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Alphabetical Index to Tables of Chemical Kinetics Homogeneous Reactions



UNITED STATES DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

Tables of Chemical Kinetics

Homogeneous Reactions

These tables are issued in the form of punched loose sheets, temporarily assembled under a paper cover. This cover can be removed at the discretion of the subscriber upon receipt of supplementary sheets which can then be inserted at their right place as indicated by the number of the table, and the whole set can then be held in a suitable loose-leaf binder.

Each table is designated by a six-digit number, the first two of which refer to the type of reaction, the third to the phase of the homogeneous reaction, gaseous (1), liquid (2), or solid (3). The indication of the phase is repeated at the upper right-hand corner of the first sheet of each table. The second three-digit group of the table number refers to the types of substances involved. Within each table, reactions are numbered. In tables including more than one page, the table number is repeated at the head of each page, and the pages are numbered. Each table starts on a new sheet.

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Alphabetical Index to Tables of Chemical Kinetics Homogeneous Reactions

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Supplement 2 to National Bureau of Standards Circular 510

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SUPPLEMENT TO TABLES OF CHEMICAL KINETICS HOMOGENEOUS REACTIONS

PREFACE

The numbering system that is in use in the Tables of Chemical Kinetics, Homogeneous Reactions, N. B. S. Circular 510 is not exact or ironclad. It may, nevertheless, be helpful for the user of these tables to have a general idea of the method being followed.

A six digit number system is employed with a decimal separating the first three digits from the last three digits. The first number refers to the broad class under which the reaction is listed, (1) refers to rearrangement and isomerization, (2) to condensation and solvolysis, (3) to exchange and substitution, (4) to elimination, (5) to dissociation and decomposition, (6) to association and addition, and (7) to oxidation and reduction. These groupings unfortunately are not mutually exclusive and therefore it is often necessary to check more than one group for the particular reaction in question. For example a reaction such as $RX + R'O^- \longrightarrow ROR' + X^-$ is listed under (2) solvolysis rather than under (3) exchange. Reactions of alkyl halides to form alkenes and hydrogen halides are listed partly under (4) elimination and partly under (5) decomposition. Reactions such as $RX + R'R''R'''N \longrightarrow RR'R''R'''N^+ + X^-$ are listed partly under (3) exchange and partly under (6) addition. This type of overlap of classification is being minimized in the Supplements now in preparation. It is well for the user of these tables to therefore consider all possible reaction classes under which a given reaction might be listed.

The second number is used for subdivision of the main reaction groups. It has no specific meaning applicable to all main classes. Where possible, however, relations are carried from one main group to another. Thus when the second number is 2 it refers usually to reactions involving a double bond. For example, 12- are cis-trans isomerizations, 42- are bond unsaturation eliminations, 52- bond unsaturation decompositions and 62- additions to double bonds. Similarly the second number 3 refers to ring closure or ring opening where such sub-classifications are appropriate.

The third number refers to the phase in which the reaction is considered to occur, (1) is gas phase (2) is liquid phase and (3) is solid phase.

The numbers after the decimal point are related to the type of reactants. Where possible they follow the group numbers in the periodic table of the important atoms involved. The first number after the decimal point thus usually refers to the group in the periodic table of the central or main atom at which reaction is taking place. In the case of exchange reactions this number is the periodic group number of the element being replaced. In the oxidation reduction reactions the first number after the decimal gives the periodic group number of the element acting as the reducing agent.

The second number after the decimal point gives the periodic group number of the element considered to be next of equal importance in the reaction. In exchange reactions it refers to the entering element or group. In oxidation-reduction reactions it refers to the element acting as the oxidizing agent.

The third number after the decimal point is for further subdivision and is consequently less significant in significance. In reactions of organic chemistry, the third number separates identical reactions typed by a (1) for aliphatic and a (2) for aromatic. Thus the reaction of an alkyl thiosulfate with halogen ion would be listed as 332.671 while the aromatic thiosulfate with halogen ion would be 332.672. Since exchanges involving sulfates, sulfites and mercaptans are also possible it is obvious that additional numbers are required and used.

Suggestions for improvements as well as corrections will be gratefully received. These should be sent to Prof. Charles H. Stauffer, St. Lawrence University, Canton, New York.

C.H. Stauffer

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	Oxidation-reduction: H_2O_2 + VII th group element	(2) 732.071
	" " ; I st group + VI th group element	(1) 732.160
	" " ; IV th group + VIII th group element	(1) 732.480
	" " ; V th group + O_2	(1) 732.500
	" " ; V th " + I st group element	(2) 732.510
	" " ; V th " + IInd " "	(2) 732.520
	" " ; V th " + V th " "	(1) 732.550
	" " ; V th " + VI th " "	(1) 732.560
	" " ; V th " + VII th group element	(6) 732.570
	" " ; V th " + VIII th " "	(1) 732.580
	" " ; VI th " + VI th " "	(1) 732.660
	" " ; VI th " + VII th " "	(2) 732.670
	" " ; VII th " + H_2O_2	(5) 732.701
	" " ; VII th " + O_3	(1) 732.703
	" " ; VII th " + V th group element	(1) 732.750
	" " ; VII th " + VI th " "	(2) 732.760
	" " ; VII th " + VII th " "	(2) 732.770
	" " ; VII th " + VIII th " "	(2) 732.780
	" " ; VIII th group + VI th group element	(1) 732.860
	" " ; VIII th " + VII th " "	(2) 732.870
740	OXIDATION-REDUCTION, Organic + Inorganic compound	
742	<i>Oxidation-reduction (liquid)</i>	
	Oxidation-reduction: organic compound + O_3	(2) 742.403
	" " ; aliphatic compound + VI th group element	(2) 742.461
	" " ; aliphatic compound + VII th group element	(5) 742.471

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Hydrolysis (l) 242.442

Acid anhydrides of aliphatic acids

- Alcoholysis (l) 242.443 (.4)
- Condensation with aromatic aldehydes (See Aldehydes, aromatic)
- Esterification (g) 201.441
- " (l) 202.441 (.14)
- Hydrolysis (l) 242.443 (.1-.3, .5-.7)
- Union with aromatic aldehydes (g) 611.443

Acid anhydrides of aromatic acids

- Condensation with amines (See Amines, primary aromatic)
- Hydrolysis (l) 242.443 (.8-.16)

Acid anhydrides of dicarboxylic acids

Hydrolysis (l) 242.443 (.17-.19)

Acid anhydrides of organic-inorganic acids

Hydrolysis (l) 242.443 (.20-.24)

Acid, alicyclic dicarboxylic

Esterification (l) 202.447

Acid, aliphatic

Dicarboxylic

Saturated

- Condensation with aromatic aldehydes (See Aldehydes, aromatic)
- Decomposition (l) 562.441 (.2-.3)
- Decarboxylation (l) 562.446 (.1-.5, .7-.9, .11-.12)
- Oxidation by halogens or oxyhalogen acids (l) 742.471 (.2-.4)
- " " Mn^{+} ions (l) 742.471 (.5-.51)
- " " MnO_4^- ions (l) 742.471 (.6)
- " " $S_2O_8^{=}$ ions (l) 742.461 (.2)

Saturated, aryl substituted

Decarboxylation (l) 562.446 (.14-.15)

Saturated, C^{13} or C^{14} labeled

Decarboxylation (l) 562.446 (.1.2, .2.3)

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ALPHABETICAL INDEX (continued)

Acid, aliphatic (continued)

Dicarboxylic

Saturated, halogen substituted

Dehydrohalogenation (*l*) 422.471 (.2-.5)

Unsaturated

Cis-trans isomerization (*l*) 122.440 (.1)Decarboxylation (*l*) 562.446 (.6-.6.2, .10, .13)Halogen addition (*l*) 622.447 (.22-.25, .36-.38, .44, .69)Racemization (*l*) 112.440 (.2, .15)

Monocarboxylic

Saturated

Decarboxylation (*l*) 562.445Decomposition (*l*) 562.441Esterification (*l*) 202.441" with diaryl diazo methane (*l*) 242.456 (.15-.21)Oxidation by halogens or halogen oxyacids (*l*) 742.471 (.1-.1.1)Oxidation by O_3 (*l*) 742.403

Saturated, aryl substituted

Decomposition (*l*) 562.441 (.5)Esterification (*l*) 202.441 (.62-.71)H-D exchange (*l*) 302.401 (.8)Nitration (*l*) 312.452 (.15)

Saturated, aryl and deuterium substituted

H-D exchange (*l*) 302.401 (.9)

Saturated, cycloalkyl substituted

Esterification (*l*) 202.441 (.72-.74, .85)

Saturated, deuterium substituted

H-D exchange (*l*) 302.401 (.4-.5)Reaction with diazoalkanes (*l*) 242.456 (.16)

Saturated, halogen substituted

Halogen-halogen exchange (*l*) 302.477 (.6)Halogen-NH₂ exchange (*l*) 332.755 (.1, .5-.7)Halogen-S₂O₃⁼ ion exchange (*l*) 332.761 (.18, .21)Racemization (*l*) 112.470 (.1-.2)

Unsaturated

Alkadienyl

Halogen addition (*l*) 622.477 (.40-.41, .67-.68)

Alkenyl

Halogen addition (*l*) 622.477H-D exchange (*l*) 302.401 (.6)

Alkenyl, aryl substituted

Cis-trans isomerization (*l*) 122.440 (.2)Halogen addition (*l*) 622.477 (.54-.59, .63-.67, .71-.72, .77-.81)

Alkynyl

Halogen addition (*l*) 622.477 (.70)

ALPHABETICAL INDEX (continued)

Acid, aliphatic (continued)

Tricarboxylic

Saturated

Decomposition (*l*) 562.441 (.4)

Acid, aromatic

Decarboxylation (*l*) 562.447Esterification (*l*) 202.442" with diaryl diazo methane (*l*) 242.456 (.1-.14, .22-.34)Racemization (*l*) 112.440 (.14)Acid, aromatic, O¹⁸ substitutedO¹⁸-O¹⁶ exchange (*l*) 202.461

Acid halides (See Acyl halides)

Acid, inorganic

Fluoboric

Hydrolysis (*l*) 242.370Reaction with HF (*l*) 232.370

Hydrohalic

Dissociation (*g*) 311.700 (.5)Esterification (*l*) 202.471" (*l*) 202.475

Hypohalous

Reaction with OH⁻ ions (*l*) 712.770 (.10)" " oxyanions of halogens (*l*) 712.770 (.3, .7-.7.1)Reduction by H₂O₂ (*l*) 732.071 (.2.2)" " H₃AsO₃ (*l*) 732.570 (.8.1)" " halide ions (*l*) 722.770 (.1-.1.1, .5)" " oxalic acid (*l*) 742.471 (.2.1)

Nitric

Reduction by H₃AsO₃ (*l*) 732.550

Phosphorous

Addition of H⁺ ions (*l*) 732.570 (.5.1)Oxidation by H₂CrO₇ (*l*) 732.560 (.2)" " halogens or oxyanions of halogens (*l*) 732.570 (.1, .4.2-.5, .5.3-.5.4)" " Ag⁺, Cu²⁺, or Hg²⁺ ions (*l*) 732.510 (.1-.2, .2.2); 732.520Tautomerization (*l*) 732.510 (.1.1, .2.1)

Sulphurous

Condensation with NH₂OH (See Hydroxylamine)

Acid, miscellaneous

Hydrocyanic

Hydrolysis (*l*) 242.453 (.1-.3)H₂SO₄ addition (*l*) 242.453 (.2.1)

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ALPHABETICAL INDEX (continued)

Acid, miscellaneous (continued)

- Sulphonic, aryl
 - Formation (l) 312.462; 662.462
- Thioaromatic
 - Condensation with amines (l) 232.564 (.1-.3)

Acyl halides, aliphatic

- Hydrolysis, Reaction with OH^- ions, Alcoholysis (l) 242.471

Acyl halides, aromatic

- Hydrolysis, Reaction with OH^- ions, Alcoholysis (l) 242.472
- Reaction with aromatic amines (l) 652.476

Acyl peptides, halogen substituted

- Halogen- NH_2 exchange (l) 332.755 (.2-.4, .8-.9)

Alcoholates

- Condensation with alkyl halides (l) 232.471 (.7-.18)

Alcohols, monohydroxy alkenyl

- Halogen addition (l) 622.477 (.7)

Alcohols, monohydroxy alkyl

- Condensation to ethers (l) 232.404
- Condensation with alkyl halides (l) 232.471 (.1-.4, .19)
- Condensation with aryl H (l) 232.403 (.1-.11)
- Esterification (l) 202.441; 202.442; 202.447; 202.471
- Oxidation by CrO_3 (l) 742.461 (.3)
- Oxidation by $\text{S}_2\text{O}_8^{2-}$ ions (l) 742.461 (.1)

Alcohols, monohydroxy alkyl, CHO or COOH substituted

- Dehydration (l) 522.442

Alcohols, monohydroxy alkyl, deuterium substituted

- H-D exchange (l) 202.401 (.1-.2, .10)
- Oxidation by CrO_3 (l) 742.461 (.3.1)

Alcohols, polyhydroxy

- Esterification (l) 202.475

Aldehydes, alicyclic

- Decomposition (g) 581.441

Aldehydes, alkenyl

- Diels-Alder addition (g) 681.441 (.1-.4)
- " " " (l) 682.441

ALPHABETICAL INDEX (continued)

Aldehydes, alkenyl (continued)

- Halogen addition (*l*) 622.477 (.19, .53)
- Hydration (*l*) 622.442 (.3-.4)
- Pyrolysis (*g*) 571.441 (.12)

Aldehydes, alkyl

- Condensation with amines (*l*) 232.451 (.1, .5, .7)
- Condensation with esters (*l*) 232.441 (.1)
- Hydration (*l*) 612.410
- Pyrolysis (*g*) 571.441 (.1-.11)
- Racemization (*l*) 112.440 (.1)

Aldehydes, alkyl, deuterium substituted

- Pyrolysis (*g*) 571.441 (.9-.10)

Aldehydes, alkyl, halogen substituted

- Pyrolysis (*g*) 571.471

Aldehydes, aromatic

- Condensation with amines (*l*) 232.441 (.18.1); 232.451 (.18-.20, .25-.39, .44-.55, .58-.60, .62-.65)
- Condensation with aryl H (*l*) 232.442
- Condensation with ketones, diketones, ketoesters, acids, acid anhydrides, diesters, nitriles and nitroalkanes (*l*) 232.441 (.2-.18, .18.2-.19); 232.446
- H₂N addition (*l*) 612.415
- Pyrolysis (*g*) 571.442
- Union with acid anhydrides (*g*) 611.443

Aldehyde hydrates

- Dissociation (*l*) 512.410

Alicyclic hydrocarbons (See Cycloalkanes or Cycloalkenes)

Alkadienes

- Diels-Alder reaction (*g*) 681.441 (.1-.2, .4)
- Dimerization (*l*) 681.441 (.5-.6)

Alkadienes, substituted

- Isomerization (Double bond and alkenyl group shift) (*l*) 152.441

Alkanes

- H-S exchange (*g*) 311.460
- Isomerization (*l*) 142.400
- Pyrolysis (*g*) 571.411 (.1-.8)
- Racemization (*l*) 112.440 (.16-.18)

ALPHABETICAL INDEX (continued)

Alkenes

- Cis-trans isomerization (*g*) 121.440 (.1)
 Halogen addition (*g*) 621.477
 " " (*l*) 622.477 (.1, .3, .16-.18, .29, .52)
 Hydration (*l*) 622.442 (.1-.2)
 Hydrogenation (*g*) 621.411 (.2)
 Hydrogen halide addition (*g*) 621.471
 " " " (*l*) 622.471 (.1)
 Pyrolysis (*g*) 571.411 (.9-.10)

Alkenes, deuterium substituted

- Cis-trans isomerization (*g*) 121.410

Alkenes, substituted

- Cis-trans isomerization (*g*) 121.440 (.2-.5); 121.450; 121.470
 " " " (*l*) 122.440; 122.470
 Isomerization (Ring closure) (*l*) 172.441 (.2-.3)
 " (OH⁻ double bond shift) (*l*) 152.461 (.2)

Alkenynes, hydroxy substituted

- Isomerization (OH⁻ double bond shift) (*l*) 152.461

Alkenyl halides

- Acetolysis (*l*) 222.471 (.7-.10, .15-.16)
 Cis-trans isomerization (*g*) 121.470
 " " " (*l*) 122.470
 Halogen addition (*l*) 622.477 (.2, .13-.15, .26-.28, .39)
 Halogen-halogen exchange (*l*) 302.477 (.2)
 Halogen-S₂O₃²⁻ ion exchange (*l*) 332.761 (.15)
 Hydrolysis (*l*) 212.471 (.62-.69, .1, .308-.319, .322-.345)
 Isomerization (halogen and double bond shift) (*l*) 152.471
 Reaction with OH⁻ ions (See Hydrolysis)

Alkenyl halides, aryl substituted

- Reaction with Li alkyls or aryls (*l*) 232.417 (.6-.8, .16)
 Reaction with OH⁻ or alkoxide ions (*l*) 212.471 (.409-.411)

Alkenyl halides, hydroxy substituted

- Dehydrohalogenation (Ring closure) (*l*) 212.471 (.277); 432.471 (.5-.7)

Alkyl halides

- Acetolysis (*l*) 222.471 (.13)
 Alcoholysis (See Hydrolysis)
 Condensation with alcohols (See Alcohols, monohydroxy alkyl)
 Condensation with phenols (See Phenols)
 Dehalogenation (*g*) 521.477

ALPHABETICAL INDEX (continued)

Alkyl halides (continued)

- Dehalogenation (l) 422.477 (.1-.2, .5-.7, .10-.16)
 Dehydrohalogenation (g) 521.471
 " (l) 422.471 (.1, .7-.22)
 Formolysis (l) 212.471 (.204); 222.471 (.13)
 Halogen-ClO₄⁻ ion exchange (l) 332.776
 Halogen-halide ion exchange (l) 332.771 (.1-.29)
 Halogen-halogen isotope exchange (l) 302.477 (.1, .3-.5, .7-.14)
 Halogen-NO₃⁻ ion exchange (l) 332.751 (.1-.8)
 Halogen-S₂O₃⁼ ion exchange (l) 332.761 (.1-.14, .16)
 Hydrolysis (l) 212.471 (.1-.52.1, .58-.61, .179-.255)
 Racemization (g) 111.470
 " (l) 112.470 (.2)
 Reaction with carboxylate ions (l) 222.471 (.1-.6)
 " " heterocyclic amines (l) 652.477 (.1-.8)
 " " Li alkyls or aryls (l) 232.417 (.1-.5, .9-.15)
 " " OH⁻, alkoxide and CH₃COO⁻ ions (See Hydrolysis)
 " " phenolate ions (l) 212.478
 " " tertiary amines (g) 651.471
 " " " " (l) 652.471 (.1-.12); 652.472 (.1-.18)

Alkyl halides, amino substituted

- Hydrolysis (l) 212.471 (.412-.419)
 Reaction with OH⁻ ions (See Hydrolysis)

Alkyl halides, aryl substituted

- Acetolysis (l) 222.471 (.11-.12, .17-.18)
 Alcoholysis (See Hydrolysis)
 Dehalogenation (l) 422.477 (.17-.18)
 Dehydrohalogenation (l) 422.471 (.23-.37)
 Formolysis (l) 222.471 (.19)
 Halogen-halide ion exchange (l) 332.771 (.30-.36, .43-.62)
 Halogen-halogen isotope exchange (l) 302.477 (.15)
 Halogen-NH₂ exchange (l) 332.755 (.10-.11)
 Halogen-NO₃⁻ ion exchange (l) 332.751 (.9-.12)
 Halogen-S₂O₃⁼ ion exchange (l) 332.761 (.30-.33)
 Hydrolysis (l) 212.471 (.70-.136, .153-.178)
 Phenolysis (l) 212.471 (.160)
 Racemization (l) 112.470 (.3-.4)
 Reaction with carboxylate ions (l) 222.471 (.18)
 " " amines (l) 652.472 (.19-.49)
 " " OH⁻ and alkoxide ions (See Hydrolysis)

Alkyl halides, aryloxy or arylthio substituted

- Halogen-halide ion exchange (l) 332.771 (.63-.70)
 Hydrolysis (l) 212.471 (.137-.152)

ALPHABETICAL INDEX (continued)

Alkyl halides, carboxy substituted

- Dehalogenation (*l*) 422.477 (.4, .8-.9)
- Hydrolysis (*l*) 212.471 (.53-.57, .290-.300)
- Reaction with OH^- or alkoxide ions (See Hydrolysis)

Alkyl halides, deuterium substituted

- Formolysis (*l*) 222.471 (.14)
- Hydrolysis (*l*) 212.471 (.225-.227, .240)
- Reaction with $\text{C}_2\text{H}_5\text{O}^-$ ions (*l*) 212.471 (.187-.188)

Alkyl halides, heterocyclic

- Alcoholysis and Hydrolysis (*l*) 212.471 (.423-.442)

Alkyl halides, hydroxy substituted

- Alcoholysis and Hydrolysis (*l*) 212.471 (.270-.279)
- Dehalogenation (*l*) 422.477 (.3)
- Dehydrohalogenation (Ring closure) (*l*) 432.471 (.1-.4)

Alkyl halides, sulphide substituted

- Hydrolysis (*l*) 212.471 (.420-.422)

Alkyl nitrates (See Esters of Nitric acid)

Alkyl peroxides (See Peroxides, alkyl)

Alkyl sulphates (See Esters of Sulphuric acid)

Alkyl sulphides (See Esters of Hydrogen sulphide)

Alkynes

- Hydrogenation (*g*) 621.411 (.1)

Alkynyl halides

- Alcoholysis (*l*) 212.471 (.321)
- Hydrolysis (*l*) 212.471 (.320)

Amides

- Acetolysis (*l*) 242.452 (.22)
- Alcoholysis, Hydrolysis and Reaction with OH^- ions (*l*) 242.452
- Formation (*l*) 652.476
- H-halogen exchange (*l*) 312.472 (.21-.26)

Amine disulphonate (imidodisulphonate) ions

- Hydrolysis (*l*) 242.561

ALPHABETICAL INDEX (continued)

Amines, heterocyclic

Reaction with alkyl halides (l) 652.477

Amines, primary alkyl

Condensation with aldehydes or ketones (See Aldehydes or Ketones)

Condensation with esters (l) 232.543

Condensation with HNO_2 (l) 232.455 (.1-.2)Halogen- NH_2 or NR_2 exchange (See Cyanogen halides)

Pyrolysis (g) 571.451 (.1, .4, .6-.7)

Amines, primary aryl

Benzoylation (l) 652.476

Condensation with acid anhydrides (l) 232.544

Condensation with HNO_2 and nitroso compounds (l) 232.455 (.3-.13, .15-.19)

" " thioacids (See Acid, miscellaneous (Thioaromatic))

Halogen- NH_2 exchange (See Alkyl halides, aryl substituted)

Reaction with alkyl halides (l) 652.472 (.19, .22-.23, .28, .32-.34, .37, .40, .43-.64)

Reaction with aryl halides (l) 652.474

Amines, secondaryCondensation with HNO_2 (l) 232.455 (.14)

Formation (l) 652.474

Halogen- NH_2 exchange (See Cyanogen halides)

Pyrolysis (g) 571.451 (.2, .5)

Reaction with alkyl halides (l) 652.472 (.20, .24-.27, .28-.31, .35, .38, .41)

Amines, tertiary

Pyrolysis (g) 571.451 (.3)

Reaction with alkyl halides (g) 651.471

" " " " (l) 652.471 (.1-.12); 652.472 (.1-.18, .21, .36, .39, .42)

Reaction with esters (l) 652.441; 652.442

Reaction with quaternary NH_4 compounds (l) 652.471 (.13-.15)**Amines, tertiary, substituted**Halogen- NH_2 exchange (See Cyanogen halides)

Hydrolysis (l) 212.471 (.35)

Reaction with OH^- ions (l) 212.471 (.34)**Ammonium compounds**

Decomposition (l) 722.550

Oxidation by $\text{S}_2\text{O}_8^{=}$ ions (l) 732.560 (.1)**Anilides**

Isomerization (l) 152.752

ALPHABETICAL INDEX *(continued)***Anilides, unsaturated**Halogen addition (*l*) 622.477 (.21)**Anilines, C and N substituted**Racemization (*l*) 112.443 (.30-.40)**Aromatic hydrocarbons**H-halogen exchange (*l*) 312.472 (.1-.5)Nitration (*l*) 312.452 (.1-.3)Pyrolysis (*g*) 571.412Sulphonation (*l*) 662.462 (.1)**Aromatic hydrocarbons, alkyl substituted**H-halogen exchange (*l*) 312.472 (.6-.18)**Aromatic hydrocarbons, disubstituted**H-halogen exchange (*l*) 312.472 (.27-.211)**Aromatic hydrocarbons, pentasubstituted**H-halogen exchange (*l*) 312.472 (.259-.271)**Aromatic hydrocarbons, tetrasubstituted**H-halogen exchange (*l*) 312.472 (.258)**Aromatic hydrocarbons, trisubstituted**H-halogen exchange (*l*) 312.472 (.212-.257)**Arsenic (III) compounds**Oxidation by Ce(IV) ions (*l*) 732.580 (.2)" " HNO_3 (*l*) 732.550" " oxyhalogen ions or acids (*l*) 732.570 (.6-.10)**Arsenic (V) compounds**Reduction by halide ions (*l*) 732.750 (.1)**Aryl halides**H-halogen exchange (*l*) 332.756Halogen-halogen isotope exchange (*l*) 302.477 (.16-.18)Halogen-halide ion exchange (*l*) 332.772 (.2-.3)Reaction with amines (*l*) 652.474" " OH^- , alkoxide and phenolate ions (*l*) 212.473Sulphonation (*l*) 662.462 (.5-.7)**Aryl nitrates (See Esters of nitric acid)**

ALPHABETICAL INDEX (continued)

Aryl nitro compounds

- Nitration (*l*) 312.452 (.8-.14)
- Pyrolysis (*g*) 571.456
- Sulphonation (*l*) 312.462; 662.462 (.2-.4, .8)

Aryl sulphonates (See Sulphonates, aryl)

Azides

- Oxidation by halogens (*l*) 732.570 (.2)

Azo compounds

- Cis-trans isomerization (*l*) 122.550 (.1-.6)
- Decomposition (*g*) 561.451
- Pyrolysis (*g*) 571.451 (.9-.10)

Azomethines

- Isomerization(H and double bond shift) (*l*) 152.440 (.4-.9)
- H-D exchange (*l*) 302.401 (.10)

Benzene, substituted (including ethylenic side chain)

- Racemization (*l*) 112.443 (.1-.2)

Benzylidene anilines

- Hydrolysis (*l*) 242.451 (.10-.13, .15-.20)

Boranes

- Hydrolysis (*g*) 241.310

Borohydrides

- Hydrolysis (*l*) 242.310

Bornyl halides

- Hydrolysis (*l*) 212.471 (.268-.269)

Carbonyl halides

- Dissociation (*g*) 541.470
- Formation (*g*) 641.470

Carboxylate ion, alkyl

- Decarboxylation (*l*) 462.441
- Racemization (*l*) 112.440 (.11)

Carboxylate ion, alkyl, deuterium substituted

- Racemization (*l*) 112.440 (.12)

ALPHABETICAL INDEX (continued)

Carboxylate ion, alkenyl

Isomerization (H and double bond shift) (l) 152.440 (.1-.3)

Cerium(III) compounds

Oxidation by oxyanions of S (l) 732.860

Cerium(IV) compounds

Reduction by AsO_3^- ions (l) 732.580 (.2)

Chlorimines

Dehydrohalogenation (l) 422.475

Chromium(III) compounds

Oxidation by $\text{S}_2\text{O}_8^{2-}$ ions (l) 732.660

Chromium(VI) compounds

Reduction by alcohols (l) 742.461 (.3-.3.1)

Reduction by H_3PO_2 (l) 732.560 (.2)

Chromium, organic complex ions

Cis-trans isomerization (l) 122.480

Racemization (l) 112.481 (.1-.2)

Cobalt, inorganic complex ions

Halogen- H_2O exchange (l) 382.870

Cobalt, organic complex ions

Racemization (l) 112.481 (.3)

Copper(II) compounds

Reduction by H_3PO_2 (l) 732.510 (.2, .2.2)

Cyanogen halides

H-Halogen exchange (l) 352.470

Halogen- NH_2 or NR_2 exchange (l) 352.475Reaction with OH^- ions (l) 242.570

Cyanohydrins

Dissociation (l) 512.415

Cycloalkadienes

Diels-Alder reaction (g) 681.441 (.3)

" " " (l) 682.441

ALPHABETICAL INDEX (continued)

Cycloalkanes

- Isomerization (ring opening) (*g*) 151.441 (.1)
- Pyrolysis (*g*) 571.413 (.1)

Cycloalkanes, substituted

- Branching isomerization (*l*) 142.402
- Cis-trans isomerization (*l*) 122.441
- Pyrolysis (*g*) 571.413 (.3)

Cycloalkenes

- Pyrolysis (*g*) 571.413 (.2)

Cycloalkenes, substituted

- Isomerization (Alkenyl group and double bond shift) (*l*) 152.443

Cycloalkyl halides

- Alcoholysis (See Hydrolysis)
- Dehydrohalogenation (*l*) 422.471 (.38-.51)
- Halogen-halide ion exchange (*l*) 332.772 (.1)
- Hydrolysis (*l*) 212.471 (.256-.267)
- Reaction with OH⁻ ions (See Hydrolysis)

Deuterium

- Deuterium halide formation (*g*) 311.700 (.3,.6)
- Ortho-para conversion (*g*) 101.000 (.7-.12)
- " " " (*l*) 102.000 (.6-.8)

Deuterium halides

- Dissociation (*g*) 311.700 (.7)

Diazoalkanes

- Pyrolysis (*g*) 571.451 (.8)

Diazoalkanes, aryl substituted

- C=N₂ bond acidolysis (*l*) 242.456
- " " alcoholysis (*l*) 242.455 (.11)
- " " phenolysis (*l*) 242.455 (.15)

Diazoanilides

- Isomerization (H substitution by NH₂) (*l*) 152.552 (.1)

Diazomalonates

- Decomposition (*l*) 562.446 (.16-.17)

Diazonitriles

- Cis-trans isomerization (*l*) 122.550 (.7-.16)

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ALPHABETICAL INDEX (continued)

Diazonium halidesDecomposition (*l*) 562.457**Diketones**H-halogen exchange (*l*) 312.471 (.8-.9, .11)**Dioxanes**Pyrolysis (*g*) 571.444 (.2)**Diphenyls, substituted**Racemization (*g*) 111.443" (*l*) 112.443 (.5-.29)**Disaccharides, derivatives of**Alcoholysis (*l*) 212.471 (.441-.442)**Esters of aliphatic acids**

Dicarboxylic alkenyl, alkyl esters of

Cis-trans isomerization (*g*) 121.440 (.2)

Dicarboxylic alkyl, alkyl esters of

Condensation with alkyl aldehydes (See Aldehydes, alkyl)

" " aromatic aldehydes (See Aldehydes, aromatic)

" " amines (See amines, primary alkyl)

Hydrolysis (*l*) 212.447 (.13-.14, .18-.23)Racemization (*l*) 112.470 (.6)Reaction with OH⁻ ions (*l*) 212.447 (.1-.12, .15-.17)

Dicarboxylic alkynyl, alkyl esters of

Hydrogen halide addition (*l*) 622.471 (.2)Monocarboxylic alkadienyl γ keto, hydroxy substituted, alkyl esters ofIsomerization (Ring closure) (*l*) 172.441 (.1, .4)

Monocarboxylic alkenyl, alkyl esters of

Ammonolysis (*l*) 212.541 (.33-.34)Hydrolysis (*l*) 212.441 (.153-.156)

Monocarboxylic alkenyl, aryl substituted, alkyl esters of

Cis-trans isomerization (*g*) 121.440 (.3)Halogen addition (*l*) 622.477 (.60-.62, .73-.76, .82-.84)Reaction with OH⁻ ions (*l*) 212.441 (.157, .246-.247)

Monocarboxylic alkyl, alkenyl esters of

Halogen addition (*l*) 622.477 (.8-.10, .12)Hydrolysis (*l*) 212.441 (.106)Reaction with OH⁻ ions (*l*) 212.441 (.107, .107.2, .107.4)

Monocarboxylic alkyl, alkyl esters of

Acetolysis (*l*) 222.444Alcoholysis (*l*) 222.441Aminolysis (*l*) 212.544 (.1-.27)Ammonolysis (*l*) 212.541 (.1-.32)

ALPHABETICAL INDEX (continued)

Esters of aliphatic acids (continued)

- Monocarboxylic alkyl, alkyl esters of
 - Ester exchange (*l*) 222.445
 - Exchange with hydrogen halide (*l*) 222.741
 - Hydrolysis (*l*) 212.441 (.1-.66, .83-.105.1, .108-.151, .240-.245)
 - Racemization (*l*) 112.470 (.5)
 - Reaction with OH⁻ ions (See Hydrolysis)
 - Reaction with tertiary amines (*l*) 652.441 (.1)
- Monocarboxylic alkyl, alkoxy or hydroxy substituted, alkyl esters of
 - Aminolysis (*l*) 212.544 (.29-.31)
 - Ammonolysis (*l*) 212.541 (.37-.57)
 - Hydrolysis (*l*) 212.441 (.158-.239); 212.445 (.11-.15)
 - Reaction with OH⁻ ions (See Hydrolysis)
 - Reaction with tertiary amines (*l*) 652.441 (.2)
- Monocarboxylic alkyl, alkyl thio or alkenyl thio esters of
 - Aminolysis (*l*) 212.564; 212.645
 - Hydrolysis (*l*) 212.641
 - Reaction with OH⁻ ions (See Hydrolysis)
- Monocarboxylic alkyl, aryl esters of
 - Aminolysis (*l*) 212.546
 - Ammonolysis (*l*) 212.543
 - Alcoholysis (*l*) 212.443 (.3); 222.443
 - Exchange with hydrogen halide (*l*) 222.741 (.20)
 - Hydrolysis (*l*) 212.443
 - Reaction with OH⁻ ions (See Hydrolysis)
- Monocarboxylic alkyl, aryl substituted, alkyl esters of
 - Aminolysis (*l*) 212.544 (.28)
 - Ammonolysis (*l*) 212.541 (.35-.36)
 - Hydrolysis (*l*) 212.441 (.69-.82)
 - Reaction with OH⁻ ions (See Hydrolysis)
- Monocarboxylic alkyl, β -keto, alkyl esters of
 - H-halogen exchange (*l*) 312.471 (.10)
- Monocarboxylic alkyl, halogen substituted, alkyl esters of
 - Halogen-S₂O₃⁻ ion exchange (*l*) 332.761 (.17, .19-.30, .22-.27)
 - Hydrolysis (*l*) 212.441 (.218-.262)
- Monocarboxylic alkyl, cycloalkoxy substituted, alkyl esters of
 - Hydrolysis (*l*) 212.441 (.234-.235)
- Monocarboxylic alkyl, polyhydroxy alcoholic esters of
 - Dissociation to aldehydes and anhydrides (*g*) 511.443
 - Hydrolysis (*l*) 212.445 (.9-.10)
 - Reaction with OH⁻ ions (*l*) 212.445 (.1-.8)
- Monocarboxylic cycloalkyl, alkyl esters of
 - Hydrolysis (*l*) 212.441 (.67, .152)
 - Reaction with OH⁻ ions (*l*) 212.441 (.68)

ALPHABETICAL INDEX (continued)

Esters of aliphatic acids (continued)

- Monocarboxylic cycloalkyl, hydroxy substituted, alkyl esters of
Hydrolysis (1) 212.441 (.236-.239)
- Monocarboxylic diazo alkyl, alkyl esters of
C=N₂ bond Acidolysis, Alcoholysis and Hydrolysis (1) 242.455 (.1-13)

Esters of aromatic acids

- Dicarboxylic aryl, alkyl esters of
Reaction with OH⁻ ions (1) 212.448
Reaction with tertiary amines (1) 652.442 (.2)
- Monocarboxylic aryl, alkenyl esters of
Halogen addition (1) 622.477 (.11)
Reaction with OH⁻ ions (1) 212.442 (.61)
- Monocarboxylic aryl, alkyl esters of
Alcoholysis (1) 212.442 (.76-.78)
Ammonolysis (1) 212.542 (.1-.5, .7)
Hydrolysis (1) 212.442 (.1-.60, .62-.68, .70-.71, .73-.75, .79-.213)
Reaction with OH⁻ ions (See Hydrolysis). Also (1) 212.442 (.214-.221)
Reaction with tertiary amines (1) 652.442 (.1, .3-.7)
- Monocarboxylic aryl, aryl esters of
Ammonolysis (1) 212.542 (.6)

Esters of inorganic acids

- Hydrogen sulphide, substituted alkyl esters of
Isomerization (Ring closure) (1) 172.476
- Nitric acid, alkyl esters of
Hydrolysis (1) 212.451
NO₃-halide ion exchange (1) 332.571 (.1-.2)
- Nitric acid, aryl esters of
NO₃-halide ion exchange (1) 332.571 (.3-.6)
- Phosphoric acid, aryl esters of
Hydrolysis (1) 212.453
- Sillicic acid, alkyl esters of
Hydrolysis (1) 242.404 (.1-.10)
- Sulphuric acid, alkyl esters of
Hydrolysis (1) 212.460 (.24)
Racemization (1) 112.460
Reaction with OH⁻ ions (1) 212.460 (.1, .23)
" " phenolate ions (1) 212.460 (.2-.22)
- Sulphuric acid, aryl esters of
Hydrolysis (1) 212.463

Esters of miscellaneous acids

- Aryl sulphonic acid, alkyl esters of
Acetolysis, Alcoholysis and Formolysis (1) 212.461 (.6-.18, .82-.90, .92-.96); 222.461 (.1)

ALPHABETICAL INDEX (continued)

Esters of miscellaneous acids (continued)

- Aryl sulphonic acid, alkyl esters of
Hydrolysis (*l*) 212.461 (.82, .91)
Reaction with OC_2H_5^- ions (*l*) 212.461 (.1-.5)
- Aryl sulphonic acid, bornyl esters of
Acetolysis and Alcoholysis (*l*) 212.461 (.80-.81, .121-.123, .125-.126)
Hydrolysis (*l*) 212.461 (.120, .124)
Racemization (*l*) 112.440 (.25-.26)
- Aryl sulphonic acid, cycloalkyl esters of
Acetolysis, Alcoholysis and Formolysis (*l*) 212.461 (.66-.70, .111-.112); 222.461 (.2-.5)
Isomerization (Ring opening) (*l*) 182.441 (.5)
- Aryl sulphonic acid, substituted alkyl esters of
Acetolysis, Alcoholysis and Formolysis (*l*) 212.461 (.22-.36, .39-.49, .54-.55, .57, .59, .64-.65, .98-.108, .110)
Hydrolysis (*l*) 212.461 (.19-.21, .37-.38, .50-.52, .60-.63, .97, .109)
Isomerization (*l*) 142.446
Racemization (*l*) 112.440 (.23)
Reaction with OCH_3^- ions (*l*) 212.461 (.53, .56, .58)
- Aryl sulphonic acid, substituted cycloalkyl esters of
Acetolysis and Alcoholysis (*l*) 212.461 (.71-.79, .113-.119)
Racemization (*l*) 112.440 (.24)
- Thiocyanic acid, alkyl esters of
Hydrolysis (*l*) 212.465
- Tricyclic acids, alkyl esters of
Reaction with OH^- ions (*l*) 212.441 (.263-.267); 212.447 (.24)

Ethers, alkyl alkenyl

- Hydrolysis (*l*) 242.441 (.4)
Pyrolysis (*g*) 571.441 (.18)

Ethers, alkyl alkynyl

- Hydration (*l*) 622.443

Ethers, alkyl aryl

- H-halogen exchange (*l*) 312.472 (.19-.20)

Ethers, dialkyl

- Condensation with aryl H (*l*) 232.403 (.12-.17)
Hydrolysis (*l*) 242.441 (.1-.3)
Pyrolysis (*g*) 571.441 (.14-.17, .19-.20)

Ethers, diaryl

- Alcoholysis (*l*) 242.441 (.5-.12)

Ethers, halogen substituted cyclic

- Halogen- S_2O_3^- ion exchange (*l*) 332.761 (.29)

ALPHABETICAL INDEX (continued)

Ethylene oxide, substituted

Isomerization(Ring opening) (l) 182.461

Fluophosphates

Hydrolysis of P-F bond (l) 252.570

Fluosilicate ionsReaction with OH⁻ ions (l) 242.470 (.4)**Formamidines, aryl**

Hydrolysis (l) 242.451 (.14)

Furanes

Pyrolysis (g) 571.444 (.1)

Halide ions

Oxidation by As(V) or V(V) compounds (l) 732.750

" " H₂O₂ (l) 732.701 (.1.1, .2.1)

" " hypohalous acids or oxyanions of halogens (l) 722.770; 732.770

" " Fe(III) ions (l) 732.780

" " O₃ (l) 732.703**Halogens**

Hydrogen and deuterium halide formation (g) 311.700 (.1-.4, .6)

Reaction with H₂O or OH⁻ ions (l) 712.770 (.1-.2, .8-.9)

Reduction by HCOOH (l) 742.471 (.1.1)

" " Fe(II) ions (l) 732.870

" " H₂O₂ (l) 732.071 (.1-.2)

" " anions, oxyanions and oxyacids of N, P and As (l) 732.570 (.1-.2, .4-.5, .5.2-.5.4)

" " oxyanions of S (l) 732.670 (.1)

" " oxalic acid (l) 742.471 (.2-.4)

Halogen xoides

Decomposition (g) 541.760

Hydrolysis and Reaction with OH⁻ ions (l) 712.770 (.5-.6)**Hexoses, derivatives of**

Alcoholysis and Hydrolysis (l) 212.471 (.427-.440)

Racemization (l) 112.440 (.19-.22)

Hydrazobenzenes, substituted

Isomerization (l) 152.552 (.2-.10)

Hydrogen

Hydrogen halide formation (g) 311.700 (.1-.2, .4)

Ortho-para conversion (g) 101.000 (.1-.6)

ALPHABETICAL INDEX (continued)

Hydrogen (continued)

- Ortho-para conversion (*l*) 102.000 (.1-.5, .9-.11)
 " " " (*s*) 103.000

Hydrogen peroxide

- Decomposition (*g*) 541.160
 Oxidation by halogens and oxyacids or oxyanions of halogens (*l*) 732.071
 Reduction by halide ions (*l*) 732.701 (.1.1, .2.1)

Hydroxyl amines

- Condensation with aldehydes or ketones (See Aldehydes or Ketones)
 " " H_2SO_3 (*l*) 232.561

Iron(II) compounds

- Oxidation by halogens (*l*) 732.870

Iron(III) compounds

- Reduction by halide ions (*l*) 732.780
 " " NO_2^- ions (*l*) 732.580 (.1)
 " " Sn^{2+} ions (*l*) 732.480

Imidazoles, halogen substituted

- Halogen-halide ion exchange (*l*) 332.771 (.37-.42)

Ketals

- Hydrolysis (*l*) 242.442 (.5-.6, .13-.14)

Ketoesters

- Condensation with aromatic aldehydes (See Aldehydes, aromatic)

Ketones, alkyl

- Condensation with aromatic aldehydes (See Aldehydes, aromatic)
 Condensation with hydroxylamine and semicarbazide (*l*) 232.451 (.2-.3, .6, .8)
 H-D exchange (*l*) 302.401 (.3)
 H-halogen exchange (*l*) 312.471 (.1-.7)
 Pyrolysis (*g*) 571.441 (.13)
 Racemization (*l*) 112.440 (.3-.4, .10)

Ketones, alkyl aryl

- Condensation with aromatic aldehydes (See Aldehydes, aromatic)
 Condensation with hydroxylamine, phenyl hydrazine or semicarbazide (*l*) 232.451 (.21-.24, .40-.43, .56-.57, .66-.107)
 H-D exchange (*l*) 302.401 (.7)
 H-halogen exchange (*l*) 312.471 (.13-.37)
 Racemization (*l*) 112.440 (.6-.9)

ALPHABETICAL INDEX (continued)

Ketones, alkyl aryl, deuterium substitutedReaction with amines (*l*) 652.472 (.50-.64)**Ketones, alkyl, deuterium substituted**D-halogen exchange (*l*) 312.471 (.3)**Ketones, alkyl, halogen substituted**Halogen-S₂O₃⁼ ion exchange (*l*) 332.761 (.28)**Ketones, alkyl, hydroxy substituted**Dissociation (*l*) 512.441**Ketones, cyclic**Condensation with hydroxyl amine, phenyl hydrazine or semicarbazide (*l*) 232.451 (.9-.10, .13-.16)Racemization (*l*) 112.440 (.13-.14)**Ketones, cycloalkyl**Racemization (*l*) 112.440 (.5)**Lactones**Ring opening by OH⁻ ions (*l*) 632.441**Lithium alkyls or aryls**Reaction with alkyl and alkenyl halides (*l*) 232.417**Manganese (III) compounds**Decomposition (*l*) 742.471 (.3.1, .5.2-.5.4)Reduction by oxalic acid (*l*) 742.471 (.5-.5.1)**Manganese (VII) compounds**Reduction by C₂O₄⁼ ions (*l*) 742.471 (.6)**Mercaptans**Condensation with alkyl halides (*l*) 232.471 (.6)**Mercury (II) compounds**Reduction by H₃PO₂ or H₃PO₃ (*l*) 732.520**Naphthalenes, substituted (including ethylenic side chain)**Racemization (*l*) 112.443 (.3-.4)**Naphthylamines, substituted**Racemization (*l*) 112.443 (.41-.43)**Nickel, organic complex ions**Racemization (*l*) 112.481 (.4-.5)

ALPHABETICAL INDEX (continued)

Nitramides

Decomposition (*l*) 542.561

Nitriles

Condensation with aromatic aldehydes (See Aldehydes, aromatic)

Hydrolysis (*l*) 242.453

Nitrites

Oxidation by Fe(III) ions (*l*) 732.580 (.1)" " halogens (*l*) 732.570 (.1)

Nitroalkane anions

Proton addition (*l*) 622.450

Nitroalkanes

Condensation with aromatic aldehydes (See Aldehydes, aromatic)

H-halogen exchange (*l*) 312.471 (.38, .40-.43)Isomerization(H and double bond shift) (*l*) 152.440 (.10)Proton elimination (*l*) 402.450 (.1-.2, .5-.6, .8-.9, .11-.13, .16-.23)

Nitroalkanes, deuterium substituted

Deuteron elimination (*l*) 402.450 (.3-.4, .7, .10, .14-.15)D-halogen exchange (*l*) 312.471 (.39)

Nitrogen oxides

Dissociation (*g*) 501.562; 541.580" (*l*) 542.560Formation (*g*) 641.580

Nitroso compounds

Reaction with aromatic amines (See Amines, primary aryl)

Nitrosyl halides

Formation (*g*) 641.570

Oxime acetates

Reaction with OH⁻ ions (*l*) 242.504

Oximes, mono

Beckmann rearrangement (*l*) 162.455Hydrolysis (*l*) 242.451 (.1)Syn-anti isomerization (*l*) 132.452

Oxyanions of halogens

Disproportionation (*l*) 712.770 (.4-.4.1, .7.2-.7.3, .11)Reaction with hypohalous acids (*l*) 712.770 (.3, .7-.7.1)

ALPHABETICAL INDEX (continued)

Oxyanions of halogens (continued)

- Reduction by HCOOH (*l*) 742.471 (.1)
 " " H₂O₂ (*l*) 732.071 (.2.1,.3)
 " " halide ions (*l*) 722.770 (.2-.4,.6-.7.2); 732.770
 " " oxyanions of S (*l*) 732.670 (.2-.3)
 " " oxyacids and oxyanions of As or P (*l*) 732.570 (.3,.6-.7,.9-.10)

Oxyanions of P

- Oxidation by halogens (*l*) 732.570 (.4.1,.5.2)

Oxyanions of S

- Hydrolysis (*l*) 712.660 (.1-.2)
 Oxidation by halogens or oxyanions of halogens (*l*) 732.670
 Reduction by Ag⁺ ions (*l*) 732.160
 " " alcohols (*l*) 742.461 (.1)
 " " Ce⁺⁺⁺ ions (*l*) 732.860
 " " Cr⁺⁺⁺ ions (*l*) 732.660
 " " NH₄⁺ ions (*l*) 732.560 (.1)
 " " oxalic acid (*l*) 742.461 (.2)

Ozone

- Decomposition (*g*) 541.660
 " (*l*) 542.660; 742.403 (.1.1)
 Reduction by HCOOH (*l*) 742.403 (.1)
 " " halides (*l*) 732.703

Pentoses, substituted

- Alcoholysis (*l*) 212.471 (.426)
 Hydrolysis (*l*) 212.471 (.425)

Peptide linkages

- Alcoholysis (*l*) 242.452 (.53,.67,.71,.73,.75)
 Hydrolysis (*l*) 242.452 (.52-.75)
 Reaction with H₃O⁺ or OH⁻ ions (See Hydrolysis)

Perbenzoates, bicyclic

- Isomerization (*l*) 152.446 (.1)

Peroxides, alkyl

- Pyrolysis (*g*) 571.441 (.21-.23)

Phenols

- Condensation with alkyl halides (*l*) 232.472 (.1-.11)

Phenols, deuterium substituted

- H-D exchange (*l*) 302.402

ALPHABETICAL INDEX (continued)

Phenylhydrazines

Condensation with aldehydes and ketones (See Aldehydes and Ketones)

Phosphates, fluo (See Fluophosphates)

Phosphates, poly

Hydrolysis (l) 252.560

Pinenes

Isomerization (ring opening) (g) 181.441 (.2-.3)

" " " (l) 182.441 (.1-.4)

Piperidines

H-halogen exchange (See Aryl halides)

Pyridines (See Amines, heterocyclic)

Semicarbazides

Condensation with aldehydes and ketones (See Aldehydes and Ketones)

Semicarbazones

Hydrolysis (l) 242.451 (.2-.9)

Silanes, alkyl substituted

Hydrolysis (l) 242.414

Silanes, alkyl aryl substituted

Hydrolysis (l) 242.444

Silanes, aryl and halogen substituted

Hydrolysis (l) 242.470 (.1,.3)

Reaction with OH⁻ ions (l) 242.470 (.2)

Silanol

Condensation (l) 232.447

Silicates, alkyl (See Esters of Silicic acid)

Siloxanes

Alcoholysis (l) 242.404 (.11-.13)

Silver(I) compounds

Oxidation by S₂O₈⁼ ions (l) 732.160

Reduction by H₃PO₂ (l) 732.510 (.1)

ALPHABETICAL INDEX (continued)

Sulphonates, halogen substituted alkyl, Na saltDehydrohalogenation (*l*) 422.471 (.6)**Sulphones, cyclic**SO₂ elimination (*l*) 522.461**Sulphonium ions, alkyl**Alcoholysis and Hydrolysis (*l*) 242.461 (.12-.14, .16-.17.1)Reaction with OH⁻, OC₂H₅⁻, OC₆H₅⁻ and CO₃⁼ ions (*l*) 242.461 (.1- .11.1, .15, .18-.21)**Tin(II) compounds**Oxidation by Fe(III) compounds (*l*) 732.480**Triazoles**Isomerization (*l*) 152.451**Trihalide ions**Reduction by H₃PO₂ or H₃AsO₃ (*l*) 732.570 (.1.3, .5.4, .8)**Uranium(V) compounds**Disproportionation (*l*) 712.860 (.3)**Vanadium(III) compounds**Oxidation by O₂ (*l*) 732.500**Vanadium(V) compounds**Reduction by halides (*l*) 732.750 (.2)





