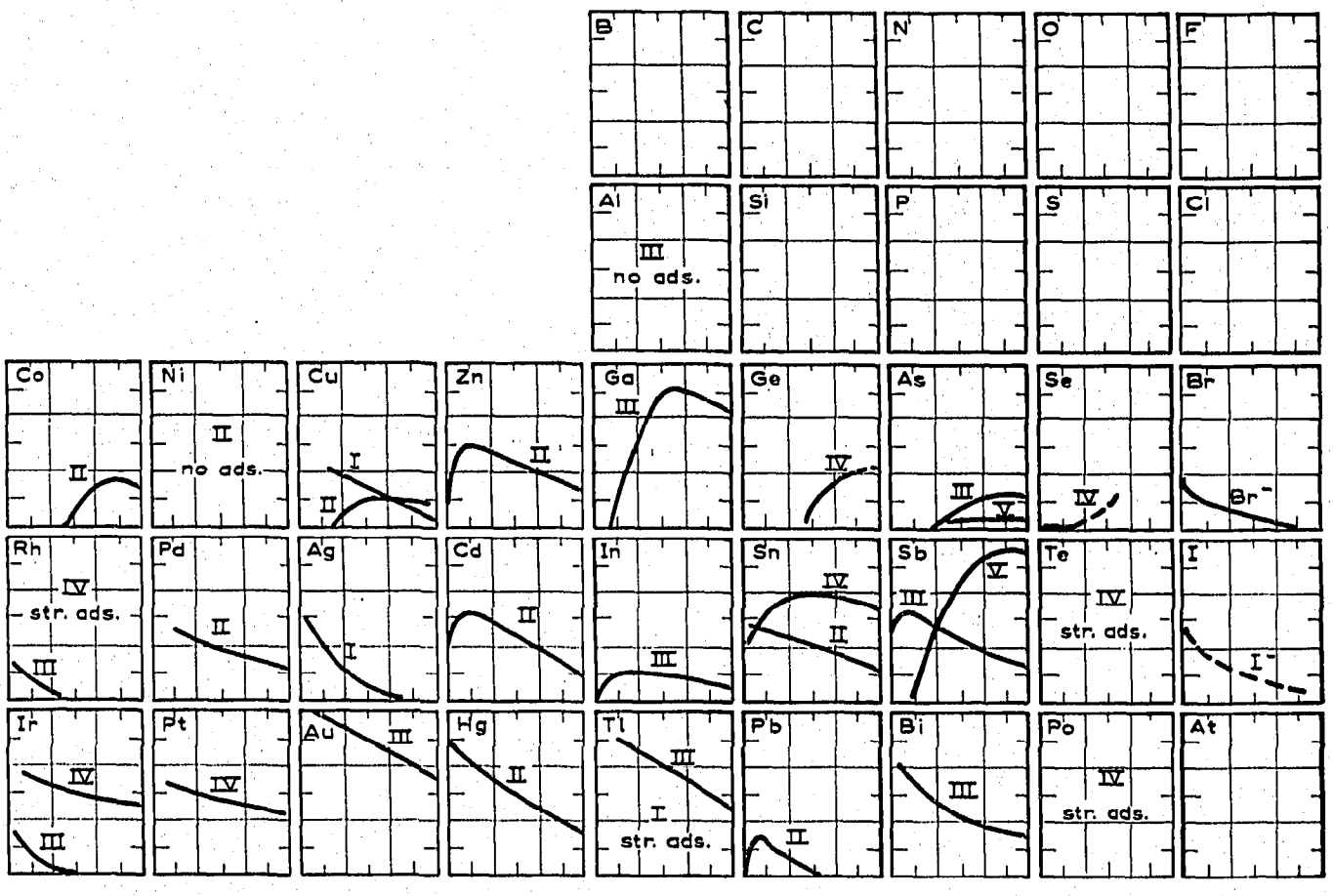

B
C
N
O
F
Al
III
no ads.
Si
P
S
Cl
Co
II
Ni
II
no ads.
Cu
I
II
Zn
II
Ga
III
Ge
IV
As
III
V
Se
IV
Br
Br⁻
Rh
IV
str. ads.
III
Pd
II
Ag
I
Cd
II
In
III
Sn
IV
II
Sb
III
V
Te
IV
str. ads.
I
I⁻
Ir
IV
III
Pt
IV
Au
III
Hg
II
Tl
III
I
str. ads.
Pb
II
Bi
III
Po
IV
str. ads.
At

TABLE XIII

R_F VALUES OF IONS IN BUTANOL–HCl MIXTURES
(R. A. GUEDES DE CARVALHO, *Anal. Chim. Acta*, 16 (1957) 555)

All solvents were prepared by shaking equal volumes of aqueous acid and butanol. After 2*N* HCl only one phase is formed.

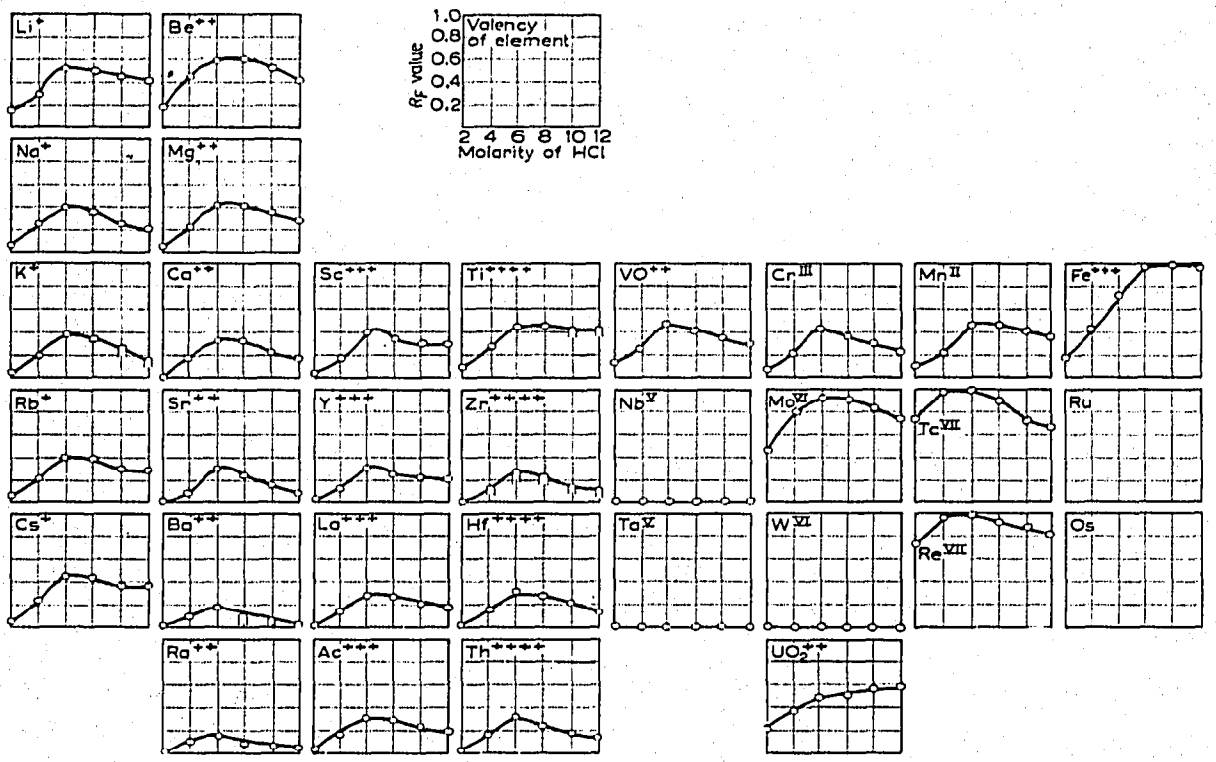


TABLE XIV

R_F VALUES OF INORGANIC IONS
(H. HARTKAMP AND H. SPECKER, *Z. anal. Chem.*, 158 (1957) 92)

Solvent: Tetrahydrofuran 50; conc. HCl 15.
Paper: Schleicher und Schüll 2043b.
Method: ascending. R_F values measured with reference to the water front.

Ion	R_F	*Ion*	R_F
Ba^{++}	0.00	Cu^{++}	0.90
Sr^{++}	0.099	UO_2^{++}	0.98
Ca^{++}	0.20	Zn^{++}	1.00
Ni^{++}	0.28	Cd^{++}	1.00
Mg^{++}	0.34	Hg^{++}	1.00
Al^{+++}	0.35	Ga^{+++}	1.00
Cr^{+++}	0.44	In^{+++}	1.00
Ti^{IV}	0.44	Sn^{++}	1.00
Mn^{++}	0.50	As^{+++}	1.00
VO_3^-	0.55	Sb^{+++}	1.00
Be^{++}	0.61	Bi^{+++}	1.00
SeO_3^{--}	0.76	MoO_4^{--}	1.00
Co^{++}	0.78	Fe^{+++}	1.00

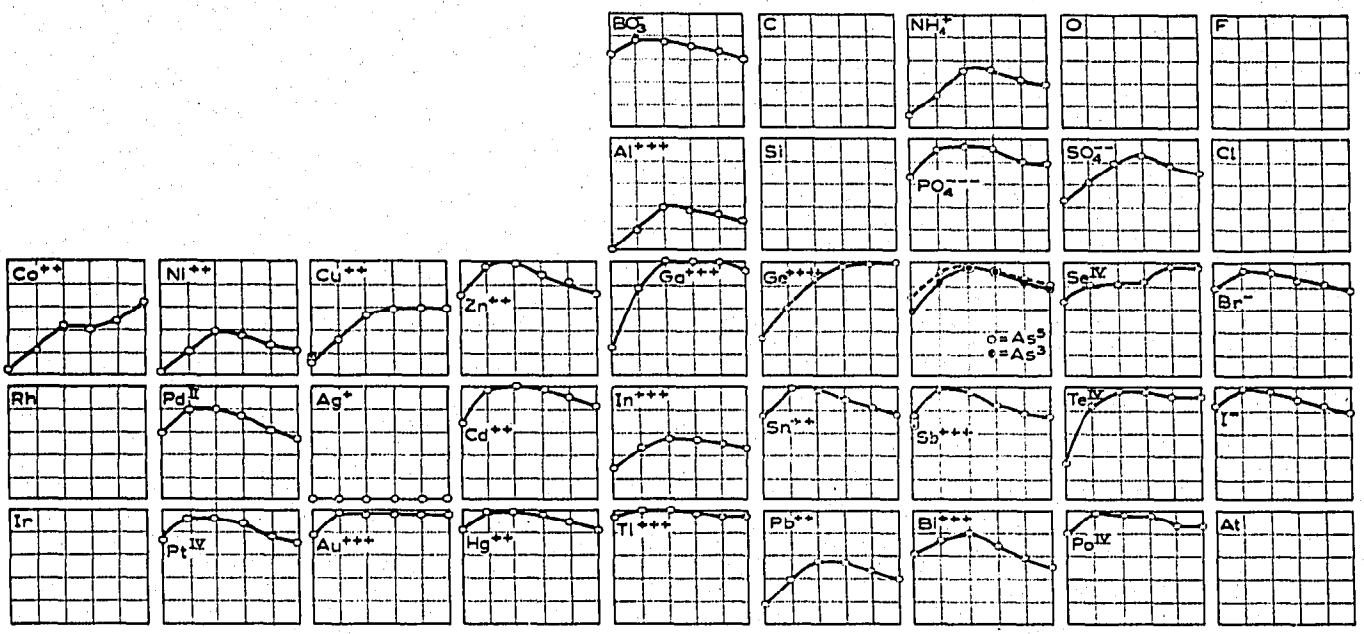


TABLE XV

R_F VALUES OF SOME FISSION PRODUCT ELEMENTS AND GROUPS
(H. GÖTTE AND D. PÄTZE, *Angew. Chem.*, 69 (1957) 608)

Paper: Schleicher und Schüll 2040a.

Ion	R_F *in* 30% *ethanol* 30% *methanol* 40% *2N HCl*	R_F *in* 40% *ethanol* 40% *methanol* 20% *2N HCl*	R_F *in* 30% *ethanol* 30% *butanol* 40% *5N HCl*
UO_2^{++}	0.73	0.72	
Co^{++}		0.61	
TeO_3^{--}	0.57		
Sb^{+++}	0.80		
Sn^{+++}	0.93		
Ag^{+}		0	0
Rh(III)			
two spots		0.54	0.43 and 0.59
Cu^{++}		0.54	0.51
Mo(VI)			0.72
Pd(II)		0.84	0.84
Cd^{++}		0.96	0.91

TABLE XVI

R_B VALUES OF 3,5-DINITROBENZOATES OF ALIPHATIC ALCOHOLS
(F. MICHEEL AND W. SCHMINKE, *Angew. Chem.*, 69 (1957) 334)

Paper: Acetylcellulose paper containing 14% acetyl.
Solvent: Ethyl acetate : dioxan : water 20:45:46.

$$R_B \text{ value} = \frac{\text{distance moved by spot}}{\text{distance moved by the methyl ester of 3,5-dinitrobenzoic acid}}$$

Ester	R_B	*Ester*	R_B
Methyl	1.00	*n*-Heptyl	0.41
Ethyl	0.85	*n*-Octyl	0.31
n-Propyl	0.73	*n*-Nonyl	0.25
n-Butyl	0.60	*n*-Decyl	0.21
n-Pentyl	0.55	*n*-Undecyl	0.17
n-Hexyl	0.48	*n*-Dodecyl	0.13

TABLE XVII

R_F VALUES OF 3,5-DINITROBENZOATES OF ALIPHATIC ALCOHOLS
(E. SUNDT AND M. WINTER, *Anal. Chem.*, 29 (1957) 851)

Paper: S. & S. 2043b impregnated with dimethylformamide (50% in acetone).
Development: saturation in atmosphere for 12 hours then descending development with decalin saturated with dimethylformamide.

Alcohol	R_F *value*	*Alcohol*	R_F *value*
Methanol	0.21	1-Hexen-3-ol	0.69
Ethanol	0.40	1-Pentanol	0.72
1-Propanol	0.50	1-Hexen-2-ol	0.73
2-Propanol	0.52	1-Hexanol	0.79
Sorbic alcohol	0.55	1-Nonenol	0.86
1-Butanol	0.64	Lauric alcohol	0.92

TABLE XVIII

R_F VALUES OF THE "CHRYSENE FRACTION" OF AN AROMATIC TAR ON ACETYLATED PAPER
(E. D. BERGMANN AND T. GRUENWALD, *J. Appl. Chem.*, 7 (1957) 15)

	Toluene 1 Methanol 6 Water 1	*Toluene 1 Methanol 10 Water 1*	*Light petroleum 1 Methanol 8 Water 2*
Chrysene	0	0	0
3:4-Benzpyrene	0.02	0.06	0.05
1:2-Benzanthracene	0.10	0.16	0.15
2:3-Benzfluorene	0.14	0.23	0.17
Fluoranthene	0.15	0.24	0.19
3:4-Benzfluorene	0.14	0.23	0.18
Pyrene	0.19	0.27	0.22

TABLE XIX

R_F VALUES OF ANTHRACENES ON ACETYLATED PAPER
(E. D. BERGMANN AND T. GRUENWALD, *J. Appl. Chem.*, 7 (1957) 15)

Solvent		*Anthracene*	*1-Methyl-anthracene*	*2-Methyl-anthracene*	*2,7-Dimethyl-anthracene*	*1,4-Dimethyl-anthracene*
Ethyl acetate	3	0.62	0.59	0.55	0.39	0.61
Pyridine	5					
Water	10					
Butyl acetate	1	0.76	0.82	0.71	0.42	0.82
Pyridine	5					
Water	10					
Toluene	1	0.70	0.31	0.26	0.05	0.33
Methanol	10					
Water	2					
Light petroleum	2	0.19	0.34	0.27	0.05	0.36
Methanol	10					
Water	2					
Benzene	1	0.57	0.65	0.59	0.36	0.68
Ethyl acetate	9					
Methanol	9					
Water	5					

TABLE XX

R_F VALUES OF FLUORENES
(E. D. BERGMANN AND T. GRUENWALD, *J. Appl. Chem.*, 7 (1957) 15)

Solvent		*Fluorene*	*1-Methylfluorene*	*2-Methylfluorene*	*3-Methylfluorene*
On propylene glycol impregnated paper					
Toluene	1	0.42	0.43	0.31	0.33
Methanol	1				
Methanol		0.74	0.71	0.70	0.70
Methanol	85	0.78	0.73	0.71	0.71
Water	20				
Methanol	85	0.84	0.76	0.73	0.72
Water	10				
Acetic acid	5				
On acetylated paper					
Butyl acetate	1	0.58	0.56	0.62	0.64
Pyridine	4				
Water	10				
Light petroleum	2	0.30	0.35	0.39	0.30
Methanol	9				
Water	2				
Toluene	1	0.33	0.39	0.30	0.31
Methanol	8				
Water	2				
Benzene	2	0.59	0.62	0.60	0.58
Ethyl acetate	9				
Methanol	5				
Water	5				

TABLE XXI

ELECTROMIGRATION OF INORGANIC ACIDS

(M. LEDERER, *Anal. Chim. Acta*, 17 (1957) 606 and D. GROSS, *Chem. & Ind.*, (1957) 1597)

	mm moved in 2% $(NH_4)_2CO_3$ in 1 hour with 150 volt in Jouan apparatus (Lederer)	*Relative rate to Cl^- in 0.1 M $(NH_4)_2CO_3$ with 100 volt/cm (high voltage technique) (Gross)*
Borate	33	
Arsenite	36.5	
Arsenate	61	
Phosphate	59	0.56
Pyrosphosphate	57	
Grahams salt	56	
Nitrite	83	0.95
Nitrate	83	0.91
Chloride	80	1.00*
Chlorate	76	0.84
Bromide	83	1.03
Bromate	67	0.73
Iodide	82	0.96
Iodate	50	0.49
Periodate	0 and 11 (2 spots)	
Fluoride	67	0.71
Thiocyanate	64	0.81
Sulphite	70	0.71
Thiosulphate	86	0.92
Sulphate	78	0.84
Persulphate	80	0.92
Selenite	60	
Tellurite	49	
Tellurate	38 with comet	
Pertechnetate	59	
Perrhenate	59	
Ferrocyanide	85	0.87
Ferricyanide	72	0.96
Metavanadate	60	
Molybdate	63	
Perchlorate		0.85
Sulphide		0.92
Metabisulphite		0.71

* Standard for comparison.

TABLE XXII

R_F VALUES OF HYDROXYSTEARIC ACIDS

(K. WINSAUER, *Mikrochim. Acta*, (1957) 481)

Solvent: Butanol 75, ethanol 15, water 8, conc. NH_4OH 2.

Substance	*R_F value*
Dihydroxystearic acid	0.65
Tetrahydroxystearic acid	0.52
Hexahydroxystearic acid	0.24

TABLE XXIII

ELECTROMIGRATION OF ALDEHYDES AND KETONES
(O. THEANDER, *Acta Chem. Scand.*, 11 (1957) 717)

$$M_v = \frac{\text{true distance of migration of the substance}}{\text{true distance of migration of vanillin}}$$

Paper: Whatman No. 3.
Technique: A. B. FOSTER, *Chem. & Ind.*, (1952) 1050.
Sulphite buffer: 0.1 *M* hydrogen sulphite buffer at pH 4.7 was prepared by dissolving 9.5 g dry sodium pyrosulphite, 8.8 g sodium acetate trihydrate and sufficient acetic acid (for pH 4.7 this is about 2.3 ml) in 1 litre of water. Room temperature, 13–18.5 V/cm for 3–5 h.

Compound	M_v
Aldehydo-pentacetylglucose	0.86
Methyl α-D-3-ketoglucopyranoside	0.50
Methyl β-D-2-ketoglucopyranoside	0.88
Methyl β-D-3-ketoglucopyranoside	0.85
Methyl β-D-6-aldehydoglucopyranoside	0.92
Glucuronic acid	0.95
Galacturonic acid	1.43
2-Ketogluconic acid	1.13
5-Ketogluconic acid	1.02
Periodate oxidized methyl-β-glucopyranoside	1.02 1.48
Periodate oxidized methyl-β-xylopyranoside	1.62
n-Heptanal	0.98
Diacetyl	0.69
Citral	1.36
Cinnamic aldehyde	1.18
Cyclohexanone	1.14
Cyclohexane-1:3-dione	1.78
Furfural	1.29
ω-Hydroxymethylfurfural	1.07
Benzaldehyde	1.16
o-Hydroxybenzaldehyde (Salicylaldehyde)	0.95
m-Hydroxybenzaldehyde	1.16
3,4-Dimethoxybenzaldehyde (Veratraldehyde)	1.03
3,4,5-Trimethoxybenzaldehyde	1.01
4-Hydroxy-3-methoxybenzaldehyde (Vanillin)	1.00
2-Hydroxy-3-methoxybenzaldehyde (Orthovanillin)	1.10
4-Hydroxy-3,5-dimethoxybenzaldehyde (Syringaldehyde)	0.95
2,4-Dihydroxybenzaldehyde	0.82
3,4-Dihydroxybenzaldehyde (Protocatechualdehyde)	1.00
2,6-Dihydroxy-4-methylbenzaldehyde (Atranol)	0.74
3-Aldehydo-4-hydroxy-5-methoxybenzaldehyde (Formylvanillin)	1.53

TABLE XXIV

R_F VALUES OF THE 2,4-DINITROPHENYLHYDRAZONES OF ALDEHYDES AND KETONES
(J. GASPARIC AND M. VECERA, *Coll. Czech. Chem. Communs.*, 22 (1957) 1426)

Paper: Whatman No. 4 dipped into a 25% solution of dimethylformamide in ethanol and allowed to dry 10 to 15 minutes.
Solvent: Cyclohexane.
Reagent: 1% NaOH in ethanol.

Compound	R_F	*Compound*	R_F
Formaldehyde	0.20	Acetone	0.48
Acetaldehyde	0.32	Methyl ethyl ketone	0.66
Acrolein	0.39	Hexen-1-one-5	0.71
Crotonaldehyde	0.47	Diethyl ketone	0.81
Propionaldehyde	0.50	Methyl *n*-butyl ketone	0.85
n-Butyraldehyde	0.66	Methyl isobutyl ketone	0.85
n-Valeraldehyde	0.76	Cyclopentanone	0.64
Isovaleraldehyde	0.76	Cyclohexanone	0.77
n-Hexylaldehyde	0.82	2-Methylcyclohexanone	0.85
2-Ethylhexylaldehyde	0.88	3-Methylcyclohexanone	0.85
Dodecylaldehyde	0.91	4-Methylcyclohexanone	0.85
Fural (*trans*-form)	0.12	Dihydroxyacetone	0
Fural (*cis*-form)	0.26	Diacetyl (monohydrazone)	0.22
		Diacetyl (dihydrazone)	0
		2,4-Dinitrophenylhydrazine	0.01

TABLE XXV

R_F VALUES OF SOME PHENOLS
(J. GASPARIC AND M. VECERA, *Mikrochim. Acta*, (1958) 68)

Solvent systems: I. Formamide–Cyclohexane, II. Formamide–Cyclohexane–Pyridine (25:1), III. Cyclohexane–Chloroform–Ethanol (27:3:0.6), IV. Benzene–Cyclohexane (1:12).

	I	*II*	*III*	*IV*
Phenol	0.12	0.32	0.23	—
o-Cresol	0.30	0.58	0.59	0.49
m-Cresol	0.19	0.46	0.41	0.27
p-Cresol	0.19	0.44	0.38	0.30
o-Ethylphenol	0.55	0.76		
m-Ethylphenol	0.37	0.63		
p-Ethylphenol	0.35	0.61		
2,3-Dimethylphenol	0.40	0.68		
2,4-Dimethylphenol	0.40	0.68		
2,5-Dimethylphenol	0.42	0.69		
3,4-Dimethylphenol	0.25	0.41		
3,5-Dimethylphenol	0.30	0.46		

TABLE XXVI

R_F VALUES OF PYRIDINE HOMOLOGUES

(WATARU FUNASAKA AND TSUGUO KOJIMA, *J. Chem. Soc. Japan, Ind. Chem. Sect.*, 60 (1957) 427)
Solvent: butanol saturated with 2 *N* HCl

Substance	R_F *values*
Pyridine	0.30
α-Picoline	0.50
β-Picoline	0.50
2,3-Lutidine	0.66
2,4-Lutidine	0.65
2,6-Lutidine	0.71
3,5-Lutidine	0.75
2,4,6-Collidine	0.85

(Compare W. R. WALKER, *Australian J. Sci.*, 13 (1950) 26, 84.)

TABLE XXVII

R_F VALUES OF SURFACE ACTIVE QUATERNARY AMMONIUM AND PYRIDINIUM CHLORIDES

(H. HOLNESS AND W. R. STONE, *Analyst*, 83 (1958) 71)

Paper: Whatman No. 1
Solvent: 35 or 40 ml industrial methylated spirits + 5 ml HCl made up to 100 ml with water
Temperature: 30°
Time of run: 7 hours approx.
Technique: Ascending

Substance	R_F *values*	
	35% alcohol	*40% alcohol*
n-Alkyltrimethylammonium salts:		
Lauryl	0.86	0.92
Myristyl	0.65	0.79
Cetyl	0.36	0.55
Stearyl	0.10	0.23
n-Alkylbenzyldimethylammonium salts:		
Lauryl	0.71	0.85
Myristyl	0.39	0.61
Cetyl	0.20	0.40
Stearyl	0.06	0.14
n-Alkylpyridinium salts:		
Lauryl	0.81	0.90
Myristyl	0.58	0.75
Cetyl	0.31	0.54
Stearyl	0.08	0.20

TABLE XXVIII

R_F VALUES OF ORGANIC PEROXIDES

(M. H. ABRAHAM, A. G. DAVIES, D. R. LLEWELLYN AND E. M. THAIN, *Anal. Chim. Acta*, 17 (1957) 499)

Conditions: Whatman No. 4 paper impregnated with a 5% solution of Silicone Fluid M.S.1107 in cyclohexane and heated at 110° for 1 hour
Solvent: Water–ethanol–chloroform (6:10:10)
Paper equilibrated with aqueous phase of solvent for 1 hour before run

Substance	R_F *value*
Hydrogen peroxide	0.84
Pinane hydroperoxide	0.61
1-Phenylethyl hydroperoxide	0.86
1-Phenylpropyl hydroperoxide	0.80
2-Phenyl-2-propyl hydroperoxide	0.85
2-Phenyl-2-butyl hydroperoxide	0.75
1,2,3,4-Tetrahydro-1-naphthyl hydroperoxide	0.78
Decahydro-9-naphthyl hydroperoxide	0.50
Triphenylmethyl hydroperoxide	0.19
Tri(*p*-nitrophenyl)methyl hydroperoxide	0.14
tert.-Butyl perbenzoate	0.17
tert.-Butyl diperterephthalate	0.16 (comet to 0)
Benzoyl peroxide	0.00
Diphenylmethyl 9-xanthenyl peroxide	0.16

TABLE XXIX

R_F VALUES OF OXIDATION PRODUCTS OF THYRONINE

(S. LISSITZKY AND M. ROQUES, *Bull. soc. chim. biol.*, 39 (1957) 521)

Solvent: Butanol–acetic acid–water (78:5:17)

Substance	R_F	*Substance*	R_F
Phenylalanine	0.35	Monoiodo-hydroquinone	0.88
o-Tyrosine	0.26	Monoiodotyrosine	0.40
m-Tyrosine	0.20	Diiodotyrosine	0.55
p-Tyrosine	0.18	5-Hydroxy-3-monoiodotyrosine	0.25
2,3-DOPA	0.12	3-Monoiodothyronine	0.64
2,5-DOPA	0.10	3′-Hydroxy-3-monoiodothyronine	0.53
3,4-DOPA	0.08	3′-Monoiodothyronine	0.68
Hydroquinone	0.80	3,3′-Diiodothyronine	0.70
Catechol	0.84	3,5-Diiodothyronine	0.73
Hydroxyhydroquinone	0.65	3′,5′-Diiodothyronine	0.80
Thyronine	0.68	3′-Hydroxy-3,5-diiodothyronine	0.55
3′-Hydroxythyronine	0.51	Iodide	0.19
Diiodo-hydroquinone	0.94		

TABLE XXX

PAPER ELECTROPHORESIS OF AROMATIC AMINES
(C. HANOT, *Bull. soc. chim. Belges*, 66 (1957) 76)

Conditions: HCl–KCl buffer of pH = 2.7 and ionic strength = 0.004. 105 or 220 V for 2 hours

Amine	*Relative mobilities*
α-Naphthylamine	1
Aniline	1.33
Methylaniline	1.66
Dimethylaniline	1.23
p-Aminobenzoic acid	0.86
o-Chloroaniline	1.06
m-Chloroaniline	1.06
p-Chloroaniline	1.06
m-Xylidine	1.06
m-Toluidine	1.32
o-Toluidine	1.44
β-Naphthylamine	1.00
Dimethyl-*α*-naphthylamine	1.01

TABLE XXXI

R_F VALUES OF AROMATIC HYDRAZO COMPOUNDS
(M. VEČEŘA, J. PETRÁNEK AND J. GASPARIČ, *Collection Czechoslov. Chem. Communs.*, 23 (1958) 333)

	Dimethylformamide–cyclohexane	*Formamide–cyclohexane*	*Formamide–benzene*
Hydrazobenzene	0.23	0.85	0.97
4-Methylhydrazobenzene	0.36	0.89	0.98
2-Methylhydrazobenzene	0.46	0.91	0.98
4,4′-Hydrazotoluene	0.51	0.91	0.98
2,2′-Hydrazotoluene	0.70	0.93	0.99
1,1′-Hydrazonaphthalene	0.31	0.85	0.97
p-Acetylaminohydrazobenzene	0	0	0.38
p-Benzoylaminohydrazobenzene	0	0	0.84
N-Acetylhydrazobenzene	0	0.33	0.93

TABLE XXXII

R_F VALUES OF OESTROGENS
(H. STRUCK, *Naturwiss.*, 45 (1958) 41)

Paper: Schleicher und Schuell 2043b (acetylated)
Solvent: methanol–water (80:20)

Substance	R_F *value*
Oestrone	0.39
Oestradiol	0.54
Oestriol	0.65
Equilin	0.38
Equilenin	0.31

TABLE XXXIII

R_F VALUES OF POLYCYCLIC HYDROCARBONS
(E. MALÝ, *Nature*, 181 (1958) 698)

Paper: Whatman No. 4 impregnated with a 10% petroleum ether solution of paraffin oil and drying for 15 min
Solvent: Methanol saturated with paraffin oil

Substance	*R_F value*
Anthracene	0.43
Phenanthrene	0.41
Pyrene	0.36
Chrysene	0.31, 0.34
3:4-Benzpyrene	0.28
1:2,5:6-Dibenzanthracene	0.25

TABLE XXXIV

R_G VALUES OF SUGARS. NEW SOLVENT FOR THE SEPARATION OF GLUCOSE AND SORBITOL
(W. R. REES AND T. REYNOLDS, *Nature*, 181 (1958) 767)

Solvent: Methyl ethyl ketone–acetic acid–satd. aqueous boric acid (9:1:1)
Paper: Whatman No. 54

Sugar	*R_G value*
Sorbitol	3.0
Mannitol	2.5
D-Fructose	1.9
D-Arabinose	2.0
D-Xylose	2.9
D-Ribose	7.0
Maltose	0.2

TABLE XXXV

R_F VALUES OF FOOD COLOURS
(I. NETTO, *Ann. fals. et fraudes*, 50, No. 580 (1957))

Paper: Whatman No. 1
Solvent: 1 *N* HCl

Colour	*Colour Index No.*	*R_F values*
Ponceau 3R	80	0.031–0.040
Amaranth	184	0.063–0.077
Indigotine	1180	0.131–0.099
Tartrazine	640	0.320–0.340
Naphthol Yellow S	10	0.534–0.574
Guinea Green B	666	0.791–0.860

TABLE XXXVI

R_G VALUES OF ORGANIC ACIDS

(J. CARLES, A. SCHNEIDER AND A. M. LACOSTE, *Bull. soc. chim. biol.*, 40 (1958) 221)

Paper: Arches No. 302
Solvent I: 95 ml ethanol 96% + 5 ml conc. NH_4OH
Solvent II: Butanol–formic acid–water (4:1:5), 12 h old

$$R_G \text{ value} = \frac{\text{Distance moved by acid}}{\text{Distance moved by glycolic acid}} \times 100$$

Acid	*R_G in solvent*		*Acid*	*R_G in solvent*	
	I	*II*		*I*	*II*
Aconitic	20	135	*m*-Aminobenzoic	115	120
Adipic	80	145	*p*-Aminobenzoic	105	140
Aspartic	20	25	*p*-Hydroxybenzoic	140	153
Ketoglutaric	60	110	Caffeic	90	135
Citraconic	55	128	Chlorogenic	80	105
Citramalic	50	110	Cinnamic	200	160
Citric	15	75	*o*-Coumaric	160	155
Isocitric	10	75	Kynurenic	160	125
Fumaric	60	145	Furoic	180	150
Galacturonic	35	15	Gallic	70	95
Glutamic	40	35	Gentisic	180	153
Glutaric	50	130	Hippuric	190	150
	60	140	Indoleacetic	160	150
Glyceric	90	70	Mandelic	190	145
Glycolic	100	100	Nicotinic	175	110
Itaconic	55	140	Phenylacetic	200	155
Lactic	145	120	*p*-Aminophenyl-acetic	130	95
Maleic	45	105	Phenylpropionic	210	160
Dihydroxymaleic	190	130	Phthalic	60	145
	220	120	Protocatechuic	90	135
Malic	40	90	Pyrocatechol-carboxylic acid	105	140
Malonic	30	110	Pyrrolidone-carboxylic acid	100	95
Mesaconic	70	150	Quinic	85	40
Mucic	0–5	0–5	β-Resorcylic	160	155
Oxalic	20	30	Salicylic	235	160
	30	90	4-Aminosalicylic	130	145
	80	130	Shikimic	75	65
Sebacic	130	160	Hydrochloric	135	25
Succinic	50	125	Nitric	160	35
Tartaric	30	35–50	Orthophosphoric	15	30
Acetylsalicylic	225	160	Sulphuric	20	5
Anthranilic	145	150			
Benzoic	200	160			

TABLE XXXVII

R_F VALUES OF LIPIDS

(M. CORMIER AND P. JOUAN, *Bull. soc. chim. biol.*, 39 (1957) 1321)

Paper: Whatman No. 1 impregnated with silicic acid

	Solvents	
	Ether 2 Petrol ether 100	*Ether 4 Petrol ether 50 Heptane 50*
Oleic acid	0	0
Stearic acid	0	0
Monobutyrine	0.03	0.03
Monopalmitine	0.03	0.03
Dipalmitine	0.05	0.05
Tripalmitine	0.32	0.30
Trioleine	0.32	0.30
Trilaurine	0.32	0.30
Steroids	0.80	0.67
Cholesterol palmitate	0.80	0.67
Cholesterol	0.10	0.08

TABLE XXXVIII

R_F VALUES OF URANIUM FISSION PRODUCTS

(C. E. CROUTHAMEL AND A. J. FUDGE, *J. Inorg. & Nuclear Chem.*, 5 (1958) 240)

Nuclide	*20 g 49% HF per 100 ml methyl ethyl ketone*	*60 g 49% HF per 100 ml methyl ethyl ketone*	*49% HF*
^{137}Cs, ^{134}Cs	0.3	0.6	1.0
^{140}Ba	0.0	0.0	0.8
^{90}Sr	0.0	0.0	0.8
^{141}Ce, ^{140}La	0.0	0.0	0.0
^{95}Nb, ^{97}Nb	1.0	1.0	0.7
^{181}Ta	1.0	1.0	0.7
^{95}Zr, ^{97}Zr	0.0	0.05	0.2
$^{125}Sb(V)$	1.0	1.0	0.8
^{106}Ru	*	(0.2)	(0.8)
$^{132}Te(VI)$	0.5	0.6	0.8
^{99}Mo	0.1	0.25	0.7
^{99m}Tc	0.5	0.6	0.7
^{233}Pa	0.0	0.05	0.9
UO_2^{++}	0.0	0.05	0.8**
^{239}Np	0.0	0.0	0.2**
^{239}Pu	0.0	0.0	0.2**
^{241}Am	0.0	0.0	0.0

* Variable R_F values

** Tailing

TABLE XXXIX*

RELATIVE RETENTION VOLUMES OF ALIPHATIC HYDROCARBONS

(D. W. GRANT AND G. A. VAUGHAN, in D. H. DESTY, *Vapour Phase Chromatography*, Butterworths Scientific Publications, London, 1957, p. 415)

(Temperature = 100°)

Stationary phase	*n-Hexane*	*n-Heptane*	*n-Octane*	*n-Decane*
Liquid paraffin	0.673	1.36	2.91	12.73
Silicone fluid M.S. 550	0.462	0.800	1.56	6.07
Dinonyl phthalate	0.369	0.811	1.61	6.84
Tricresyl phosphate	0.246	0.443	0.820	3.28

TABLE XL

RELATIVE RETENTION VOLUMES OF LOWER HYDROCARBONS ON CARBITOL AND DIMETHYLFORMAMIDE

(M. M. WIRTH, in D. H. DESTY, *Vapour Phase Chromatography*, Butterworths Scientific Publications, London, 1957, p. 162)

(*n*-Pentane = 1, Temperature = 0°)

Hydrocarbon	*B.p. °C*	*Carbitol*	*Dimethyl-formamide*
Propane	— 42.1	0.082	
Propylene	47.7	0.119	
Isobutane	11.7	0.190	0.208
n-Butane	0.5	0.298	0.374
Isobutene	6.9	0.393	0.662
Butene-1	6.3	0.393	0.662
trans-Butene-2	+ 0.9	0.512	0.805
cis-Butene-2	+ 3.7	0.625	1.0
Butadiene	— 4.4	0.738	1.78
Isopentane	+ 27.9	0.738	0.662
3-Methylbutene-1	20.1	0.815	1.15
n-Pentane	36.1	1.0	1.0
Pentene-1	30.0	1.28	1.78
2-Methylbutene-1	31.1	1.46	2.19
2,2-Dimethylbutane	49.7	1.50	1.39
trans-Pentene-2	36.4	1.61	2.19
cis-Pentene-2	37.1	1.76	2.42
2-Methylbutene-2	38.5	1.93	2.88
Cyclopentane	49.3	2.65	2.16
Isoprene	34.1	2.65	5.55
Cyclopentene	44.2	3.11	5.02
trans-Piperylene	42.3	3.51	7.69
cis-Piperylene	44.2	4.02	8.73
Cyclopentadiene	41.0	4.66	11.52

* Tables XXXIX to LV have been collected by A. T. JAMES.

TABLE XLI

RELATIVE RETENTION VOLUMES OF ISOMERIC HEXANES AND HEXENES

(L. J. SULLIVAN, J. R. LOTZ AND C. B. WILLINGHAM, *Anal. Chem.*, 28 (1956) 495)

(Temperature = 20°; values relative to that of *n*-pentane = 1)

Substance	*Di-n-decyl phthalate*	*Ditetrahydrofurfuryl phthalate*
3,3-Dimethyl-1-butene	1.20	1.30
4-Methyl-1-pentene	2.05	2.15
3-Methyl-1-pentene	2.10	2.15
2,3-Dimethyl-1-butene	2.40	2.55
4-Methyl-*cis*-2-pentene	2.25	2.35
4-Methyl-*trans*-2-pentene	2.40	2.50
2-Methyl-1-pentene	3.10	3.20
1-Hexene	3.20	3.20
2-Ethyl-1-butene	3.60	3.80
cis-3-Hexene	3.50	3.75
trans-3-Hexene	3.50	3.55
2-Methyl-2-pentene	3.85	4.00
3-Methyl-*trans*-2-pentene	4.00	4.25
trans-2-Hexene	3.70	3.65
cis-2-Hexene	4.10	4.20
3-Methyl-*cis*-2-pentene	4.55	4.65
2,3-Dimethyl-2-butene	5.40	5.75
2,2-Dimethylbutane	1.45	1.15
2,3-Dimethylbutane	2.10	1.65
2-Methylpentane	2.15	1.65
3-Methylpentane	2.60	2.30
n-Hexane	3.10	2.20

TABLE XLII

RELATIVE RETENTION VOLUMES OF AROMATIC HYDROCARBONS

(D. W. GRANT AND G. A. VAUGHAN, in D. H. DESTY, *Vapour Phase Chromatography*, Butterworths Scientific Publications, London, 1957, p. 415)

(Temperature = 100°)

Stationary phase	*Benzene*	*Toluene*	*Ethylbenzene*	*m-Xylene*	*o-Xylene*
Liquid paraffin	1	1.99	4.54	5.17	6.08
Silicone fluid M.S. 550	1	2.00	3.92	3.92	4.85
Dinonyl phthalate	1	2.23	4.36	4.86	5.90
Tricresyl phosphate	1	2.05	4.08	4.27	5.32

TABLE XLIII

RELATIVE RETENTION VOLUMES OF HYDROCARBONS

(V. T. BROOKS AND G. A. COLLINS, *Chem. and Ind. (London)*, (1956) 921)

(Temperature 120°, values relative to that of benzene—benzene taken as 1)

Compound	*B.p., °C 760 mm*	*Column liquid phase*					
		"Nujol"	*D.N.P.*	*T.X.P.*	*CW.1000*	*P.P.G.2025*	*M.P.E.G.550*
n-Hexane	69.0	0.66	0.50	0.31	0.47	0.40	0.27
n-Heptane	98.4	1.26	0.80	0.53	0.52	0.66	0.36
n-Octane	125.6	2.42	1.46	0.93	0.61	1.13	0.52
n-Decane	174.0	9.43	5.00	3.12	1.00	3.48	1.23
Cyclohexane	80.7	1.11	0.72	0.55	0.63	0.65	0.42
Methylcyclohexane	100.4	1.75	1.00	0.78	1.00	0.89	0.51
1-Hexene	64.1	0.64	0.48	0.36	0.48	0.42	0.27
1-Heptene	94.9	1.19	0.81	0.59	0.57	0.70	0.39
1-Octene	121.6	2.34	1.44	1.00	0.71	1.20	0.60
1-Nonene	145.3	4.57	2.58	1.87	0.91	2.10	1.00
1-Decene	172.0	9.06	4.83	3.43	1.31	3.76	1.62
Cyclohexene	83.2	1.21	0.91	0.73	0.70	0.83	0.58
4-Methylcyclohexene	102.6	1.87	1.30	1.00	0.78	1.12	0.71
Benzene	80.1	1.00	1.00	1.00	1.00	1.00	1.00
Toluene	110.6	2.06	1.91	1.87	1.31	1.76	1.56
Ethylbenzene	136.2	3.84	3.30	3.29	1.84	2.99	2.44
p-Xylene	138.4	4.37	3.81	3.43	2.04	3.17	2.62
m-Xylene	139.2	4.51	3.76	3.64	2.03	3.35	2.64
o-Xylene	144.5	4.93	4.26	4.31	2.40	3.86	3.25
Cumene	152.4	5.63	5.07	4.53	2.40	4.17	3.23
n-Propylbenzene	159.2	7.55	5.97	5.77	2.72	5.24	3.74
Mesitylene	164.6	8.73	6.88	6.48	3.02	5.97	4.33
Pseudocumene	169.2	11.20	8.00	7.84	3.60	7.02	5.39
sec.-Butylbenzene	171.0	11.31	8.45	7.89	3.30	7.05	4.62
p-Cymene	175.0	13.45	9.90	8.44	3.60	7.45	5.39
tert.-Amylbenzene	191.0	20.60	14.42	13.18	4.85	11.57	7.25
Hydrindene	178.0	12.60	10.05	10.78	5.50	9.84	8.00
Styrene	145.2	4.98	4.60	4.89	3.39	4.76	4.52
α-Methylstyrene	161.5	9.18	7.75	8.11	4.72	7.45	6.38
Indene	182.0	14.65	13.73	15.25	10.15	12.50	14.10

Nujol = Liquid paraffin (Stemco Ltd.); D.N.P. = Dinonyl phthalate (British Industrial Solvents); T.X.P. = Trixylenyl phosphate (Albright & Wilson Ltd.); CW.1000 = Polyethylene glycol 1000 (Gemec Chemicals Co.); P.P.G.2025 = Polypropylene glycol 2025 (Gemec Chemicals Co.); M.P.E.G.550 = Methoxy polyethylene glycol 550 (Gemec Chemicals Co.).

TABLE XLIV

RELATIVE RETENTION VOLUMES OF HYDROCARBONS AND SULFUR COMPOUNDS

(D. H. DESTY AND B. H. F. WHYMAN, *Anal. Chem.*, 29 (1957) 330)

(Operating temperature, 78.5°; *n*-pentane = 1)

No.	Boiling pt., °C 760 mm	Compound	Stationary phase: *n*-Hexatriacontane r.r.v.	*n*-Hexatriacontane $\log_{10}$ r.r.v.	Benzyldiphenyl r.r.v.	Benzyldiphenyl $\log_{10}$ r.r.v.
		Paraffins				
1	— 11.73	Isobutane	0.29	— 0.538	—	—
2	— 0.50	*n*-Butane	0.39	— 0.409	—	—
3	+ 9.50	Neopentane	0.44	— 0.356	—	—
4	27.85	Isopentane	0.77	— 0.113	0.76	— 0.119
5	36.07	*n*-Pentane	1.00	0	1.00	0
6	49.74	2,2-Dimethylbutane	1.34	+ 0.127	1.26	+ 0.100
7	57.99	2,3-Dimethylbutane	1.83	0.263	1.74	0.241
8	60.27	2-Methylpentane	1.83	0.263	1.79	0.253
9	63.28	3-Methylpentane	2.12	0.326	2.05	0.312
10	68.74	*n*-Hexane	2.42	0.384	2.31	0.364
11	79.20	2,2-Dimethylpentane	3.00	0.477	2.57	0.410
12	80.50	2,4-Dimethylpentane	3.08	0.489	2.63	0.420
13	80.88	2,2,3-Trimethylbutane	3.49	0.543	2.94	0.468
14	86.06	3,3-Dimethylpentane	4.13	0.616	3.84	0.584
15	89.78	2,3-Dimethylpentane	4.55	0.658	4.03	0.605
16	90.05	2-Methylhexane	4.27	0.630	3.74	0.573
17	91.85	3-Methylhexane	4.68	0.670	4.14	0.617
18	93.48	3-Ethylpentane	5.18	0.714	4.63	0.666
19	98.43	*n*-Heptane	5.73	0.758	5.26	0.721
20	99.24	2,2,4-Trimethylpentane	5.28	0.723	4.26	0.629
21	106.84	2,2-Dimethylhexane	6.57	0.818	5.49	0.740
22	109.10	2,5-Dimethylhexane	7.13	0.853	5.94	0.774
23	109.43	2,4-Dimethylhexane	7.45	0.872	6.23	0.795
24	109.84	2,2,3-Trimethylpentane	8.10	0.909	6.89	0.838
25	111.97	3,3-Dimethylhexane	8.49	0.929	7.17	0.856
26	113.47	2,3,4-Trimethylpentane	9.21	0.964	8.03	0.905
27	114.76	2,3,3-Trimethylpentane	10.00	1.000	8.71	0.940
28	115.61	2,3-Dimethylhexane	9.63	0.984	8.51	0.930
29	115.65	2-Methyl-3-ethylpentane	9.84	0.993	8.83	0.946
30	117.65	2-Methylheptane	9.83	0.993	8.54	0.932
31	117.71	4-Methylheptane	10.12	1.005	8.83	0.946
32	117.73	3,4-Dimethylhexane	10.73	1.030	9.67	0.985
33	118.26	3-Methyl-3-ethylpentane	11.33	1.054	10.09	1.004
34	118.53	3-Ethylhexane	10.69	1.029	9.66	0.985
35	118.93	3-Methylheptane	10.58	1.025	8.54	0.932
36	125.67	*n*-Octane	13.42	1.128	12.00	1.079
37	150.80	*n*-Nonane	30.96	1.491	27.14	1.434
38	174.12	*n*-Decane	—	—	61.20	1.787
		Aromatics				
39	80.10	Benzene	4.19	0.622	10.77	1.032
40	110.63	Toluene	10.50	1.021	25.46	1.406
41	136.19	Ethylbenzene	21.97	1.342	53.97	1.732
42	138.35	*p*-Xylene	26.02	1.416	57.78	1.762
43	139.10	*m*-Xylene	25.72	1.410	55.63	1.745
44	144.41	*o*-Xylene	30.72	1.487	73.19	1.864
		Cyclopentanes				
45	49.26	Cyclopentane	1.90	0.279	2.54	0.405
46	71.81	Methylcyclopentane	3.25	0.512	3.74	0.573
47	87.85	1,1-Dimethylcyclopentane	4.77	0.679	5.00	0.699
48	90.77	*cis*-1,3-Dimethylcyclopentane	5.18	0.714	5.66	0.753

(Contd. on p. xxix)

TABLE XLIV (*Continued*)

No.	Boiling pt., °C 760 mm	Compound	Stationary phase			
			n-Hexatriacontane		Benzyldiphenyl	
			r.r.v.	$\log_{10}$ r.r.v.	r.r.v.	$\log_{10}$ r.r.v.
		Cyclopentanes (contd.)				
49	91.87	*trans*-1,2-Dimethylcyclopentane	5.49	0.740	5.71	0.757
50	99.53	*cis*-1,2-Dimethylcyclopentane	7.25	0.860	8.03	0.905
51	103.47	Ethylcyclopentane	8.18	0.913	9.31	0.969
52	105.05	1,1,3-Trimethylcyclopentane	10.39	1.017	10.43	1.018
53	109.40	1,2,4-Trimethylcyclopentane (low boiling isomer)	8.53	0.931	8.03	0.903
54	116.95	1,2,4-Trimethylcyclopentane (high boiling isomer)	11.37	1.056	11.32	1.054
55	121.50	1-Methyl-1-ethylcyclopentane	13.61	1.134	14.93	1.174
56	126.95	Isopropylcyclopentane	16.20	1.210	17.14	1.234
57	130.95	*n*-Propylcyclopentane	18.43	1.266	20.49	1.312
		Cyclohexanes				
58	80.74	Cyclohexane	4.50	0.653	5.54	0.744
59	100.94	Methylcyclohexane	7.77	0.890	8.46	0.927
60	119.54	1,1-Dimethylcyclohexane	13.05	1.115	13.46	1.129
61	120.10	*cis*-1,3-Dimethylcyclohexane	12.95	1.112	12.80	1.107
62	131.78	Ethylcyclohexane	19.61	1.293	21.46	1.331
		Other Saturated Cyclics				
63	118.9	Cycloheptane	14.00	1.146	18.09	1.257
64	151	Cyclo-octane	38.72	1.588	51.43	1.711
65	108	Norbornylane	9.45	0.975	13.55	1.132
66	132	*trans*-(3,3,0)-Bicyclo-octane	24.53	1.389	38.13	1.581
67	135	*cis*-(3,3,0)-Bicyclo-octane	24.39	1.387	36.41	1.561
		Olefins				
		Alkenes				
68	31.16	2-Methyl-1-butene	0.91	— 0.041	1.25	0.097
69	38.57	2-Methyl-2-butene	1.16	+ 0.065	1.55	0.190
70	56.30	*cis*-4-Methyl-2-pentene	1.68	0.225	2.06	0.314
71	58.55	*trans*-4-Methyl-2-pentene	1.73	0.238	1.97	0.295
72	63.49	1-Hexene	2.13	0.328	2.73	0.426
73	72.5	4,4-Dimethyl-1-pentene	2.59	0.413	2.61	0.417
74	101.44	2,4,4-Trimethyl-1-pentene	6.09	0.785	6.23	0.795
75	104.91	2,4,4-Trimethyl-2-pentene	6.34	0.802	7.33	0.865
76	121.28	1-Octene	11.70	1.068	13.40	1.127
		Cyclic Olefins				
77	82.98	Cyclohexene	5.03	0.702	7.83	0.894
78	115	Cycloheptene	12.41	1.094	19.12	1.281
		Cyclic Diolefins				
79	41	Cyclopentadiene	1.32	0.121	3.17	0.501
80	70	Methylcyclopentadiene	3.20	0.505	7.09	0.851
81	81	Cyclohexadiene	4.27	0.630	10.02	1.009
		Sulfur Compounds				
		Alkane Sulfides				
82	37.28	2-Thiapropane	1.14	0.057	3.38	0.529
83	92.06	3-Thiapentane	5.22	0.718	13.81	1.140
84	118.50	3-Thiahexane	11.67	1.087	29.13	1.464
		Cyclic Sulfides				
85	121.45	Thiacyclopentane	13.33	1.125	50.59	1.704
86	133.23	2-Methylthiacyclopentane	18.85	1.275	61.19	1.787
		Thiophenes				
87	84.10	Thiophene	4.58	0.661	15.06	1.178
88	115.44	3-Methylthiophene	10.04	1.001	35.28	1.548

TABLE XLV

VALUES AND PARTITION COEFFICIENTS FOR COMPOUNDS ON PEG 400, METHOXY PEG 350, AND PPG 425*
(E. R. ADLARD, in D. H. DESTY, *Vapour Phase Chromatography*, Butterworths Scientific Publications, London, 1957, p. 105)

Substance	$V_g°$ *at 200 mm Hg and 100°*			*Partition coefficient at 100° (Stationary phase /N_2)*		
	PEG 400	*Methoxy PEG 350*	*PPG 425*	*PEG 400*	*Methoxy PEG 350*	*PPG 425*
n-Pentane	3.56	5.73	9.24	2.98	5.58	8.95
n-Hexane	5.87	10.24	19.85	5.36	10.4	19.0
n-Heptane	10.23	18.47	40.60	9.85	19.1	38.6
n-Octane	17.38	34.07	80.22	17.1	35.6	76.0
n-Decane	48.71	110.6	—	49.3	117	—
Benzene	50.13	73.47	80.34	52.1	77.3	76.1
Toluene	85.94	132.6	159.4	89.7	140	151
m-Xylene	146.6	239.9	313.0	153	254	296
o-Xylene	188.9	303.2	382.4	198	321	362
Mesitylene	249.1	428.4	606.6	261	453	573
Methanol	52.62	55.50	49.81	54.6	58.3	47.2
Ethanol	62.89	70.99	65.28	65.5	73.7	61.8
n-Propanol	109.4	133.4	130.7	114	141	124
n-Butanol	199.4	256.7	270.7	209	271	256
n-Pentanol	362.3	495.3	554.2	380	524	524
Acetone	18.61	38.38	34.09	18.9	39.9	32.4
MEK	35.85	64.05	63.80	37.0	67.3	60.4
MIPK	44.19	80.32	89.33	45.8	83.6	84.6
DEK	59.42	102.6	113.8	61.8	108	108
MIBK	72.28	127.3	151.4	75.4	134	143
Ethyl acetate	38.39	53.30	60.37	39.7	55.9	57.1
n-Propyl acetate	63.54	94.28	115.9	66.2	99.3	110
n-Butyl acetate	108.6	173.8	227.7	113	184	215
Water	170.4	153.7	99.31	—	—	—

* $V_g°$ = retention volume per g of stationary phase corrected to zero pressure drop across the column; PEG = polyethylene glycol; PPG = polypropylene glycol.

TABLE XLVI

UNCORRECTED RETENTION VOLUMES OF CHLORO-, BROMO- AND SOME OTHER COMPOUNDS
(G. F. HARRISON, in D. H. DESTY, *Vapour Phase Chromatography*, Butterworths Scientific Publications, London, 1957, p. 336)

Column		*Paraffin*		*Silicone fluid MS 710*		*DNP*		*TCP*	
Compound	*B.p.°C*	*35°*	*77°*	*35°*	*77°*	*35°*	*77°*	*35°*	*77°*
Ethyl chloride	12.2	72	—	100	—	156	—	130	—
2-Chloropropene	22	—	—	132	32	192	44	130	30
Isopropyl chloride	35.5	160	48	188	44	276	76	192	44
1,1-Dichloroethylene	37	212	56	212	52	325	84	216	60
Dichloromethane	40.1	196	56	332	80	595	136	530	125
Allyl chloride	44.6	212	56	292	76	450	116	370	84
n-Propyl chloride	47.2	268	72	308	76	450	116	330	84
trans-1,2-Dichloroethylene	48.4	356	96	372	84	590	136	460	110
tert.-Butyl chloride	51.5	268	72	264	64	408	100	260	64
1,1-Dichloroethane	57.3	356	96	500	112	840	188	685	150
cis-1,2-Dichloroethylene	60.1	452	124	685	148	1320	270	1180	250
Chloroform	61	580	144	775	164	1620	320	1520	290
Propargyl chloride	65	224	60	470	108	—	—	—	—
sec.-Butyl chloride	68	544	144	560	124	870	210	590	136
Isobutyl chloride	68.9	—	—	—	156	—	220	—	159
1,1,1-Trichloroethane	74.1	780	204	840	176	1290	270	950	200
Carbon tetrachloride	76.5	960	248	940	196	1180	270	980	205
n-Butyl chloride	78	780	204	865	180	1380	280	880	190
1,2-Dichloroethane	83.5	712	180	1200	250	1780	410	2100	410
tert.-Amyl chloride	86	—	—	880	184	1500	300	920	195
Trichloroethylene	87	—	352	—	290	—	510	—	390
Isoamyl chloride	98.9	—	372	—	290	—	520	—	335
1,1,2-Trichloroethane	113.5	—	580	—	680	—	1350	—	1350
Tetrachloroethylene	121.2	—	220*	—	—	—	—	—	—
1,1,1,2-Tetrachloroethane	130.5	—	—	—	1140	—	—	—	—
1,1,2,2-Tetrachloroethane	146.3	—	460*	—	2200*	—	—	—	520*
Ethyl ether	34.6	156	44	160	35	220	55	135	35
Ethyl bromide	38	208	50	265	60	360	88	280	70
Acetone	56.5	108	32	245	60	390	90	440	100
Methyl alcohol	64.7	—	—	70	—	230	—	—	—
n-Hexane	69	600	—	—	—	440	—	—	—
Ethyl alcohol	78.9	192	50	160	30	510	88	690	125
Toluene	110	—	670	—	—	—	—	—	—
1,2-Dibromoethane	131	—	—	—	980	—	1620	—	—

* At 136°.

TABLE XLVII

CORRECTED RETENTION VOLUMES OF CHLORO COMPOUNDS

(F. H. POLLARD AND C. J. HARDY, in D. H. DESTY, *Vapour Phase Chromatography*, Butterworths Scientific Publications, London, 1957, p. 117)

Liquid phase	*Weight g*	*Temp. °C*	*Corrected retention volume per gramme* V_g°			
			CH_3Cl	CH_2Cl_2	$CHCl_3$	CCl_4
Kieselguhr	3.00	27.3	—	1.5/3 g	2.25/3 g	2.3/4g
Dibutyl phthalate	4.0	57.0	—	108	254	182
Dinonyl phthalate	1.89	57.2	27.3 (24.5°)	82.8	210	173
Silicone 702	2.14	56.7	10.0	60.5	136	180
Silicone 702	2.14	20.2	25.1	232	595	746
Silicone 1107	1.98	19.5	—	149	390	565
Glycerol	2.27	24.4	2.16	12.9	16.75	3.85
Liquid paraffin	1.85	56.6	—	33.8	87.6	170
Water	1.72	24.2	—	14.7	5.95	1.70

TABLE XLVIII

CORRECTED RETENTION VOLUMES OF CHLORO AND FLUORO COMPOUNDS

(F. H. POLLARD AND C. J. HARDY, in D. H. DESTY, *Vapour Phase Chromatography*, Butterworths Scientific Publications, London, 1957, p. 117)

	Column	*4.0 g Dibutyl phthalate*	*1.89 g Dinonyl phthalate*	*2.14 g Silicone 702*	*1.83 g Charcoal 207B*
Temperature		*20°*	*24.5°*	*40.1°*	*137°*
Boiling point	*Compound*	*Corrected retention volume per gramme* V_g°			
— 82.2	CF_3H	2.5	1.8	0.45	7.6
— 80	CF_3Cl	0.6	0.6	0.54	17.3
— 40.8	CF_2ClH	21.6	17.3	5.57	53.0
— 28	CF_2Cl_2	8.3	9.5	6.10	152
8.9	$CFCl_2H$	88.0	131.5	41.0	453
24.1	$CFCl_3$	171	80.5	47.0	1160
— 23.7	CH_3Cl	—	27.3	22.0	57.5

TABLE XLIX

RELATIVE RETENTION VOLUMES OF THE METHYLAMINES
(A. T. JAMES, A. J. P. MARTIN AND G. HOWARD SMITH, *Biochem. J.*, 51 (1952) 323)

(Volumes are relative to that of NH_3, taken as 1)

Liquid phase (% v/v)	CH_3NH_2	$(CH_3)_3N$	$(CH_3)_2NH$	*Temp. (°C)*
Hendecanol	3.4	4.2	5.2	78.6
Hendecanol–15% liquid paraffin	3.6	4.6	5.8	78.6
Hendecanol–50% liquid paraffin	4.2	7.5	7.5	65
Liquid paraffin–33% hendecanol	3.8	6.8	6.8	65
Liquid paraffin	1.65	2.7	2.7	78.6
Glycerol	2.5	0.47	approx. 1	100
Silicone DC550–10% hendecanol	1.33	0.36	0.78	65

TABLE L

RETENTION VOLUMES OF AMINES RELATIVE TO THAT OF ETHYLAMINE WITH NON-POLAR AND POLAR LIQUID PHASES IN THE COLUMNS AT 100°
(A. T. JAMES, *Biochem. J.*, 52 (1952) 242)

Amine	*B.p. °C)*	*Column liquid phase*	
		Paraffin	*Lubrol MO*
Methylamine	— 6.5	0.61	0.68
Dimethylamine	7.4	0.93	0.81
Ethylamine	16.6	1	1
Trimethylamine	3.5	1.17	0.67
Isopropylamine	34	1.49	1.42
n-Propylamine	48.7	2.20	2.10
Diethylamine	55.5	3.25	2.10
sec.-Butylamine	63	3.57	2.8
Isobutylamine	68	3.70	3.1
Ethylenediamine	118	4.65	15.5
n-Butylamine	77.8	4.7	4.4
Ethanolamine	172.2	5.25	25.8
Diisopropylamine	83	6.8	3.00
Triethylamine	89.5	8.6	3.1
Isoamylamine	95	8.8	7.3
n-Amylamine	104	10.5	9.7
Di-*n*-propylamine	110.7	13.2	7.2
4-Methylpentyl-1-amine	123.9	17.8	13.8
n-Hexylamine	132.7	22.6	19.6
Di-*sec.*-butylamine	132.0	27.6	9.74
Cyclohexylamine	134	28.4	25.9
Diisobutylamine	139	30.4	10.9
n-Heptylamine	158.3	49.5	40.05
Tri-*n*-propylamine	156	49.6	15.1
Di-*n*-butylamine	159	62.1	27.6
Tri-*n*-butylamine	214	—	85.5
Benzylamine	185	81.0	91.5

TABLE LI

RETENTION VOLUMES OF SOME AROMATIC BASES RELATIVE TO ANILINE AT 137° IN 3 TYPES OF COLUMN
(A. T. JAMES, *Anal. Chem.*, 28 (1956) 1564)

N atom	*Substituents in position*					*Paraffin wax*	*Lubrol MO*	*Benzyl-diphenyl*
	2	*3*	*4*	*5*	*6*			
—	F–	—	—	—	—	0.72	—	0.63
—	F–	—	F–	—	—	0.74	0.75	—
—	F–	—	—	F–	—	0.79	1.08	—
—	—	—	F–	—	—	0.96	1.28	1.1
—	—	F–	—	—	—	—	0.99	1.52
—	—	F–	CH_3–	—	—	1.88	2.28	—
—	—	—	CH_3–	—	—	1.95	1.63	1.75
—	CH_3–	—	F–	—	—	2.0	2.28	—
—	—	CH_3–	—	—	—	2.0	1.56	1.86
CH_3–	—	—	—	—	—	2.05	1.28	1.73
—	CH_3–	—	—	—	—	2.05	1.53	1.8
$(CH_3)_2$	CH_3–	—	—	—	—	2.56	0.71	1.07
$(CH_3)_2$	—	—	—	—	—	2.60	1.05	1.68
—	Cl–	—	—	—	—	2.8	2.34	2.6
C_2H_5–	—	—	—	—	—	3.18	1.66	2.33
—	CH_3O–	—	—	—	—	3.4	2.7	3.7
CH_3–	CH_3–	—	—	—	—	3.4	—	3.05
CH_3–	—	CH_3–	—	—	—	3.4	—	3.28
—	—	—	Cl–	—	—	3.7	5.25	4.4
CH_3 / C_2H_5	—	—	—	—	—	3.76	—	—
—	—	Cl–	—	—	—	3.8	5.35	4.4
—	CH_3–	—	CH_3–	—	—	3.84	2.60	3.36
—	NH_2–	—	—	—	—	3.92	7.95	6.6
—	CH_3–	—	—	CH_3–	—	4.0	2.7	3.14
—	—	—	CH_3O–	—	—	4.1	5.5	—
—	—	NH_2–	—	—	—	4.2	—	10.0
—	CH_3–	—	—	—	CH_3–	4.25	2.5	3.22
—	—	CH_3–	CH_3–	—	—	4.27	3.27	3.8
CH_3	Cl–	—	—	—	—	4.3	—	3.7
—	—	CH_3O–	—	—	—	4.4	5.8	6.6
—	CH_3–	CH_3–	—	—	—	4.6	3.34	4.0
$(CH_3)_2$	Cl–	—	—	—	—	4.8	—	—
—	Br–	—	—	—	—	4.9	4.5	5.0
—	—	—	CH_3O–	—	—	4.9	—	5.7
$(CH_3)_2$	—	—	CH_3–	—	—	5.1	1.7	2.74
C_2H_5	CH_3–	—	—	—	—	5.21	2.34	3.66
$(CH_3)_2$	—	CH_3–	—	—	—	5.4	1.8	2.9
$(C_2H_5)_2$	—	—	—	—	—	5.45	1.9	3.0
n-C_3H_7–	—	—	—	—	—	5.82	2.7	4.0
C_2H_5–	—	CH_3–	—	—	—	5.9	3.02	4.4
C_2H_5–	—	—	CH_3–	—	—	6.0	2.9	4.4
—	—	NH_2–	—	—	—	6.2	—	12.4
—	—	—	C_2H_5O–	—	—	6.2	—	8.8
—	—	—	Br–	—	—	6.4	10.0	8.8
—	—	Br–	—	—	—	6.4	10.0	9.0
CH_3–	—	—	Cl–	—	—	7.35	—	6.9
—	—	Br–	CH_3–	—	—	8.8	—	—
—	NO_2–	—	—	—	—	9.8	—	—
—	Cl–	Cl–	—	—	—	10.0	—	—
—	Cl–	—	Cl–	—	—	10.0	—	—
—	I–	—	—	—	—	10.1	—	—
$(C_2H_5)_2$	—	—	CH_3–	—	—	10.5	3.2	5.0

(Contd. on p. xxxv)

TABLE LI (*Continued*)

N atom	*Substituents in position*					*Paraffin wax*	*Lubrol MO*	*Benzyl-diphenyl*
	2	*3*	*4*	*5*	*6*			
$(C_2H_5)_2$	—	CH_3–	—	—	—	10.8	3.1	5.1
n-C_4H_9–	—	—	—	—	—	11.0	4.7	7.0
—	—	—	I–	—	—	13.0	—	23.2
—	—	I–	—	—	—	13.1	22.4	23.2
—	CH_3O–	—	—	CH_3O–	—	14.0	—	—
—	—	Cl–	Cl–	—	—	14.6	—	—
—	CH_3O–	—	—	NH_2–	—	16.4	—	—
iso-C_5H_{11}–	—	—	—	—	—	16.8	6.4	—
$(CH_3)_2$	—	—	Br–	—	—	17.3	6.8	13.3

TABLE LII

RELATIVE RETENTION VOLUMES OF PYRIDINE HOMOLOGUES
(A. T. JAMES, *Biochem. J.*, 52 (1952) 242)

(Temperature, 137°; values relative to that of pyridine, taken as 1)

Column liquid phase	*α-Picoline*	*β-Picoline*	*γ-Picoline*	*2,6-Lutidine*	*2,4-Lutidine*	*2,4,6-Collidine*
DC550	1.39	2.3	2.24	1.94	2.82	4.30
Lubrol MO	1.50	2.3	2.34	2.15	3.40	4.85
Liquid paraffin	1.75	2.4	2.31	2.80	4.00	6.35

DC550 = Dow Corning Silicone or MS. 550, Midland Silicones Ltd.; Lubrol MO = polymer of ethylene oxide and a long chain alcohol.

TABLE LIII

RELATIVE RETENTION VOLUMES OF PYRIDINE HOMOLOGUES
(V. T. BROOKS AND G. A. COLLINS, *Chem. and Ind. (London)*, (1956) 1021)

Compound	*B.p. (°C)*	*Stationary phase*					
		Nujol 120°	*T.X.P. 120°*	*C.W. 1000 120°*	*S.M.430 140°*	*T.E.A. 120°*	*G. 90°*
Pyridine	115.26	1.00	1.00	1.00	1.00	1.00	1.00
α-Picoline	129.41	1.80	1.72	1.22	1.60	1.13	0.82
2,6-Lutidine	144.05	2.90	2.64	1.43	2.31	1.16	0.53
β-Picoline	144.14	2.55	3.12	1.98	2.10	1.90	1.54
γ-Picoline	145.36	2.55	3.12	2.07	2.10	2.20	1.86
2-Ethylpyridine	148.70	3.25	3.24	1.74	2.72	1.25	0.62
2,5-Lutidine	157.01	4.34	4.40	2.25	3.06	2.22	1.22
2,4-Lutidine	157.90	4.42	4.47	2.43	3.06	2.55	1.55
2,3-Lutidine	160.8	4.95	4.85	2.79	3.45	2.68	1.51
2-Methyl-6-ethylpyridine	160.1	5.00	4.40	1.83	3.84	1.17	0.30
3-Ethylpyridine	165.0	5.25	5.73	2.99	3.84	3.00	1.65
4-Ethylpyridine	167.7	5.20	6.25	3.60	3.84	3.53	2.11
2,4,6-Collidine	170.3	6.95	6.20	2.83	4.27	2.34	1.00
3,5-Lutidine	172.2	6.10	6.85	3.68	4.07	3.60	2.30
2,3,5-Collidine	186.8	11.17	11.08	4.74	6.29	4.87	2.46
2,3,4-Collidine	192.7	13.75	13.15	6.80	7.33	7.98	4.03

Nujol = Liquid paraffin (Stemco Ltd.); T.X.P. = Trixylenyl phosphate (Albright and Wilson Ltd.); C.W. 1000 = Polyethylene glycol 1000 (Gemec Chemicals Co.); S.M.430 = Silicone M.430 (I.C.I. Ltd.); T.E.A. = Triethanolamine (B.D.H. Ltd.); G. = Glycerol (B.D.H. Ltd.).

TABLE LIV

RETENTION VOLUMES OF FREE FATTY ACIDS RELATIVE TO THAT OF *n*-BUTYRIC ACID ON SILICONE–STEARIC ACID COLUMNS

(A. T. JAMES AND A. J. P. MARTIN, *Biochem. J.*, 50 (1952) 679)

Acid	*B.p. (°C)*	*Column temp.*	
		100°	*137°*
Formic	107.7	0.076	—
Acetic	118.1	0.20	0.26
Propionic	141.1	0.47	0.54
Isobutyric	154.4	0.77	0.81
n-Butyric	163.5	1.0	1.0
α,α-Dimethylpropionic	163.8	1.15	—
Isovaleric	176.7	1.51	1.48
α-Methylbutyric	177	1.70	—
n-Valeric	187	2.17	1.91
γ-Methylvaleric	199.1	—	2.94
Hexanoic	205	—	3.58
Heptanoic	223.5	—	6.55
Octanoic	237.5	—	12.0
Nonanoic	254	—	22.0
Decanoic	268–70	—	40.5
Hendecanoic	225*	—	72.8
Dodecanoic	225**	—	138.5

* 100 mm Hg.
** 40 mm Hg.

TABLE LV

RETENTION VOLUMES OF METHYL ESTERS OF SATURATED FATTY ACIDS FROM FORMIC TO *n*-CAPROIC ACID RELATIVE TO METHYL *n*-BUTYRATE IN A VARIETY OF STATIONARY PHASES AT TWO TEMPERATURES

(A. T. JAMES AND A. J. P. MARTIN, *Biochem. J.*, 63 (1956) 144)

Methyl ester	*Temp. 78.6° Stationary phase*		*Temp. 100° Stationary phase*		
	Liquid paraffin	*Dioctyl phthalate*	*Paraffin wax*	*Benzyldiphenyl*	*Dioctyl phthalate*
Formate	0.071	0.098	0.09	0.117	0.124
Acetate	0.177	0.216	0.228	0.261	0.256
Propionate	0.445	0.485	0.495	0.53	0.51
Isobutyrate	0.724	0.71	0.75	0.67	0.706
n-Butyrate	1.0	1.0	1.0	1.0	1.0
α,α-Dimethylpropionate	1.04	0.87	1.0	—	0.875
α-Methylbutyrate	1.69	1.51	1.52	—	1.45
Isovalerate	1.63	1.56	1.53	1.34	1.45
n-Valerate	2.42	2.31	2.15	2.13	2.12
3-Methylvalerate	4.25	3.66	3.53	—	—
Isocaproate	4.5	3.96	3.60	3.03	3.24
n-Caproate	5.86	5.16	4.70	4.37	4.36

TABLE LVI*

RETENTION VOLUMES OF METHYL ESTERS OF LONGER CHAIN SATURATED FATTY ACIDS RELATIVE TO METHYL MYRISTATE IN TWO STATIONARY PHASES AT 197°
(A. T. JAMES AND A. J. P. MARTIN, *Biochem. J.*, 63 (1956) 144)

Ester	*Stationary phase*	
	'Apiezon M' vacuum grease	*Heavy lubricating oil extract*
Methyl *n*-pentanoate (valerate)	0.0194	0.0148
Methyl *n*-hexanoate (caproate)	0.0311	0.240
Methyl 4-methylhexanoate	0.0407	0.0354
Methyl 6-methylheptanoate	0.0567	0.052
Methyl *n*-octanoate (caprylate)	0.0715	0.064
Methyl 6-methyloctanoate	0.0965	0.0861
Methyl *n*-nonanoate (pelargonate)	0.112	0.100
Methyl 8-methylnonanoate	0.144	0.133
Methyl *n*-decanoate (caprate)	0.173	0.169
Methyl 8-methyldecanoate	0.235	0.229
Methyl 10-methylundecanoate	0.354	0.344
Methyl *n*-dodecanoate (laurate)	0.426	0.396
Methyl 10-methyldodecanoate	0.567	0.55
Methyl *n*-tetradecanoate (myristate)	1.0	1.0
Methyl 12-methyltetradecanoate	1.35	1.37
Methyl 14-methylpentadecanoate	2.04	2.09
Methyl *n*-hexadecanoate (palmitate)	2.41	2.45
Methyl 14-methylhexadecanoate	3.24	3.32
Methyl *n*-octadecanoate (stearate)	5.60	5.92

TABLE LVII

RETENTION VOLUMES OF METHYL ESTERS OF SOME UNSATURATED ACIDS RELATIVE TO METHYL *n*-TETRADECANOATE IN TWO STATIONARY PHASES AT 197°
(A. T. JAMES AND A. J. P. MARTIN, *Biochem. J.*, 63 (1956) 144)

Ester	*Stationary phase*	
	'Apiezon M' vacuum grease	*Heavy lubricating oil extract*
Methyl *cis*-palmitoleate	2.09	2.21
Methyl *trans*-palmitoleate	2.16	2.26
Methyl linoleate	4.55	5.05
Methyl oleate	4.75	5.22
Methyl petroselinate	4.87	5.15
Methyl elaidate	4.95	5.40
Methyl *cis*-$\Delta^{4,5}$-octadecenoate	4.95	5.42
Methyl *trans*-$\Delta^{4,5}$-octadecenoate	5.15	5.52

* Tables LVI and LVII have been collected by A. T. JAMES.

TABLE LVIII*

R_{Lys} VALUES OF SOME N-METHYL-LYSINE DERIVATIVES
(K. PODUŠKA, *Chem. listy*, 52 (1958) 153)

Paper: Whatman No. 1.
Solvents: (a) phenol, water, ammonia system
(b) *n*-butanol, acetic acid, water (6:1:3, upper phase).
Time of run: 14 days.

Compound	*(a)*	*(b)*
N^{ε}-Dimethyl-DL-lysine	1.12	1.45
N^{ε}-Methyl-DL-lysine	1.10	1.41
N^{α}-Dimethyl-DL-lysine	1.13	1.48
N^{α}-Methyl-DL-lysine	1.08	1.33

TABLE LIX

R_F VALUES OF SOME LYSERGIC ACID DERIVATIVES
(K. MACEK AND S. VANĚČEK, *Chem. listy*, 52 (1958) 553)

Paper: Whatman No. 1.
Temperature: 20° (approx.). Special conditions: carried out in the dark.
Solvents: (a) formamide, chloroform
(b) benzene, methanol, water (2:1:1)
(with the latter solvent the paper sheets were hung in the chromatography cabinet for 10–15 hours and allowed to equilibrate with an atmosphere produced by 50% aqueous methanol).
Location: ultraviolet light.

Compound	*(a)*		*(b)*
	R_F	R_{ME}§	R_F
d-Lysergic acid	0.00	0.01	0.00
l-Lysergic acid	0.00	0.01	0.00
d-Isolysergic acid	0.02	0.20	0.01
l-Isolysergic acid	0.02	0.20	0.01
(+)-Propanolamide-(2) of *d*-lysergic acid	0.07	0.45	0.04
(+)-Propanolamide-(2) of *l*-lysergic acid	0.06	0.41	0.03
(+)-Propanolamide-(2) of *d*-isolysergic acid	0.33	—	0.24
(+)-Propanolamide-(2) of *l*-isolysergic acid	0.50	—	0.36
(+)-Butanolamide-(2) of *d*-lysergic acid	0.12	1.00	0.08
(+)-Butanolamide-(2) of *l*-lysergic acid	0.10	0.79	0.06
(+)-Butanolamide-(2) of *d*-isolysergic acid	0.52	—	0.41
(+)-Butanolamide-(2) of *l*-isolysergic acid	0.66	—	0.54
(—)-Butanolamide-(2) of *d*-lysergic acid	0.10	—	0.06
(—)-Butanolamide-(2) of *l*-lysergic acid	0.12	—	0.08
(—)-Butanolamide-(2) of *d*-isolysergic acid	0.66	—	0.54
(—)-Butanolamide-(2) of *l*-isolysergic acid	0.52	—	0.41

§ R_{ME} values are based on the mobility of the (+)-butanolamide-(2) of *d*-lysergic acid (methylergometrine).

* Tables LVIII to LXII have been collected by C. B. COULSON.

TABLE LX

R_F VALUES OF SOME MONOHYDRIC PHENOLS

(J. FRANC, *Chem. listy*, 52 (1958) 55)

Paper: Whatman No. 4 impregnated by dipping in 20% ethanolic solutions of formamide, acetamide or dimethylformamide. Descending chromatography. Dimethylformamide reduces losses of phenol, *p*-cresol and *p*-ethylphenol.

Solvent: Cyclohexane–pyridine in various proportions.

Detection: Pauly reagent.

Substance	*Dipole moment of phenol*	*Formamide*					*Acetamide*			*Dimethylformamide*			*Colour of spots*
		Cyclohexane–pyridine					*Cyclohexane–pyridine*			*Cyclohexane–pyridine*			
		25:0	*25:1*	*25:2*[a]*	*25:4*[a]	*25:10*	*25:1*	*25:5*	*25:10*	*25:1*[a]	*25:5*[b]	*25:10*[c]	
Phenol	1.6	0.12	0.32	0.31	0.35	0.29	0.32	0.33	0.50	0.18	0.12	0.45	Yellow
o-Cresol	1.4	0.30	0.58	0.55	0.61	0.53	0.56	0.52	0.63	0.31	0.22	0.59	Brownish yellow
m-Cresol	1.8	0.19	0.46	0.43	0.48	0.45	0.44	0.41	0.58	0.23	0.16	0.56	Orange
p-Cresol	2.0	0.19	0.44	0.41	0.46	0.43	0.42	0.40	0.58	0.22	0.17	0.51	Violet
2,3-Dimethylphenol	1.8	0.40	0.68	0.64	0.72	0.66	0.67	0.60	0.73	0.32	0.32	0.68	Brown
2,4-Dimethylphenol	1.8	0.40	0.69	0.65	0.72	0.66	0.66	0.60	0.75	0.36	0.31	0.67	Reddish violet
2,5-Dimethylphenol	1.6	0.42	0.69	0.66	0.71	0.67	0.68	0.59	0.70	0.32	0.33	0.69	Brown
3,4-Dimethylphenol	2.2	0.25	0.49	0.51	0.61	0.58	0.51	0.44	0.58	0.21	0.21	0.62	Orange-violet
3,5-Dimethylphenol	2.0	0.30	0.58	0.57	0.61	0.60	0.56	0.51	0.64	0.28	0.26	0.65	Orange-brown
o-Ethylphenol	1.4	0.55	0.76	0.75	0.80	0.74	0.73	0.70	0.80	0.41	0.33	0.71	Orange
m-Ethylphenol	1.8	0.37	0.63	0.64	0.70	0.64	0.62	0.56	0.68	0.31	0.28	0.67	Orange
p-Ethylphenol	2.0	0.35	0.61	0.60	0.67	0.64	0.60	0.56	0.67	0.30	0.26	0.66	Violet
3-Methyl-5-ethyl-phenol	2.0	0.49	0.74	0.75	0.80	—	0.72	0.66	—	0.33	0.36	0.72	Brown

* Chromatography was carried out at 18° ([a] 19°; [b] 20°; [c] 21°).

TABLE LXI

R_F VALUES OF SOME SULPHAMIDOBENZOIC ACIDS
(M. TROJNA AND J. HUBÁČEK, *Chem. listy*, 52 (1958) 87)

Paper: Whatman No. 4.
Reagent: An 0.06% solution of bromocresol green in 96% ethanol adjusted to pH 7 with a borate–boric acid buffer.
Solvents: (a) *n*-propanol, 5% NH_3 (1:1)
(b) isopropanol, 5% NH_3 (1:1)
(c) *n*-butanol, 5% NH_3 (1:1)
(d) isobutanol, 5% NH_3 (1:1).

Acid	*(a)*	*(b)*	*(c)*	*(d)*
o-Sulphamidobenzoic	—	—	0.28	—
m-Sulphamidobenzoic	0.80	—	0.23	0.18
p-Sulphamidobenzoic	0.75	0.83	0.15	0.12

TABLE LXII

R_F VALUES OF SOME CARDIAC GLYCOSIDES
(J. PITRA, H. KOLÁŘOVÁ AND Z. ČEKAN, *Chem. listy*, 52 (1958) 745)

Solvent: chloroform, dioxan, water (7:2:0.5).
Temperature of run: 20 ± 2°.
Length of run: 40–45 cm (descending).
Paper: Whatman No. 4 or Schleicher & Schüll No. 2043b, impregnated by dipping in a 25% solution of formamide in methanol.
Reagents: trichloroacetic acid with chloramine or a modified Kedde's reagent.

Compound	R_F
Lanatoside A	0.81
Lanatoside B	0.59
Desacetyl-lanatoside A	0.53
Lanatoside C	0.40
Desacetyl-lanatoside B	0.18
Desacetyl-lanatoside C	0.10

See also F. KAISER, *Ber.*, 88 (1955) 556.

TABLE LXIII

R_F VALUES OF HALOGENATED ACETIC AND PROPIONIC ACIDS

(J. W. CHITTUM, T. A. GUSTIN, R. L. MCGUIRE AND J. T. SWEENEY, *Anal. Chem.*, 30 (1958) 1213)

Solvent: Butanol saturated with 1.5 *N* NH_4OH.
Paper: Whatman No. 1.

Acid	R_F *value*	*Acid*	R_F *value*
Acetic	0.08	Propionic	0.08
Monochloroacetic	0.14	2-Chloropropionic	0.23
Dichloroacetic	0.27	3-Chloropropionic	0.19
Trichloroacetic	0.45	2-Bromopropionic	0.25
Monobromoacetic	0.02	3-Bromopropionic	0.20
Dibromoacetic	0.10	2,3-Dibromopropionic	0.27
Tribromoacetic	0.31		

TABLE LXIV

R_F VALUES OF AROMATIC ACIDS

(J. FRANC, *Collection Czechoslov. Chem. Communs.*, 23 (1958) 655)

Acid	R_F *values*	
	Butanol 3 *Ethanol* 1 *Pyridine* 1 *Water* 1	*Butanol* 3 *Pyridine* 1 *Water* 1
Phthalic	0.69	0.75
Isophthalic	0.16	0.15
Terephthalic	0.13	0.11
p-Toluic	0.69	0.75
Benzoic	0.63	0.71
	Butanol 5 *Pyridine* 3 *Water* 3	*Isoamyl alcohol* 1 *Ethanol* 1 *Pyridine* 1 *Water* 1
3-Nitrophthalic	0.26	0.43
4-Nitrophthalic	0.54	0.66
5-Nitroisophthalic	0.54	0.64
2-Nitroterephthalic	0.30	0.48
2,5-Dinitroterephthalic	0.55	0.64
3-Nitro-*p*-toluic 3,5-Dinitrotoluic	0.77	0.81
2,5-Dinitrotoluic	0.71	0.78
m-Nitrobenzoic	0.73	0.79
3,5-Dinitrobenzoic	0.66	0.72
2,6-Dinitrobenzoic	0.18	0.37
2,4-Dinitrobenzoic	0.55	0.64
3,4-Dinitrobenzoic	0.34	0.47
2,4,6-Trinitrobenzoic	0.60	0.69
Monomethyl 2-nitroterephthalate	0.72	
Monomethyl 5-nitroterephthalate	0.65	
Dimethyl 2-nitroterephthalate	0.94	
2-Nitro-*p*-toluic	0.95	

TABLE LXV

R_F VALUES OF HYDROQUINONE DERIVATIVES
(M. BARBIER AND E. LEDERER, *Biokhimiya*, 22 (1957) 236)

Solvent: Benzene–acetic acid–water (8:2:1).
Conditions: Descending, Whatman No. 1 paper.
Detection: Spraying with 10% aqueous Na_2CO_3.

Substance	R_F
2,3-Dimethyl-hydroquinone	0
Hydroxy-hydroquinone	0.01
Hydroquinone	0.07
Methyl-hydroquinone	0.10
2-Methoxy-hydroquinone	0.25
Ethyl-hydroquinone	0.30
2-Ethoxy-hydroquinone	0.55
Propyl-hydroquinone	0.65

TABLE LXVI

R_F VALUES OF NAPHTHOQUINONE PIGMENTS OF SEA URCHINS
(M. BARBIER AND E. LEDERER, unpublished results)

Solvent: Butanol–1% aqueous formic acid.
Paper: Whatman No. 1.
Method: Ascending.

*Pigment**	R_F
Echinochrome	0.79
Spinochrome A	0.08
Spinochrome B	0.75
Spinochrome C	0.08
Spinochrome E	0

* For nomenclature see *Biochim. Biophys. Acta*, 9 (1952) 92.

TABLE LXVII

R_F VALUES OF N-SUBSTITUTED PHENOTHIAZINES
(R. L. TABAU AND J. P. VIGNE, *Bull. soc. chim. France*, (1958) 458)

Solvent: Acetone 10, *M* ammonium acetate 20, *M* acetic acid 5; allowed to stand 6 days before use.
Conditions: Whatman No. 1 paper, ascending method at 20°.

Substance	R_F
Phenothiazine	0
Methylene blue (for reference)	0.25
Thiazinamium	0.88
Chlorpromazine	0.80
Acepromazine	0.89
Isothazine	0.91
Methopropazine	0.87
Promethazine	0.83
Diethazine	0.85