
SECTION 3

INORGANIC CHEMISTRY

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3.1 NOMENCLATURE OF INORGANIC COMPOUNDS

The following synopsis of rules for naming inorganic compounds and the examples given in explanation are not intended to cover all the possible cases. For a more comprehensive and detailed description, see G. J. Leigh (ed.), *Nomenclature of Inorganic Chemistry*, 3d ed., Blackwell Scientific Publications, Oxford, 1990. This 289-page publication contains the Recommendations 1990 of the Commission on Nomenclature of Inorganic Chemistry and was prepared under the auspices of the International Union of Pure and Applied Chemistry (IUPAC). In particular, the latest report should be consulted for coordination compounds, boron compounds, and crystalline phases of variable composition.

3.1.1 Writing Formulas

3.1.1.1 Mass Number, Atomic Number, Number of Atoms, and Ionic Charge. The mass number, atomic number, number of atoms, and ionic charge of an element are indicated by means of four indices placed around the symbol:

mass number	SYMBOL	ionic charge	${}^{15}_7\text{N}_2^{-}$
atomic number		number of atoms	

Ionic charge should be indicated by an Arabic superscript numeral preceding the plus or minus sign: Mg^{2+} , PO_4^{3-} .

3.1.1.2 Placement of Atoms in a Formula. The electropositive constituent (cation) is placed first in a formula. If the compound contains more than one electropositive or more than one electronegative constituent, the sequence within each class should be in alphabetical order of their symbols.

The alphabetical order may be different in formulas and names; for example, $\text{NaNH}_4\text{HPO}_4$, ammonium sodium hydrogen phosphate.

Acids are treated as hydrogen salts. Hydrogen is cited last among the cations.

When there are several types of ligands, anionic ligands are cited before the neutral ligands.

3.1.1.3 Binary Compounds between Nonmetals. For binary compounds between nonmetals, that constituent should be placed first which appears earlier in the sequence:



Examples: AsCl_3 , SbH_3 , H_3Te , BrF_3 , OF_2 , and N_4S_4 .

3.1.1.4 Chain Compounds. For chain compounds containing three or more elements, the sequence should be in accordance with the order in which the atoms are actually bound in the molecule or ion.

Examples: SCN^- (thiocyanate), HSCN (hydrogen thiocyanate or thiocyanic acid), HNCO (hydrogen isocyanate), HONC (hydrogen fulminate), and HPH_2O_2 (hydrogen phosphinate).

3.1.1.5 Use of Centered Period. A centered period is used to denote water of hydration, other solvates, and addition compounds; for example, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, copper(II) sulfate 5-water (or pentahydrate).

3.1.1.6 Free Radicals. In the formula of a polyatomic radical an unpaired electron(s) is(are) indicated by a dot placed as a right superscript to the parentheses (or square bracket for coordination compounds). In radical ions the dot precedes the charge. In structural formulas, the dot may be placed to indicate the location of the unpaired electron(s).

Examples: $(\text{HO})\cdot$ $(\text{O}_2)^{\cdot 2}$ $(\dot{\text{N}}\text{H}_3)$

3.1.1.7 Enclosing Marks. Where it is necessary in an inorganic formula, enclosing marks (parentheses, braces, and brackets) are nested within square brackets as follows:



In an inorganic name the nesting order is different: { { { [()] } } }, and so on.

3.1.1.8 Molecular Formula. For compounds consisting of discrete molecules, a formula in accordance with the correct molecular weight of the compound should be used.

Examples: S_2Cl_2 , S_8 , N_2O_4 , and $\text{H}_4\text{P}_2\text{O}_6$; not SCl , S , NO_2 , and H_2PO_3 .

3.1.1.9 Structural Formula and Prefixes. In the structural formula the sequence and spatial arrangement of the atoms in a molecule are indicated.

Examples: $\text{NaO}(\text{O}=\text{C})\text{H}$ (sodium formate), $\text{Cl}-\text{S}-\text{S}-\text{Cl}$ (disulfur dichloride).

Structural prefixes should be italicized and connected with the chemical formula by a hyphen: *cis-*, *trans-*, *anti-*, *syn-*, *cyclo-*, *catena-*, *o-* or *ortho-*, *m-* or *meta-*, *p-* or *para-*, *sec-* (secondary), *tert-* (tertiary), *v-* (vicinal), *meso-*, *as-* for asymmetrical, and *s-* for symmetrical.

The sign of optical rotation is placed in parentheses, (+) for dextrorotary, (−) for levorotary, and (±) for racemic, and placed before the formula. The wavelength (in nanometers) is indicated by a right subscript; unless indicated otherwise, it refers to the sodium D-line.

The italicized symbols *d*- (for deuterium) and *t*- (for tritium) are placed after the formula and connected to it by a hyphen. The number of deuterium or tritium atoms is indicated by a subscript to the symbol.

Examples: *cis*-[PtCl₂(NH₃)₂] methan-*d*₃-ol
 di-*tert*-butyl sulfate (+)₅₈₉[Co(en)₃]Cl₂
 methan-ol-*d*

3.1.2 Naming Compounds

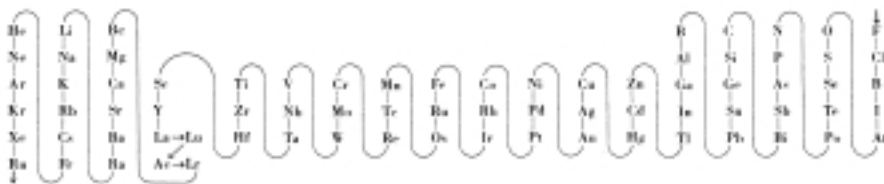
3.1.2.1 Names and Symbols for Elements. Names and symbols for the elements are given in Table 3.2. Wolfram is preferred to tungsten but the latter is used in the United States. In forming a complete name of a compound, the name of the electropositive constituent is left unmodified except when it is necessary to indicate the valency (see oxidation number and charge number, formerly the Stock and Ewens-Bassett systems). The order of citation follows the alphabetic listing of the names of the cations followed by the alphabetical listing of the anions and ligands. The alphabetical citation is maintained regardless of the number of each ligand.

Example: K[AuS(S₂)] is potassium (disulfido)thioaurate(1-).

3.1.2.2 Electronegative Constituents. The name of a monatomic electronegative constituent is obtained from the element name with its ending (-en, -ese, -ic, -ine, -ium, -ogen, -on, -orus, -um, -ur, -y, or -ygen) replaced by -ide. The elements bismuth, cobalt, nickel, zinc, and the noble gases are used unchanged with the ending -ide. Homopolyatomic ligands will carry the appropriate prefix. A few Latin names are used with affixes: cupr- (copper), aur- (gold), ferr- (iron), plumb- (lead), argent- (silver), and stann- (tin).

For binary compounds the name of the element standing later in the sequence in Sec. 3.1.1.3 is modified to end in -ide. Elements other than those in the sequence of Sec. 3.1.1.3 are taken in the reverse order of the following sequence, and the name of the element occurring last is modified to end in -ide; e.g., calcium stannide.

ELEMENT SEQUENCE



3.1.2.3 Stoichiometric Proportions. The stoichiometric proportions of the constituents in a formula may be denoted by Greek numerical prefixes: mono-, di-, tri-, tetra-, penta-, hexa-, hepta-, octa-, nona- (Latin), deca-, undeca- (Latin), dodeca-, . . . , icos- (20), henicosa- (21), . . . , triconta- (30), tetraconta- (40), . . . , hecta- (100), and so on, preceding without a hyphen the names of the elements to which they refer. The prefix mono can usually be omitted; occasionally hemi- (½) and sesqui- (¾) are used. No elisions are made when using numerical prefixes except in the case of icos- when the letter “i” is elided in docosa- and tricosa-. Beyond 10, prefixes may be replaced by Arabic numerals.

When it is required to indicate the number of entire groups of atoms, the multiplicative numerals bis-, tris-, tetrakis-, pentakis-, and so on, are used (i.e., -kis is added starting from tetra-). The entity to which they refer is placed in parentheses.

Examples: $\text{Ca}[\text{PF}_6]_2$, calcium bis(hexafluorophosphate); and $(\text{C}_{10}\text{H}_{21})_3\text{PO}_4$, tris(decyl) phosphate instead of tridecyl which is $(\text{C}_{13}\text{H}_{27}-)$.

Composite numeral prefixes are built up by citing units first, then tens, then hundreds, and so on. For example, 43 is written tritetraconta- (or tritetracontakis-).

In indexing it may be convenient to italicize a numerical prefix at the beginning of the name and connect it to the rest of the name with a hyphen; e.g., *di*-nitrogen pentaoxide (indexed under the letter “n”).

3.1.2.4 Oxidation and Charge Numbers. The *oxidation number* (Stock system) of an element is indicated by a Roman numeral placed in parentheses immediately following the name of the element. For zero, the cipher 0 is used. When used in conjunction with symbols the Roman numeral may be placed above and to the right. The *charge number* of an ion (Ewens-Bassett system) rather than the oxidation state is indicated by an Arabic numeral followed by the sign of the charge cited and is placed in parentheses immediately following the name of the ion.

Examples: P_2O_5 , diphosphorus pentaoxide or phosphorus(V) oxide; Hg_2^{2+} , mercury(I) ion or dimercury(2+) ion; $\text{K}_2[\text{Fe}(\text{CN})_6]$, potassium hexacyanoferrate(II) or potassium hexacyanoferrate(4-); $\text{Pb}_2^{\text{II}}\text{Pb}^{\text{IV}}\text{O}_4$, dilead(II) lead(IV) oxide or trilead tetraoxide.

Where it is not feasible to define an oxidation state for each individual member of a group, the overall oxidation level of the group is defined by a formal ionic charge to avoid the use of fractional oxidation states; for example, O_2^- .

3.1.2.5 Collective Names. Collective names include:

Halogens (F, Cl, Br, I, At)

Chalcogens (O, S, Se, Te, Po)

Alkali metals (Li, Na, K, Rb, Cs, Fr)

Alkaline-earth metals (Ca, Sr, Ba, Ra)

Lanthanoids or lanthanides (La to Lu)

Rare-earth metals (Sc, Y, and La to Lu inclusive)

Actinoids or actinides (Ac to Lr, those whose 5f shell is being filled)

Noble gases (He to Rn)

A transition element is an element whose atom has an incomplete *d* subshell, or which gives rise to a cation or cations with an incomplete *d* subshell.

3.1.2.6 Isotopically Labeled Compounds. The hydrogen isotopes are given special names: ^1H (protium), ^2H or D (deuterium), and ^3H or T (tritium). The superscript designation is preferred because D and T disturb the alphabetical ordering in formulas.

Other isotopes are designated by mass numbers: ^{10}B (boron-10).

Isotopically labeled compounds may be described by inserting the italic symbol of the isotope in brackets into the name of the compound; for example, H^{36}Cl is hydrogen chloride[^{36}Cl] or hydrogen chloride-36, and $^2\text{H}^{38}\text{Cl}$ is hydrogen [^2H] chloride[^{38}Cl] or hydrogen-2 chloride-38.

3.1.2.7 Allotropes. Systematic names for gaseous and liquid modifications of elements are sometimes needed. Allotropic modifications of an element bear the name of the atom together with the descriptor to specify the modification. The following are a few common examples:

Symbol	Trivial name	Systematic name
H	Atomic hydrogen	Monohydrogen
O ₂	(Common oxygen)	Dioxygen
O ₃	Ozone	Trioxygen
P ₄	White phosphorus	Tetraphosphorus
S ₈	α -Sulfur, β -Sulfur	Octasulfur
S _n	μ -Sulfur (plastic sulfur)	Polysulfur

Trivial (customary) names are used for the amorphous modification of an element.

3.1.2.8 Heteroatomic and Other Anions. A few heteroatomic anions have names ending in -ide. These are

—OH, hydroxide ion (not hydroxyl)	—NH—, imide ion
—CN, cyanide ion	—NH—NH ₂ , hydrazide ion
—HF ₂ ⁻ , hydrogen difluoride ion	—NHOH, hydroxylamide ion
—NH ₂ , amide ion	—HS ⁻ , hydrogen sulfide ion

Added to these anions are

—I ₃ ⁻ , triiodide ion	—O—O—, peroxide ion
—N ₃ , azide ion	—S—S—, disulfide ion
—O ₃ , ozonide ion	

3.1.2.9 Binary Compounds of Hydrogen. Binary compounds of hydrogen with the more electropositive elements are designated hydrides (NaH, sodium hydride).

Volatile hydrides, except those of Periodic Group VII and of oxygen and nitrogen, are named by citing the root name of the element (penultimate consonant and Latin affixes, Sec. 3.1.2.2) followed by the suffix -ane. Exceptions are water, ammonia, hydrazine, phosphine, arsine, stibine, and bismuthine.

Examples: B₂H₆, diborane; B₁₀H₁₄, decaborane(14); B₁₀H₁₆, decaborane(16); P₂H₄, diphosphane; Sn₂H₆, distannane; H₂Se₂, diselane; H₂Te₂, ditellane; H₂S₅, pentasulfane; and PbH₄, plumbane.

3.1.2.10 Neutral Radicals. Certain neutral radicals have special names ending in -yl:

HO	hydroxyl	ClO ₃	perchloryl*
CO	carbonyl	CrO ₂	chromyl
ClO	chlorosyl*	NO	nitrosyl
ClO ₂	chloryl*	NO ₂	nitryl (nitroyl)

* Similarly for the other halogens.

PO	phosphoryl	SeO	seleninyl
SO	sulfinyl (thionyl)	SeO ₂	selenonyl
SO ₂	sulfonyl (sulfuryl)	UO ₂	uranyl
S ₂ O ₅	disulfuryl	NpO ₂	neptunyl†

Radicals analogous to the above containing other chalcogens in place of oxygen are named by adding the prefixes thio-, seleno-, and so on; for example, PS, thiophosphoryl; CS, thiocarbonyl.

3.1.3 Cations

3.1.3.1 Monatomic Cations. Monatomic cations are named as the corresponding element; for example, Fe²⁺, iron(II) ion; Fe³⁺, iron(III) ion.

This principle also applies to polyatomic cations corresponding to radicals with special names ending in -yl (Sec. 3.1.2.10); for example, PO⁺, phosphoryl cation; NO⁺, nitrosyl cation; NO₂⁺, nitryl cation; O₂⁺, oxygenyl cation.

Use of the oxidation number and charge number extends the range for radicals; for example, UO₂⁺ uranyl(VI) or uranyl(2+) cation; UO₂⁺, uranyl(V) or uranyl(1+) cation.

3.1.3.2 Polyatomic Cations. Polyatomic cations derived by addition of more protons than required to give a neutral unit to polyatomic anions are named by adding the ending -onium to the root of the name of the anion element; for example, PH₄⁺, phosphonium ion; H₂I⁺, iodonium ion; H₃O⁺, oxonium ion; CH₃OH₂⁺, methyl oxonium ion.

Exception: The name ammonium is retained for the NH₄⁺ ion; similarly for substituted ammonium ions; for example, NF₄⁺, tetrafluoroammonium ion.

Substituted ammonium ions derived from nitrogen bases with names ending in -amine receive names formed by changing -amine into -ammonium. When known by a name not ending in -amine, the cation name is formed by adding the ending -ium to the name of the base (eliding the final vowel); e.g., anilinium, hydrazinium, imidazolium, acetonium, dioxanium.

Exceptions are the names uronium and thiouronium derived from urea and thiourea, respectively.

3.1.3.3 Multiple Ions from One Base. Where more than one ion is derived from one base, the ionic charges are indicated in their names: N₂H₅⁺, hydrazinium(1+) ion; N₂H₆²⁺, hydrazinium(2+) ion.

3.1.4 Anions

See Secs. 3.1.2.2 and 3.1.2.8 for naming monatomic and certain polyatomic anions. When an organic group occurs in an inorganic compound, organic nomenclature (*q.v.*) is followed to name the organic part.

3.1.4.1 Protonated Anions. Ions such as HSO₄⁻ are recommended to be named hydrogensulfate with the two words written as one following the usual practice for polyatomic anions. However, in the *Nomenclature of Organic Chemistry*, 1979 edition, hydrogen is used as a separate word; this practice is followed in this Handbook.

† Similarly for the other actinoid elements.

3.1.4.2 Other Polyatomic Anions. Names for other polyatomic anions consist of the root name of the central atom with the ending -ate and followed by the valence of the central atom expressed by its oxidation number. Atoms and groups attached to the central atom are treated as ligands in a complex.

Examples: $[\text{Sb}(\text{OH})_6]^-$, hexahydroxoantimonate(V); $[\text{Fe}(\text{CN})_6]^{3-}$, hexacyanoferrate(III); $[\text{Co}(\text{NO}_2)_6]^{3-}$, hexanitritocobaltate(III); $[\text{TiO}(\text{C}_2\text{O}_4)_2(\text{H}_2\text{O})_2]^{2-}$, oxobisoxalato diaquatitanate(IV); $[\text{PCl}_6]^-$, hexachlorophosphate(V).

Exceptions to the use of the root name of the central atom are antimonate, bismuthate, carbonate, cobaltate, nickelate (or niccolate), nitrate, phosphate, tungstate (or wolframate), and zincate.

3.1.4.3 Anions of Oxygen. Oxygen is treated in the same manner as other ligands with the number of -oxo groups indicated by a suffix; for example, SO_3^{2-} , trioxosulfate.

The ending -ite, formerly used to denote a lower state of oxidation, may be retained in trivial names in these cases (note Sec. 3.1.5.3 also):

AsO_3^{3-}	arsenite	NOO_2^-	peroxonitrite
BrO^-	hypobromite	PO_3^{3-}	phosphite*
ClO^-	hypochlorite	SO_3^{2-}	sulfite
ClO_2^-	chlorite	$\text{S}_2\text{O}_5^{2-}$	disulfite
IO^-	hypoiodite	$\text{S}_2\text{O}_4^{2-}$	dithionite
NO_2^-	nitrite	$\text{S}_2\text{O}_3^{2-}$	thiosulfite
$\text{N}_2\text{O}_2^{2-}$	hyponitrite	SeO_3^{2-}	selenite

However, compounds known to be double oxides in the solid state are named as such; for example, Cr_2CuO_4 (actually $\text{Cr}_2\text{O}_3 \cdot \text{CuO}$) is chromium(III) copper(II) oxide (and not copper chromite).

3.1.4.4 Isopolyanions. Isopolyanions are named by indicating with numerical prefixes the number of atoms of the characteristic element. It is not necessary to give the number of oxygen atoms when the charge of the anion or the number of cations is indicated.

Examples: $\text{Ca}_3\text{Mo}_7\text{O}_{24}$, tricalcium 24-oxoheptamolybdate, may be shortened to tricalcium heptamolybdate; the anion, $\text{Mo}_7\text{O}_{24}^{6-}$, is heptamolybdate(6-); $\text{S}_2\text{O}_7^{2-}$, disulfate(2-); $\text{P}_2\text{O}_7^{4-}$, diphosphate(V)(4-).

When the characteristic element is partially or wholly present in a lower oxidation state than corresponds to its Periodic Group number, oxidation numbers are used; for example, $[\text{O}_2\text{HP}-\text{O}-\text{PO}_3\text{H}]^{2-}$, dihydrogendiphosphate(III,V)(2-).

A bridging group should be indicated by adding the Greek letter μ immediately before its names and separating this from the rest of the complex by a hyphen. The atom or atoms of the characteristic element to which the bridging atom is bonded, is indicated by numbers.

Examples: $[\text{O}_3\text{P}-\text{S}-\text{PO}_2-\text{O}-\text{PO}_3]^{5-}$, 1,2- μ -thiotriphosphate(5-)
 $[\text{S}_3\text{P}-\text{O}-\text{PS}_2-\text{O}-\text{PS}_3]^{5-}$, di- μ -oxo-octathiotriphosphate(5-)

* Named for esters formed from the hypothetical acid $\text{P}(\text{OH})_3$.

3.1.5 Acids

3.1.5.1 Acids and -ide Anions. Acids giving rise to the -ide anions (Sec. 3.1.2.2) should be named as hydrogen . . . -ide; for example, HCl, hydrogen chloride; HN_3 , hydrogen azide.

Names such as hydrobromic acid refer to an aqueous solution, and percentages such as 48% HBr denote the weight/volume of hydrogen bromide in the solution.

3.1.5.2 Acids and -ate Anions. Acids giving rise to anions bearing names ending in -ate are treated as in Sec. 3.1.5.1; for example, H_2GeO_4 , hydrogen germanate; $\text{H}_4[\text{Fe}(\text{CN})_6]$, hydrogen hexacyanoferrate(II).

3.1.5.3 Trivial Names. Acids given in Table 3.1 retain their trivial names due to long-established usage. Anions may be formed from these trivial names by changing -ous acid to -ite, and -ic acid to -ate. The prefix hypo- is used to denote a lower oxidation state and the prefix per- designates a higher oxidation state. The prefixes ortho- and meta- distinguish acids of differing water content; for example, H_4SiO_4 is orthosilicic acid and H_2SiO_3 is metasilicic acid. The anions would be named silicate(4-) and silicate(2-), respectively.

3.1.5.4 Peroxo- Group. When used in conjunction with the trivial names of acids, the prefix peroxo- indicates substitution of —O— by —O—O—.

3.1.5.5 Replacement of Oxygen by Other Chalcogens. Acids derived from oxoacids by replacement of oxygen by sulfur are called thioacids, and the number of replacements are given by prefixes di-, tri-, and so on. The affixes seleno- and telluro- are used analogously.

Examples: HOO—C=S , thiocarbonic acid; HSS—C=S , trithiocarbonic acid.

3.1.5.6 Ligands Other than Oxygen and Sulfur. See Sec. 3.1.7, Coordination Compounds, for acids containing ligands other than oxygen and sulfur (selenium and tellurium).

3.1.5.7 Differences between Organic and Inorganic Nomenclature. Organic nomenclature is largely built upon the scheme of substitution, that is, the replacement of hydrogen atoms by other atoms or groups. Although rare in inorganic nomenclature: NH_2Cl is called chloramine and NHCl_2 dichloroamine. Other substitutive names are fluorosulfonic acid and chlorosulfonic acid derived from HSO_3H . These and the names aminosulfonic acid (sulfamic acid), iminodisulfonic acid, and nitritrisulfonic acid should be replaced by the following based on the concept that these names are formed by adding hydroxyl, amide, imide, and so on, groups together with oxygen atoms to a sulfur atom:

HSO_3F	fluorosulfuric acid	$\text{NH}(\text{SO}_3\text{H})_2$	imidobis(sulfuric) acid
HSO_3Cl	chlorosulfuric acid	$\text{N}(\text{SO}_3\text{H})_3$	nitridotris(sulfuric) acid
$\text{NH}_2\text{SO}_3\text{H}$	amidosulfuric acid		

3.1.6 Salts and Functional Derivatives of Acids

3.1.6.1 Acid Halogenides. For acid halogenides the name is formed from the corresponding acid radical if this has a special name (Sec. 3.1.2.10); for example, NOCl , nitrosyl chloride. In other cases these compounds are named as halogenide oxides with the ligands listed alphabetically; for example, BiClO , bismuth chloride oxide; VCl_2O , vanadium(IV) dichloride oxide.

3.1.6.2 Anhydrides. Anhydrides of inorganic acids are named as oxides; for example, N_2O_5 , dinitrogen pentoxide.

TABLE 3.1 Trivial Names Retained for Acids

Alphabetically by characteristic element.

H_3AsO_4	arsenic acid	$H_4P_2O_7$	diphosphoric acid (or pyro- phosphoric acid)
H_3AsO_3	arsenious acid	$H_4P_2O_8$	peroxodiphosphoric acid
H_3BO_3	orthoboric acid (or boric acid)	$(HO)_2OP$	diphosphoric(IV) acid or hypophosphoric acid
HBO_2	metaboric acid	$(HO)_2OP$	
$HBrO_3$	bromic acid	$(HO)_2P-O$	diphosphoric(III,V) acid
$HBrO_2$	bromous acid	$(HO)_2P-O$	
$HBrO$	hypobromous acid	H_2PHO_3	phosphonic acid
H_2CO_3	carbonic acid	$H_2P_2H_2O_5$	diphosphonic acid
$HOCN$	cyanic acid	HPH_2O_2	phosphinic acid (formerly hypophosphorous acid)
$HNCO$	isocyanic acid	$HReO_4$	perrhenic acid
$HONC$	fulminic acid	H_2ReO_4	rhenic acid
$HClO_4$	perchloric acid	H_2SO_4	sulfuric acid
$HClO_3$	chloric acid	$H_2S_2O_7$	disulfuric acid
$HClO_2$	chlorous acid	H_2SO_5	peroxomonosulfuric acid
$HClO$	hypochlorous acid	$H_2S_2O_3$	thiosulfuric acid
H_2CrO_4	chromic acid	$H_2S_2S_6$	dithionic acid
$H_2Cr_2O_7$	dichromic acid	H_2SO_3	sulfurous acid
H_5IO_6	orthoperiodic acid	$H_2S_2O_5$	disulfurous acid
HIO_4	periodic acid	$H_2S_2O_2$	thiosulfurous acid
HIO_3	iodic acid	$H_2S_2O_4$	dithionous acid
HIO	hypoiodous acid	$H_2S_xO_6$	polythionic acid ($x = 3, 4, \dots$) (tri-, tetra-, . . .)
$HMnO_4$	permanganic acid	H_2SO_2	sulfoxylic acid
H_2MnO_4	manganic acid	$HSb(OH)_6$	hexahydroxoantimonic acid
HNO_4	peroxonitric acid	H_2SeO_4	selenic acid
HNO_3	nitric acid	H_2SeO_3	selenious acid
HNO_2	nitrous acid	H_4SiO_4	orthosilicic acid
H_2NO_2	nitroxylic acid	H_2SiO_3	metasilicic acid
$H_2N_2O_2$	hyponitrous acid	$HTcO_4$	pertechnetic acid
$HOONO$	peroxonitrous acid	H_2TeO_4	technetic acid
H_3PO_4	orthophosphoric acid (or phosphoric acid)	H_6TeO_6	orthotelluric acid
HPO_3	metaphosphoric acid		
H_3PO_5	peroxomonophosphoric acid		

3.1.6.3 Esters. Esters of inorganic acids are named as the salts; for example, $(CH_3)_2SO_4$, dimethyl sulfate. However, if it is desired to specify the constitution of the compound, the nomenclature for coordination compounds should be used.

3.1.6.4 Amides. Names for amides are derived from the names of the acid radicals (or from the names of acids by replacing acid by amide); for example, $SO_2(NH_2)_2$, sulfonyl diamide (or sulfuric diamide); NH_2SO_3H , sulfamidic acid (or amidosulfuric acid).

3.1.6.5 Salts. Salts containing acid hydrogen are named by adding the word hydrogen before the name of the anion (however, see Sec. 3.1.4.1), for example, KH_2PO_4 , potassium dihydrogen phosphate; $NaHCO_3$, sodium hydrogen carbonate (not bicarbonate); $NaHPO_3$, sodium hydrogen phosphonate (only one acid hydrogen remaining).

Salts containing O^{2-} and HO^- anions are named oxide and hydroxide, respectively. Anions are cited in alphabetical order which may be different in formulas and names.

Examples: $FeO(OH)$, iron(III) hydroxide oxide; $VO(SO_4)$, vanadium(IV) oxide sulfate.

3.1.6.6 Multiplicative Prefixes. The multiplicative prefixes bis, tris, etc., are used with certain anions for indicating stoichiometric proportions when di, tri, etc., have been preempted to designate condensed anions; for example, $\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$, aluminum potassium bis(sulfate) 12-water (recall that disulfate refers to the anion $\text{S}_2\text{O}_7^{2-}$).

3.1.6.7 Crystal Structure. The structure type of crystals may be added in parentheses and in italics after the name; the latter should be in accordance with the structure. When the typename is also the mineral name of the substance itself, italics are not used.

Examples: MgTiO_3 , magnesium titanium trioxide (*ilmenite* type); FeTiO_3 , iron(II) titanium trioxide (*ilmenite*).

3.1.7 Coordination Compounds

3.1.7.1 Naming a Coordination Compound. To name a coordination compound, the names of the ligands are attached directly in front of the name of the central atom. The ligands are listed in alphabetical order regardless of the number of each and with the name of a ligand treated as a unit. Thus “diammine” is listed under “a” and “dimethylamine” under “d.” The oxidation number of the central atom is stated last by either the oxidation number or charge number.

3.1.7.2 Anionic Ligands. Whether inorganic or organic, the names for anionic ligands end in -o (eliding the final -e, if present, in the anion name). Enclosing marks are required for inorganic anionic ligands containing numerical prefixes, and for thio, seleno, and telluro analogs of oxo anions containing more than one atom.

If the coordination entity is negatively charged, the cations paired with the complex anion (with -ate ending) are listed first. If the entity is positively charged, the anions paired with the complex cation are listed immediately afterward.

The following anions do not follow the nomenclature rules:

F^-	fluoro	HO_2^-	hydrogen peroxy
Cl^-	chloro	S^{2-}	thio (only for single sulfur)
Br^-	bromo	S_2^{2-}	disulfido
I^-	iodo	HS^-	mercapto
O^{2-}	oxo	CN^-	cyano
H^-	hydrido (or hydro)	CH_2O^-	methoxy or methanolato
OH^-	hydroxo	CH_2S^-	methylthio or methanethiolato
O_2^{2-}	peroxy		

3.1.7.3 Neutral and Cationic Ligands. Neutral and cationic ligands are used without change in name and are set off with enclosing marks. Water and ammonia, as neutral ligands, are called “aqua” and “ammine,” respectively. The groups NO and CO, when linked directly to a metal atom, are called nitrosyl and carbonyl, respectively.

3.1.7.4 Attachment Points of Ligands. The different points of attachment of a ligand are denoted by adding italicized symbol(s) for the atom or atoms through which the attachment occurs at the end of the name of the ligand; e.g., glycine-*N* or glycinate-*O,N*. If the same element is involved in different possible coordination sites, the position in the chain or ring to which the element is attached is indicated by numerical superscripts: e.g., tartrato(3-)-*O*¹,*O*², or tartrato(4-)-*O*²,*O*³ or tartrato(2-)-*O*¹,*O*⁴.

3.1.7.5 Abbreviations for Ligand Names. Except for certain hydrocarbon radicals, for ligand (L) and metal (M), and a few with H, all abbreviations are in lowercase letters and do not involve hyphens. In formulas, the ligand abbreviation is set off with parentheses. Some common abbreviations are

Ac	acetyl	en	ethylenediamine
acac	acetylacetonato	Him	imidazole
Hacac	acetylacetonato	H ₂ ida	iminodiacetic acid
Hba	benzoylacetone	Me	methyl
Bzl	benzyl	H ₃ nta	nitrilotriacetic acid
Hbg	biguanide	nbd	norbornadiene
bpy	2,2'-bipyridine	ox	oxalato(2-) from parent H ₂ ox
Bu	butyl	phen	1,10-phenanthroline
Cy	cyclohexyl	Ph	phenyl
D ₂ dea	diethanolamine	pip	piperidine
dien	diethylenetriamine	Pr	propyl
dmf	dimethylformamide	pn	propylenediamine
H ₂ dmg	dimethylglyoxime	Hpz	pyrazole
dmg	dimethylglyoximato(2-)	py	pyridine
Hdmg	dimethylglyoximato(1-)	thf	tetrahydrofuran
dmsO	dimethylsulfoxide	tu	thiourea
Et	ethyl	H ₃ tea	triethanolamine
H ₄ edta	ethylenediaminetetraacetic acid	tren	2,2',2''-triaminotriethylamine
Hedta, edta	coordinated ions derived from H ₄ edta	trien	triethylenetetraamine
Hea	ethanolamine	tn	trimethylenediamine
		ur	urea

Examples: Li[B(NH₂)₄], lithium tetraamidoborate(1-) or lithium tetraamidoborate(III); [Co(NH₃)₅Cl]Cl₃, pentaamminechlorocobalt(III) chloride or pentaamminechlorocobalt(2+) chloride; K₃[Fe(CN)₅CO], potassium carbonylpentacyanoferrate(II) or potassium carbonylpentacyanoferrate(3-); [Mn{C₆H₄(O)(COO)}₂(H₂O)₄]⁻, tetraaquabis[salicylato(2-)]manganate(III) ion; [Ni(C₄H₇N₂O₂)₂] or [Ni(dmg)] which can be named bis-(2,3-butanedione dioximato)nickel(II) or bis[dimethylglyoximato(2-)]nickel(II).

3.1.8 Addition Compounds

The names of addition compounds are formed by connecting the names of individual compounds by a dash (—) and indicating the numbers of molecules in the name by Arabic numerals separated by the solidus (diagonal slash). All molecules are cited in order of increasing number; those having the same number are cited in alphabetic order. However, boron compounds and water are always cited last and in that order.

Examples: 3CdSO₄ · 8H₂O, cadmium sulfate—water (3/8); Al₂(SO₄)₃ · K₂SO₄ · 24H₂O, aluminum sulfate—potassium sulfate—water (1/1/24); AlCl₃ · 4C₂H₅OH, aluminum chloride—ethanol (1/4).

3.2 PHYSICAL PROPERTIES OF PURE SUBSTANCES

TABLE 3.2 Physical Constants of Inorganic Compounds

Names follow the IUPAC Nomenclature. Solvates are listed under the entry for the anhydrous salt. Acids are entered under Hydrogen and acid salts are entered as a subentry under hydrogen.

Formula weights are based upon the International Atomic Weights of 1993 and are computed to the nearest hundredth when justified. The actual significant figures are given in the atomic weights of the individual elements.

Each element that has neither a stable isotope nor a characteristic natural isotopic composition is represented in this table by one of that element's commonly known radioisotopes identified by mass number and relative atomic mass.

Density values are given at room temperature unless otherwise indicated by the superscript figure; for example, 2.487^{15} indicates a density of 2.487 g/cm³ for the substance at 15°C. A superscript 20 over a subscript 4 indicates a density at 20°C relative to that of water at 4°C. For gases the values are given as grams per liter (g/L).

Melting point is recorded in a certain case as 250 d and in some other cases as d 250, the distinction being made in this manner to indicate that the former is a melting point with decomposition at 250°C while in the latter decomposition only occurs at 250°C and higher temperatures. Where a value such as $-6\text{H}_2\text{O}$, 150 is given it indicates a loss of 6 moles of water per formula weight of the compound at a temperature of 150°C. For hydrates the temperature stated represents the compound melting in its water of hydration.

Boiling point is given at atmospheric pressure (760 mm of mercury or 101 325 Pa) unless otherwise indicated; thus $82^{15\text{mm}}$ indicates that the boiling point is 82°C when the pressure is 15 mm of mercury. Also, subl 550 indicates that the compound sublimates at 550°C. Occasionally decomposition products are mentioned.

Solubility is given in parts by weight (of the formula weight) per 100 parts by weight of the solvent (i.e., percent by weight) and at room temperature. Another unit frequently used is grams per 100 mL of solvent (mL per 100 mL for liquids and gases). The symbols of the common mineral acids represent aqueous solutions of these acids.

Abbreviations Used in the Table

a, acid	h, hot
abs, absolute	hex, hexagonal
abs alc, anhydrous ethanol	HOAc, acetic acid
acet, acetone	i, insoluble
alk, alkali (aq NaOH or KOH)	ign, ignites
anhyd, anhydrous	L, liter
aq, aqueous	lq, liquid
aq reg, aqua regia	MeOH, methanol
atm, atmosphere	min, mineral
BuOH, butanol	mL, milliliter
bz, benzene	org, organic
c, solid state	oxid, oxidizing
ca., approximately	PE, petroleum ether
chl, chloroform	pyr, pyridine
conc, concentrated	s, soluble
cub, cubic	satd, saturated
d, decomposes	sl, slightly
dil, dilute	soln, solution
disprop, disproportionates	solv, solvent(s)
EtOAc, ethyl acetate	subl, sublimes
eth, diethyl ether	sulf, sulfides
EtOH, 95% ethanol	tart, tartrate
expl, explodes	THF, tetrahydrofuran
fcc, face-centered cubic	v, very
fcctetr, face-centered tetragonal	vac, vacuum
FP, flash point	viol, violently
fum, fuming	volat, volatilizes
fus, fusion, fuses	<, less than
g, gas, gram	>, greater than
glyc, glycerol	

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Actinium-227	Ac	227.0278	10.07	1050(50)	ca. 3200	d aq; s acids
bromide	AcBr ₃	466.74	5.85	subl 800		s aq
Aluminum	Al	26.981539	2.70	660.323	2518	s HCl, H ₂ SO ₄ , alk
acetylacetonate	Al(C ₅ H ₇ O ₂) ₃	324.31	1.27	190–193	315	i aq; v s alc; s bz, eth
ammonium bis(sulfate) 12-water	AlNH ₄ (SO ₄) ₂ · 12H ₂ O	453.33	1.65	anhyd >280		14.3 g/100 mL aq; s glyc; i alc
antimonide	AlSb	148.74	4.26	1060		
arsenide	AlAs	101.90	3.76	1740		
bis(acetylsalicylate)	Al(OOCC ₆ H ₄ OCOCH ₃) ₂ OH	402.30				v sl s aq, alc, eth
borate (2/1)	2Al ₂ O ₃ · B ₂ O ₃	273.54		ca. 1050		i aq
bromide	AlBr ₃	266.69	3.205 ₀ ¹⁸	97.5	subl 253	d (viol) aq; s alc, acet, bz, CS ₂
butoxide, <i>sec</i> -	Al(C ₄ H ₉ O) ₃	246.33	0.967		200–206 ^{30mm}	FP 27; v s org solv
butoxide, <i>tert</i> -	Al(C ₄ H ₉ O) ₃	246.33	1.025 ²⁰		subl 180	v s org solv
carbide (4/3)	Al ₄ C ₃	143.96	2.360	2100	d >2200 ^{40mm}	d aq; fire hazard
chlorate	Al(ClO ₃) ₃	277.35				v s aq; s alc
chloride	AlCl ₃	133.34	2.440 ²⁵	192.6	subl 181.1	g/100 mL: 70 aq (viol), 100 ¹² abs alc; s CCl ₄ , eth; sl s bz
ethoxide	Al(C ₂ H ₅ O) ₃	162.16	1.142 ²⁰	140	205 ^{14mm}	s hot aq d; v sl s alc, eth
fluoride	AlF ₃	83.98	2.882 ²⁵ ₄	1090	subl 1272	0.56 aq; i a, alk, alc, acet
hydroxide	Al(OH) ₃	78.01	2.42	to Al ₂ O ₃ , 300		i aq; s acids, alkalis
iodide	AlI ₃	407.69	3.98 ¹⁷	191.0	382	d aq; s alc, eth, CS ₂
isopropoxide	Al(C ₃ H ₇ O) ₃	204.25	1.0346 ²⁰ ₀	118.5	135 ^{10mm}	d aq; s alc, bz, chl, PE
methoxide	Al(CH ₃ O) ₃	72.07		0	130	
nitrate 9-water	Al(NO ₃) ₃ · 9H ₂ O	375.13	1.72	73	d 135	g/100 mL: 64 aq, 100 alc; s acet
nitride	AlN	40.99	3.05	d 2517		d aq, acid, alkali
oxide (alpha-)	AlO ₃	101.96	3.97	2054(6)	2980	i aq; v sl s a, alk
perchlorate 6-water	Al(ClO ₄) ₃ · 6H ₂ O	433.43	2.020	120.8	anhyd 178	133 g/100 mL ²⁰ aq
phenoxide	Al(C ₆ H ₅ O) ₃	306.27	1.23	d 265		d aq; s alc, chl, eth
phosphate	AlPO ₄	121.95	2.56	>1460		i aq; sl s a
phosphide	AlP	57.96	2.85 ₄ ¹⁵	2550		d aq
phosphinate (hypophos- phite)	Al(H ₂ PO ₂) ₃	221.94		d to PH ₃ , 220		i aq; s HCl, warm alkali

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Aluminum (<i>continued</i>)						
potassium bis(sulfate) 12-water	$\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$	474.39	1.757 ²⁰	− 9H ₂ O, 92	anhyd, 200	11.4 g/100 mL aq; v s glyc; i alc
propoxide	$\text{Al}(\text{C}_3\text{H}_7\text{O})_3$	204.25	1.0578 ²⁰ ₀	106	248 ^{14mm}	d aq; s alc
selenide	Al_2Se_3	290.84	3.437 ²⁰ ₄	947		d aq, acid
silicon oxide (1/1)	$\text{Al}_2\text{O}_3 \cdot \text{SiO}_2$	162.05	3.247			i aq; d HF; s fused alkali
sodium bis(sulfate) 12-water	$\text{AlNa}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$	458.28	1.675 ²⁰	61		110 g/100 mL ¹⁵ aq; i alc
stearate	$\text{Al}(\text{C}_{18}\text{H}_{35}\text{O}_2)_3$	877.41	1.070	117–120		i aq, alc; s bz, alk
sulfate	$\text{Al}_2(\text{SO}_4)_3$	342.15	1.61	770 d		36.4 g/100 mL ²⁰ aq; sl s alc
sulfate 18-water	$\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$	666.46	1.69 ¹⁷	d 86.5		87 g/100 mL ⁹ aq; i alc
sulfide	Al_2S_3	150.16	2.20 ¹³	1097	subl 1500	hyd aq; s acid
tetrahydridoborate	$\text{Al}(\text{BH}_4)_3$	71.53		− 64.5	44.5	d aq; ign air; expl in O ₂ , 20
Americium	Am	243	12	1176	2011	s a
Ammonia	NH ₃	17.03	lq: 0.6818 at bp g: 0.6175 ^{15, 7.2atm}	− 77.75	− 33.35	g/100 mL: 34 aq; 13.2 alc; s eth, organic solvents
Ammonium acetate	NH ₄ C ₂ H ₃ O ₂	77.08	1.17 ²⁰	114	d	g/100 mL: 148 ⁴ aq, 7.9 ¹⁵ MeOH; s alc
amidosulfate	NH ₄ SO ₃ NH ₂	114.13		131	d 160	v s aq; sl s alc
benzoate	NH ₄ C ₆ H ₅ O ₂	139.15	1.260	198	subl 160	g/100 mL: 20 ¹⁵ aq, 2.8 alc; s glyc
bromide	NH ₄ Br	97.94	2.429	452 (subl under pressure)	d 397 vacuo	76 g/100 mL ²⁰ aq; v s acet, alc, eth
calcium arsenate 6-water	$\text{NH}_4\text{CaAsO}_4 \cdot 6\text{H}_2\text{O}$	305.13	1.905 ¹⁵	d 140		0.02 aq; s NH ₄ Cl
carbamate	NH ₄ COONH ₂	78.07		subl 60		v s aq; sl s alc; i eth
carbonate 1-water	$(\text{NH}_4)_2\text{CO}_3 \cdot \text{H}_2\text{O}$	114.10		volatilizes 60		v s aq; i alc
chloride	NH ₄ Cl	53.49	1.5274 ²⁵	237.8	520	g/100 mL: 26 ¹⁵ aq, 0.6 ¹⁹ abs alc; i acet, eth
chromate(VI)	$(\text{NH}_4)_2\text{CrO}_4$	152.07	1.91 ¹²	d 185		34 g/100 mL ²⁰ aq; sl s MeOH
chromium(III) bissulfate 12-water	$\text{NH}_4\text{Cr}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$	478.34	1.72	94 d		7.2 g/100 mL ⁰ aq
copper(II) tetrachloride 2-water	$(\text{NH}_4)_2\text{CuCl}_4 \cdot 2\text{H}_2\text{O}$	277.46	1.993	anhyd, 110	d >120	40.3 g/100 mL ²⁰ aq; s alc

cyanide	NH_4CN	44.06	1.10	d 36		v s aq, alc
dichromate(VI)	$(\text{NH}_4)_2\text{Cr}_2\text{O}_7$	252.07	2.155	d 180 to Cr_2O_3		35.6 g/100 mL ²⁰ aq; s alc; flammable
dihydrogen arsenate	$\text{NH}_4\text{H}_2\text{AsO}_4$	158.97	2.311	d 300		v s aq
dihydrogen phosphate	$\text{NH}_4\text{H}_2\text{PO}_4$	115.03	1.803 ¹⁹	d 190		37 g/100 mL ²⁰ aq; sl s alc; i acet
disulfatocobaltate(II) 6-water	$(\text{NH}_4)_2[\text{Co}(\text{SO}_4)_2] \cdot 6\text{H}_2\text{O}$	395.23	1.902			18 g/100 mL ²⁰ aq; v sl s alc
disulfatoferrate(II) 6-water	$(\text{NH}_4)_2[\text{Fe}(\text{SO}_4)_2] \cdot 6\text{H}_2\text{O}$	392.14	1.864	d 100		36.4 g/100 mL ²⁰ aq; i alc
disulfatoferrate(III) 12-water	$\text{NH}_4[\text{Fe}(\text{SO}_4)_2] \cdot 12\text{H}_2\text{O}$	482.19	1.71	39–41	d 230	124 g/100 mL aq
disulfatonickelate(II) 6-water	$(\text{NH}_4)_2[\text{Ni}(\text{SO}_4)_2] \cdot 6\text{H}_2\text{O}$	395.00	1.923			8.95 g/100 mL ²⁰ aq
dithiocarbamate	$\text{NH}_4\text{S}(\text{C}=\text{S})\text{NH}_2$	110.20	1.451 ²⁰	99 d		v s aq; s alc; sl s eth
diuranate(VI)	$(\text{NH}_4)_2\text{U}_2\text{O}_7$	624.22				v sl s aq, alk; s acids
fluoride	NH_4F	37.04	1.009 ²⁵	d to NH_3 + HF		100 g/100 mL ⁰ aq; s alc
formate	NH_4OOCH	63.06	1.27	116	d 180	143 g/100 mL ²⁰ aq; s alc, eth
heptamolybdate(VI)(6–) 4-water	$(\text{NH}_4)_2\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$	1235.86	2.498	anhyd 90	d 190	43 g/100 mL aq; s acids; i alc
hexachloropalladate(IV)	$(\text{NH}_4)_2[\text{PdCl}_6]$	355.20	2.418	d		sl s aq
hexachloroplatinate(IV)	$(\text{NH}_4)_2[\text{PtCl}_6]$	443.87	3.065	d 380		0.5 aq
hexadecanoate	$\text{NH}_4\text{OOC}(\text{CH}_2)_{14}\text{CH}_3$	273.45		21–22		s aq; sl s bz; i alc, acet
hexafluoroaluminate(3–)	$(\text{NH}_4)_3[\text{AlF}_6]$	195.09	1.78	d > 100		v s aq
hexafluorogallate	$(\text{NH}_4)_3\text{GaF}_6$	237.83	2.10	d 200		
hexafluorogermanate	$(\text{NH}_4)_3\text{GeF}_6$	222.68	2.564	380	subl	s aq; i eth
hexafluorophosphate	$\text{NH}_4[\text{PF}_6]$	163.00	2.180 ¹⁸	d 68		74.8 g/100 mL ²⁰ aq; s alc, acet
hexafluorosilicate	$(\text{NH}_4)_2[\text{SiF}_6]$	178.15	2.011	d		18.6 g/100 mL ²⁰ aq; i alc, acet
hexanitratocerate(IV)	$(\text{NH}_4)_2[\text{Ce}(\text{NO}_3)_6]$	548.22				135 g/100 mL ²⁰ aq; s alc, HNO
hydrogen carbonate	NH_4HCO_3	79.06	1.586	107 (rapid heating)		g/100 mL: 17.4 ²⁰ aq, 10 glyc
hydrogen citrate	$(\text{NH}_4)_2\text{HC}_6\text{H}_5\text{O}_7$	226.19	1.48			100 g/100 mL aq; sl s alc
hydrogen difluoride	NH_4HF_2	57.04	1.51	124.6	240 d	v s aq; sl s alc
hydrogen oxalate hydrate	$\text{NH}_4\text{HC}_2\text{O}_4 \cdot \text{H}_2\text{O}$	125.08	1.556	anhyd, 170		s aq, alc; i bz, eth
hydrogen phosphate	$(\text{NH}_4)_2\text{HPO}_4$	132.06	1.619	d 155		69 g/100 mL ²⁰ aq; i alc, acet
hydrogen sulfate	NH_4HSO_4	115.11	1.78	146.9	d 350	100 g/100 mL aq; i alc, acet
hydrogen sulfide	NH_4HS	51.11	1.17	d 25 to NH_3 + H_2S		128 g/100 mL ⁰ aq; s glyc; i alc, acet
hydrogen sulfite	NH_4HSO_3	99.11	2.03	subl 150 in N_2		267 g/100 mL ¹⁰ aq

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Ammonium acetate (<i>continued</i>)						
hydrogen (±)tartrate	NH ₄ HC ₄ H ₄ O ₆	167.12	1.68	d 200		2.2 ¹⁵ aq; i alc
hydroxide	NH ₄ OH	35.05		− 77		49% dissolved NH ₃
hypophosphite	NH ₄ H ₂ PO ₂	83.03		d		v s aq; sl s alc; i acet
iodate	NH ₄ IO ₃	192.94	3.309	d 150		2.6 ¹⁵ aq
iodide	NH ₄ I	144.94	2.514 ²⁵	subl 551	220 vacuo	167 g/100 mL ²⁰ aq; v s alc, acet
lactate	NH ₄ C ₃ H ₅ O ₃	107.11	1.2 ¹⁵	92		v s aq, alc, glyc; i acet, eth
magnesium arsenate 6-water	NH ₄ MgAsO ₄ · 6H ₂ O	289.36	1.923	d		0.038 ²⁰ aq
molybdate(VI)(2−)	(NH ₄) ₂ MoO ₄	196.04	2.276 ²⁵	d		s acids
nitrate	NH ₄ NO ₃	80.04	1.725 ²⁵	169.6	d 210	g/100 mL: 192 ²⁰ aq; 3.8 ²⁰ alc; 17 ²⁰ MeOH; s acet
octadecanoate	NH ₄ OOC(CH ₂) ₁₆ CH ₃	301.50		21–22		sl s aq; s alc; i acet
octanoate	NH ₄ OOC(CH ₂) ₆ CH ₃	161.24		d on standing		v s aq, alc, acet; sl s eth
oxalate hydrate	(NH ₄) ₂ C ₂ O ₄ · H ₂ O	142.11	1.50	d 70		5.1 ²⁰ aq; s alc
oxodioxalotitanate(IV)	(NH ₄) ₂ TiO(C ₂ O ₄) ₂	276.02				v s aq
perchlorate	NH ₄ ClO ₄	117.49	1.95	d 240		g/100 mL ²⁵ : 21.9 aq, 1.49 EtOH, 0.014 BuOH, 0.029 EtOAc
permanganate	NH ₄ MnO ₄	136.97	2.208 ¹⁰	explodes, 110		0.8 ¹⁵ aq
peroxodisulfate	(NH ₄) ₂ S ₂ O ₈	228.20	1.982	d 120	expl 180	58 g/100 mL ⁰ aq
phosphinate	NH ₄ PH ₂ O ₂	83.04	1.634	200	d 240	g/100 mL: 100 aq, 5 alc; i acet
phosphomolybdate hydrate	(NH ₄) ₃ PO ₄ · 12MoO ₃ · H ₂ O	1894.36		d		sl s aq
picrate	NH ₄ C ₆ H ₂ N ₃ O ₇	246.14	1.719	d	expl 423	1.1 ²⁰ aq; sl s alc
selenate(VI)	(NH ₄) ₂ SeO ₄	179.04	2.193 ²⁴	d		117 g/100 mL ⁷ aq; s HOAC; i alc
stearate	NH ₄ C ₁₈ H ₃₅ O ₂	301.51	0.89	22		sl s aq, bz; s alc; i acet
sulfamate	NH ₄ NH ₂ SO ₃	114.13		131	d 160	v s aq; sl s alc
sulfate	(NH ₄) ₂ SO ₄	132.14	1.769 ²⁰	d > 280		43.5 g/100 mL ²⁰ aq; i alc, acet
sulfide	(NH ₄) ₂ S	68.14		d ≈ 0		v s aq; s alc, alk
sulfite hydrate	(NH ₄) ₂ SO ₃ · H ₂ O	134.16	1.41	d 60		75 g/100 mL ²⁰ aq; i alc, acet
(±)tartrate	(NH ₄) ₂ C ₄ H ₄ O ₆	184.15	1.601	d		58 g/100 mL ¹⁵ aq; sl s alc
tetraborate 4-water	(NH ₄) ₂ B ₄ O ₇ · 4H ₂ O	263.44				s aq; i alc

tetrachloroaluminate	$\text{NH}_4[\text{AlCl}_4]$	186.83		304		s aq, eth
tetrachloropalladate(II)	$(\text{NH}_4)_2[\text{PdCl}_4]$	284.29	2.170	d		v s aq; i abs alc
tetrachloroplatinatate(II)	$(\text{NH}_4)_2[\text{PtCl}_4]$	372.97	2.936	140 d		s aq; i alc
tetrachlorozincate	$(\text{NH}_4)_2[\text{ZnCl}_4]$	243.28	1.879	150 d	subl 341	v s aq
tetrafluoroborate	$\text{NH}_4[\text{BF}_4]$	104.84	1.871	subl		25 g/100 mL ¹⁶ aq
thiocyanate	NH_4SCN	76.12	1.305	149.6	d 170	128 g/100 mL ⁰ aq; v s alc; s acet
thiosulfate	$(\text{NH}_4)_2\text{S}_2\text{O}_3$	148.21	1.679	d 150		2.15 ¹⁵ aq; i alc, eth
vanadate(V)(1-)	NH_4VO_3	116.98	2.326	d 200		0.48 ²⁰ aq
Antimony	Sb	121.760(1)	6.697 ²⁵	630.7	1587	s hot conc H_2SO_4 , aqua regia
arsenide	SbAs	196.68	6.0	≈680		
(III) bromide	SbBr_3	361.47	4.35	96.6	280	s acet, bz, chl
(III) chloride	SbCl_3	228.12	3.14 ³⁰	73.4	220.3	10 g/100 mL ²⁰ aq; s alc, bz, chl
(V) chloride	SbCl_5	299.02	2.336 ²⁰	3.5	79 ^{22mm}	d aq; s HCl, chl, CCl_4
(III) fluoride	SbF_3	178.75	4.379 ²⁰	292	376	444 g/100 mL ²⁰ aq
(V) fluoride	SbF_5	216.75	2.99 ²³	8.3	141	d viol aq; s HOAc; forms solids with alc, bz, CS_2 , eth
hydride (stibine)	SbH_3	124.78	5.475 g/L	-91.5	-18.4	20 mL/100 mL ²⁰ aq; s CS_2 , alc
(III) iodide	SbI_3	502.47	4.92	168	401	g/100 g ²⁵ : 1.16 bz, 1.24 tol, 0.16 chl
(III) oxide (valentinite)	Sb_2O_3	291.52	5.7	655	1425	v sl s aq; s HCl, KOH
(V) oxide	Sb_2O_5	323.52	3.78	-O ₂ , >300		v sl s aq; sl s warm KOH, eth
(III) selenide	Sb_2Se_3	480.40	5.81	612		v sl s aq; s conc HCl
(III) sulfate	$\text{Sb}_2(\text{SO}_4)_3$	531.71	3.62	d		sl s aq
(III) sulfide	Sb_2S_3	339.72	4.56	546		0.002 ²⁰ aq (d); s H_2SO_4
(V) sulfide	Sb_2S_5	403.85	4.120	75 d		i aq; s HCl (d), NaOH
(III) telluride	Sb_2Te_3	626.32	6.52	620		i aq; s HNO_3
triethyl	$\text{Sb}(\text{C}_2\text{H}_5)_3$	209.0	1.324 ¹⁴	-29	159.5	i aq
trimethyl	$\text{Sb}(\text{CH}_3)_3$	166.9	1.523 ¹⁵		80.6	sl s aq
Argon	Ar	39.948(1)	1.7824 g/L ⁰	-189.38	-185.87	3.36 mL/100 mL ²⁰ aq
Arsenic	As	74.92159(2)	5.727 ²⁵ ₄	817	subl 615	i aq; s HNO_3
(III) bromide	AsBr_3	314.63	3.3972 ²⁵ ₄	31.1	220.0	hyd aq; s HCl, CS_2 , PE
(III) chloride	AsCl_3	181.28	2.1497 ²⁵ ₄	-16.2	130.2	misc chl, CCl_4 , eth; s HCl
(di-) disulfide	As_2S_2	213.97	3.254 ¹⁹	320	565	s alkali; v sl s bz
(III) fluoride	AsF_3	131.92	2.73 ¹⁵ ₃	-5.95	57.8	s alc, bz, eth, HF
(V) fluoride	AsF_5	169.91	7.46 g/L	-79.8	-52.8	hyd aq; s alc, bz, eth
(III) hydride (arsine)	AsH_3	77.95	3.420 g/L	-116.9	-62.5	28 mL/100 mL ²⁰ aq; s bz, chl
(III) iodide	AsI_3	455.63	4.73	140.9	424	s bz, tol; sl s aq, alc, eth
(III) oxide (arsenolite)	As_2O_3	197.84	3.86	274	460	1.8 ²⁰ aq; s alc

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
<i>Arsenic (continued)</i>						
(III) oxide (claudetite)	As ₂ O ₃	197.84	3.74	313	460	sl s aq; s dil acid, alk
(V) oxide	As ₂ O ₅	229.84	4.32	315	d 800	66 g/100 mL ²⁰ aq; s alc
(III) selenide	As ₂ Se ₃	386.72	4.75	260		s alkali, HNO ₃
(III) sulfide	As ₂ S ₃	246.04	3.460	310	707	i aq; s alk, slowly s hot HCl
(V) sulfide	As ₂ S ₅	310.17		subl 500		0.0003 aq; s alkali, HNO ₃
(III) telluride	As ₂ Te ₃	532.64	6.50	621		
Astatine	At	210		302		
Barium	Ba	137.33	3.51 ²⁰	726.9	1845	d aq to Ba(OH)
acetate hydrate	Ba(C ₂ H ₃ O ₂) ₂ · H ₂ O	273.43	2.19	anhyd 110	d 150	58.8 g/100 mL ⁰ aq; 0.014 alc
benzenesulfonate	Ba(O ₃ SC ₆ H ₅) ₂	451.70				s aq; sl s alc
bromate hydrate	Ba(BrO ₃) ₂ · H ₂ O	411.14	3.99 ¹⁸	d 260		0.96 ³⁰ aq; s acet; i alc
bromide	BaBr ₂	297.14	4.781	856	1835	92 g/100 mL ⁰ aq; s MeOH, acet
carbonate	BaCO ₃	197.34	4.2865	d 1300 to BaO + CO ₂		0.0024 aq; s acids
chlorate hydrate	Ba(ClO ₃) ₂ · H ₂ O	322.24	3.179	anhyd 120	- O ₂ , 250	34 g/100 mL ²⁰ aq; sl s alc, acet
chloride	BaCl ₂	208.24	3.856 ²⁴	962	1560	36 g/100 mL ²⁰ aq; s MeOH; i acet, EtAc
chloride dihydrate	BaCl ₂ · 2H ₂ O	244.26	3.097	anhyd 113		31.7 g/100 mL ⁰ aq
chromate(VI)	BaCrO ₄	253.33	4.498 ²⁰	d		0.001 ²⁰ aq; s mineral acids
cyanide	Ba(CN) ₂	189.36				80 g/100 mL ¹⁴ aq; s alc
fluoride	BaF ₂	175.32	4.89	1368	2260	0.161 ²⁰ aq; s acids
hexafluorosilicate	Ba[SiF ₆]	279.40	4.29 ₄ ¹	d 300		0.0235 ²⁵ aq; s NH ₄ Cl soln; i alc
hydrogen phosphate	BaHPO ₄	233.31	4.165 ¹⁵	d 410		0.01 aq; s HCl, HNO ₃
hydroxide 8-water	Ba(OH) ₂ · 8H ₂ O	315.48	2.18 ¹⁶	78		3.9 ²⁰ aq
iodate	Ba(IO ₃) ₂	487.13	5.23 ²⁰	d 476		0.033 ²⁰ aq; s HCl
iodide	BaI ₂	391.14	5.15	711	2027	169 g/100 mL ²⁰ aq; s alc, acet
manganate(VI)(2-)	BaMnO ₄	256.26	4.85			disprop to Ba(MnO ₄) ₂ + MnO ₂
molybdate	BaMoO ₄	297.27	4.975	1450		0.0058 ²⁵ aq
niobate	Ba(NbO ₃) ₂	419.14	5.44	1455		i aq
nitrate	Ba(NO ₃) ₂	261.34	3.24 ²³	592	d	5.0 aq; v sl s alc, acet
nitrite hydrate	Ba(NO ₂) ₂ · H ₂ O	247.35	3.173 ³⁰	d 115		54.8 g/100 mL ⁰ aq; i alc

oxalate	BaC ₂ O ₄	225.35	2.658	400 d		i aq
oxide	BaO	153.33	5.72	1973	3088	3.5 ²⁰ aq; s acids, EtOH
perchlorate	Ba(ClO ₄) ₂	336.23	3.20	505		g/100 mL ²⁵ ; 129 aq, 78 EtOH, 42 BuOH, 81 EtOAc; i eth
perchlorate 3-water	Ba(ClO ₄) ₂ · 3H ₂ O	390.27	2.74	d 400		198 g/100 mL ²⁵ aq; s MeOH; sl s acet
permanganate	Ba(MnO ₄) ₂	375.20	3.77	d 200		v s aq
peroxide	BaO ₂	169.33	4.96	450 d	– O ₂ , 800	1.5 ⁰ aq
selenide	BaSe	216.29	5.02	1780		d aq
stearate	Ba(C ₁₈ H ₃₅ O ₂) ₂	704.28	1.145	160		i aq
sulfate	BaSO ₄	233.39	4.50 ¹⁵	1580	d > 1600	0.00285 aq
sulfide	BaS	169.39	4.25 ¹⁵	2230		7.9 ²⁰ aq; dec in acids
sulfite	BaSO ₃	217.39	4.44	d		0.02 ⁰ aq; i alc
tetracyanoplatinate(II)-4-water	Ba[Pt(CN) ₄] · 4H ₂ O	508.54	2.076			2.86 aq; i alc
thiocyanate 2-water	Ba(SCN) ₂ · 2H ₂ O	289.53	2.286 ¹⁸	d 160		170 g/100 mL ²⁰ aq; s alc, acet
thiosulfate hydrate	BaS ₂ O ₃ · H ₂ O	267.47	3.5 ¹⁸	d 220		0.21 ²⁰ aq; i alc, acet, eth, CS
titanate(IV)(2–)	BaTiO ₃	233.19	6.02	1625		i aq
vanadate	Ba ₃ (VO ₄) ₂	641.86	5.14	707		
zirconate	BaZrO ₃	276.55	5.52	2500		i aq, alk; sl s acids
Berkelium (α form)	Bk	247	14.78	1050		
(β form)	Bk	247	13.25	986		
Beryllium	Be	9.012	1.8477 ²⁰	1287	2467	i aq; s acid, alk
bromide	BeBr ₂	168.82	3.465 ²⁵	508	521	v s aq; s alc; 18.6 pyr
carbide	Be ₂ C	30.04	1.90 ¹⁵	d > 2127		d aq; s acids, alkali giving CH ₄
chloride	BeCl ₂	79.92	1.899 ²⁵	415 (alpha)	482.3	42 g/100 mL aq; s alc, eth, pyr, CS ₂
fluoride	BeF ₂	47.01	1.986	555	subl 1036 ^{1mm}	v s aq (slowly)
hydride	BeH ₂	11.03	0.65	– H ₂ , 220		d aq (slowly), acids (rapidly)
hydroxide	Be(OH) ₂	43.03	1.909	93		s hot conc acids and alkali (viol)
iodide	BeI ₂	262.82	4.32	480	487	hyd aq violently; s alc, eth, CS ₂
nitrate 3-water	Be(NO ₃) ₂ · 3H ₂ O	187.07	1.557	60.5	d 125	166 g/100 mL ²⁰ aq
nitride	Be ₃ N ₂	55.05	2.71	2200		d hot aq, alkali
oxide	BeO	25.01	3.025	2578 (alpha)	3787	s conc H ₂ SO ₄
selenate 4-water	BeSeO ₄ · 4H ₂ O	224.03	2.03	anhyd 300	d 560	49 g/100 mL ²⁵ aq
silicate	Be ₂ SiO ₄	110.11	3.0	1560		i aq
sulfate 4-water	BeSO ₄ · 4H ₂ O	177.14	1.713	anhyd 270	d 580	39 g/100 mL ²⁰ aq; i alc
sulfide	BeS	41.08	2.36	d		i aq; s HNO ₃

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Bismuth	Bi	208.9804	9.78	271.5	1564	i aq; s hot H ₂ SO ₄
(III) bromide	BiBr ₃	448.69	5.72	218	453	d aq; s dil acids, acet
bromide oxide	BiBrO	304.88	8.08 ²¹⁵	d		i aq; s acids
(III) chloride	BiCl ₃	315.34	4.75	233.5	447	d aq; s HCl, alc, eth, acet
chloride oxide	BiClO	260.43	7.72 ¹⁵	d		i aq; s HCl
(III) fluoride	BiF ₃	265.98	8.32	727	900	i aq; s HF
(V) fluoride	BiF ₅	303.97	5.55 ²⁵	154.4	subl 550	d (viol) aq giving O ₃ + BiF ₃
hydride	BiH ₃	212.00	9.303 g/L	-67	16.8	very unstable liquid
(III) hydroxide	Bi(OH) ₃	260.00	4.962 ¹⁵	- water, 100		d aq; s HCl
(III) iodide	BiI ₃	589.69	5.778 ²⁰	408.6	subl 439	i aq; s HCl, alc
iodide oxide	BiIO	351.88	7.922	d red heat		i aq; s HCl
(III) nitrate 5-water	Bi(NO ₃) ₃ · 5H ₂ O	485.07	2.83	anhyd 80		d aq; s HNO ₃ , acet, glycol
(III) oxide	Bi ₂ O ₃	465.96	8.76	817	1890	i aq; s HCl, HNO ₃
(V) oxide	Bi ₂ O ₅	497.96	5.10	d 150		i aq; s KOH
(III) phosphate	BiPO ₄	303.95	6.323 ¹⁵	d		s conc HCl, HNO ₃
(III) selenide	Bi ₂ Se ₃	654.84	7.70 ²⁰	710 d	d	i aq; d aq reg
(III) sulfate	Bi ₂ (SO ₄) ₃	706.14	5.08	d 405		d aq, alc; s HCl
(III) sulfide	Bi ₂ S ₃	514.16	6.78	850		i aq, EtAc; s HNO ₃ , HCl
(III) telluride	Bi ₂ Te ₃	800.76	7.74	588.5		i aq; s alc
Boranes						
diborane(6)	B ₂ H ₆	27.67	1.214 g/L	-165.5	-92.5	FP -68; s NH ₄ OH, conc H ₂ SO ₄
tetraborane(10)	B ₄ H ₁₀	53.32	2.340 g/L	-120	18	sl s aq; s bz
pentaborane(9)	B ₅ H ₉	63.13	0.60	-46.81	60.0	hyd aq
pentaborane(11)	B ₅ H ₁₁	65.14	0.745	-123	63	d aq
hexaborane(10)	B ₆ H ₁₀	74.95	0.67	-62.3	108 d	d hot aq
decaborane(14)	B ₁₀ H ₁₄	122.22	0.948	99.5	213	sl s aq; s bz, CS ₂ , eth
Borazine	B ₃ H ₆ N ₃	80.50	lq; 0.81 ^{pp}	-58	55	sl s aq (d)
Boric acids, <i>see</i> under Hydrogen						
Boron	B	10.811	2.34	2076	3864	i aq
carbide	B ₄ C	55.25	2.510 ²⁵	2350	>3500	s fused alkalis
tribromide	BBr ₃	250.52	2.6	-46.0	91.3	d aq, alc

trichloride	BCl_3	117.17	5.141 g/L	-107	12.7	d aq, alc
trifluoride	BF_3	67.81	3.077 g/L ^{STP}	-127.1	-100.4	332 g/100 mL ⁰ aq; s bz, chl, CCl_4
trifluoride 1-diethyl ether	$\text{BF}_3 \cdot \text{O}(\text{C}_2\text{H}_5)_2$	141.94	1.125	-60.4	125.7	d aq
trifluoride 1-methanol	$\text{BF}_3 \cdot \text{HOCH}_3$	131.89	1.203		59 ^{4mm}	
nitride	BN	24.82	2.18	2967		sl s hot acids
oxide	B_2O_3	69.62	2.55	450.0	2065	3.3 aq (slowly); s alc, glyc
Bromine	Br_2	159.808	3.1023 ²⁵	-7.25	58.8	3.4 g/100 mL ²⁰ aq; v s alc, chl, eth
pentafluoride	BF_5	174.90	2.460	-60.5	40.76	explodes with water; s HF
trifluoride	BF_3	136.90	2.803 ²⁵	8.77	125.74	d viol aq; d alk; smokes in air
Cadmium	Cd	112.411	8.65 ²⁵	321	765	i aq, alk; s HNO_3 , hot HCl
acetate	$\text{Cd}(\text{C}_2\text{H}_3\text{O}_2)_2$	230.50	2.341	255	d	v s aq; s alc
bromide	CdBr_2	272.22	5.192	566	963	99 g/100 mL ²⁰ aq; s acet; sl s eth
carbonate	CdCO_3	172.42	4.258 ⁴	d 500		s acids, NH_4OH
chloride	CdCl_2	183.32	4.05 ²⁵	568	960	120 g/100 mL ²⁵ aq
cyanide	$\text{Cd}(\text{CN})_2$	164.44	2.226	d 200		1.71 g/100 mL ¹⁵ aq; sl s alc
fluoride	CdF_2	150.41	6.33	1110	1748	4.3 g/100 mL ²⁵ aq
hydroxide	$\text{Cd}(\text{OH})_2$	146.43	4.79	- H_2O , 130	CaO , 200	0.00026 ²⁰ aq; s acids
iodide	CdI_2	366.22	5.670	388	742	84.7 g/100 mL ²⁰ aq; s alc, acet, eth
nitrate 4-water	$\text{Cd}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$	308.48	2.455	59.4		167 g/100 mL ²⁵ aq; s alc, acet
oxide	CdO	128.41	8.15 cubic	1540		i aq; s acids
phosphide	Cd_3P_2	399.18	5.96	700		s dil acid
selenide	CdSe	191.37	5.81 ¹⁵	1350		i aq; d acids
sulfate-water (3/8)	$3\text{CdSO}_4 \cdot 8\text{H}_2\text{O}$	769.56	3.08	monohydrate, 80		94.4 g/100 mL ²⁵ aq; i alc, EtAc
sulfide	CdS	144.48	4.83	1750		0.13 ¹⁸ aq; s acids
telluride	CdTe	240.01	6.20 ¹⁵	1041		i aq; d HNO_3
tungstate(VI)	CdWO_4	360.25	8.0			i aq, dil acids; s alkali CN's
Calcium	Ca	40.078(4)	1.55	842	1484	d aq; s acids
acetate	$\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$	158.17	1.50	d > 160		37.4 g/100 mL ⁰ aq; i alc, bz, acet
arsenate	$\text{Ca}_3(\text{AsO}_4)_2$	398.07	3.620			0.013 ²⁵ aq
bromide	CaBr_2	199.89	3.38	742	1815	143 g/100 mL ²⁰ aq; v s alc, acet
carbide	CaC_2	64.10	2.222	2300		reacts with aq giving C_2H_2
carbonate (aragonite)	CaCO_3	100.09	2.83	d 825 to CaO		s dil acids
carbonate (calcite)	CaCO_3	100.09	2.711	d 825 to CaO		0.0013 g/100 mL ²⁰ ; s acids
chlorate 2-water	$\text{Ca}(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$	243.01	2.711	anhyd 100		167 g/100 mL ²⁰ aq; s alc
chloride	CaCl_2	110.98	2.163 ²⁵	775	ca. 1940	42 g/100 mL ²⁰ aq; s alc, acet
chloride 6-water	$\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$	219.07	1.71	anhyd 200		74.5 g/100 mL ²⁰ aq; v s alc
chlorite	$\text{Ca}(\text{ClO}_2)_2$	174.99	2.71 ²⁵	100		167 g/100 mL aq; s alc

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Calcium (<i>continued</i>)						
chromate(VI) 2-water	CaCrO ₄ · 2H ₂ O	192.10	2.50	anhyd 200		sl s aq; s dil acids
citrate 4-water	CaC ₆ H ₆ O ₇ · 4H ₂ O	570.51		anhyd 120		0.10 aq; i alc
cyanamide	CaCN ₂	80.10	2.29	ca. 1340	subl	no known solv without dec
cyanide	Ca(CN) ₂	92.11		s > 350		s aq
dichromate(VI)	CaCr ₂ O ₇	256.10	2.370 ³⁰	d > 100		v s aq; i eth; d alc
dihydrogen phosphate hydrate	Ca(H ₂ PO ₄) ₂ · H ₂ O	252.07	2.220 ¹⁸	anhyd 100	d 200	1.8 ³⁰ aq
diphosphate (pyrophosphate)	Ca ₂ P ₂ O ₇	254.10	3.09	1353		i aq; s HCl, HNO ₃
fluoride	CaF ₂	78.08	3.180	1418	2533	0.0015 ²⁰ aq; s conc mineral acids
formate	Ca(CHO ₂) ₂	130.11	2.015	300 d		16.6 g/100 mL ²⁰ aq; i alc
(+)gluconate	Ca[OOC(CHOH) ₂ CH ₂ OH] ₂	430.38				3.72 ²⁰ aq
glycerophosphate	Ca[C ₃ H ₂ (OH) ₃]PO ₄	210.16		d > 170		1.66 ²⁰ aq; i alc
hexafluorosilicate	Ca[SiF ₆]	182.17	2.662			i aq, acet
hydride	CaH ₂	42.09	1.70	1000		d aq, alc
hydroxide	Ca(OH) ₂	74.09	2.343	– H ₂ O, 580		0.17 ¹⁰ aq; s acids
hypochlorite	Ca(OCl) ₂	142.99	2.35	100 d		d aq evolving Cl ₂ ; i alc
iodate	Ca(IO ₃) ₂	389.88	4.519 ¹⁵	d > 540		0.10 ⁰ aq; i alc
iodide	CaI ₂	293.89	3.956	783	1755	68 g/100 mL ²⁰ aq; v s alc, acet; i eth
lactate 5-water	Ca(C ₃ H ₂ O ₃) ₂ · 5H ₂ O	308.30		– 3H ₂ O, 100	anhyd 120	5.4 ¹⁵ aq; v sl s alc
magnesium carbonate	Ca[Mg(CO ₃) ₂]	184.41	2.872	d 730		0.032 ¹⁸ aq; s HCl
molybdate(VI)(2–)	CaMoO ₄	200.02	4.35			s conc mineral acids
nitrate	Ca(NO ₃) ₂	164.09	2.504	56l		152 g/100 mL ³⁰ aq
nitride	Ca ₃ N ₂	148.25	2.67	1195		d aq; s dilute acids (d)
nitrite 4-water	Ca(NO ₂) ₂ · 4H ₂ O	204.15	1.674	d		84.5 g/100 mL ¹⁸ aq; sl s alc
oleate	Ca(C ₁₈ H ₃₃ O ₂) ₂	603.01		83–84	d > 400	0.04 aq; s chl, bz; v sl s alc, eth
oxalate hydrate	CaC ₂ O ₄ · H ₂ O	146.11	2.2	anhyd 200		0.0006 aq; s acids
oxide	CaO	56.08	3.34	2900	3500	0.13 ²⁵ aq; s acids
palmitate	Ca(C ₁₆ H ₃₁ O ₂) ₂	550.93		d > 155		0.003 aq; sl s bz, chl, HOAc
(+)panthothenate (vitamin B ₃)	Ca[O ₂ CH ₂ CH ₂ NHO-CH(OH)(CH ₃) ₂ CH ₂ OH] ₂	476.55		d 195–196		36 g/100 mL aq; sl s alc, acet

perchlorate	$\text{Ca}(\text{ClO}_4)_2$	238.98	2.65	d 270		g/100 mL ²⁵ : 112 aq, 89.5 EtOH, 68 BuOH, 57 EtOAc, 43 acet
permanganate 5-water	$\text{Ca}(\text{MnO}_4)_2 \cdot 5\text{H}_2\text{O}$	368.03	2.4	d		338 g/100 mL aq
peroxide	CaO_2	72.08	2.92	explodes 275		sl s aq; s acids
phenoxide	$\text{Ca}(\text{OC}_6\text{H}_5)_2$	226.28	d in air			sl s aq, alc
phosphate	$\text{Ca}_3(\text{PO}_4)_2$	310.18	3.14	1670		0.03 ²⁵ aq; s HCl, HNO ₃ ; i alc
phosphide	Ca_3P_2	182.18	2.51	ca. 1600		d aq; s acids; i alc, eth
phosphinate	$\text{Ca}(\text{PH}_2\text{O}_2)_2$	170.06		d > 300		15.4 g/100 mL aq; sl s glyc
propanoate	$\text{Ca}(\text{OOCCH}_2\text{CH}_3)_2$	186.22				s aq; sl s alc; i acet, bz
salicylate 2-water	$\text{Ca}(\text{C}_7\text{H}_5\text{O}_3)_2 \cdot 2\text{H}_2\text{O}$	350.34		anhyd 200	d 240	2.8 ¹⁵ aq; 0.015 ¹⁶ EtOH
selenate 2-water	$\text{CaSeO}_4 \cdot 2\text{H}_2\text{O}$	219.07	2.75	anhyd 200	d 698	9.2 g/100 mL ²⁵ aq
selenide	CaSe	119.04	3.82			
silicate	Ca_2SiO_4	172.24	3.27	2130		i aq
stearate	$\text{Ca}(\text{C}_{18}\text{H}_{35}\text{O}_2)_2$	607.04		179–180		0.004 ¹⁵ aq; s hot pyr; i acet, chl
succinate 3-water	$\text{CaC}_4\text{H}_6\text{O}_4 \cdot 3\text{H}_2\text{O}$	212.22				1.28 ²⁰ aq; s acids; i alc
sulfate	CaSO_4	136.14	2.960	1460		0.20 aq; s acids
sulfate hemihydrate	$\text{CaSO}_4 \cdot 0.5\text{H}_2\text{O}$	145.15		anhyd 163		0.3 ²⁰ aq; s acids, glyc
sulfate 2-water	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$	172.17	2.32	– 1.5 H ₂ O, 128	anhyd 163	0.26 ²⁰ aq; s acid, glyc
sulfide	CaS	72.14	2.59	2525		0.02 (d) aq; d acids
sulfite 2-water	$\text{CaSO}_3 \cdot 2\text{H}_2\text{O}$	156.17		anhyd 100		0.004 aq; s acids d; sl s alc
(±)tartarate 4-water	$\text{CaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$	260.21		anhyd 200		0.0045 ²⁵ aq; s acids; sl s alc
telluride	CaTe	167.68	4.873			
tetraborate	CaB_4O_7	195.36				s dil acids
tetrahydroaluminat	$\text{Ca}[\text{AlH}_4]_2$	102.10		ign moist air		d viol aq, alc; i bz, eth
thiocyanate 3-water	$\text{Ca}(\text{SCN})_2 \cdot 3\text{H}_2\text{O}$	210.29		d > 160		150 g/100 mL aq; v s alc
thioglycollate 3-water	$\text{Ca}(-\text{OOCCH}_2\text{S}-) \cdot 3\text{H}_2\text{O}$	184.24		– H ₂ O, > 95	d > 220	s aq; v sl s alc, chl; i bz, eth
thiosulfate 6-water	$\text{CaS}_2\text{O}_3 \cdot 6\text{H}_2\text{O}$	260.30	1.872	d > 45		92 g/100 mL ²⁵ aq; i alc
titanate	CaTiO_3	135.84	3.98	1980		
tungstate(VI)(2–)	CaWO_4	287.93	6.062 ²⁰			0.0032 aq; d hot acids
Californium-252	Cf	252.1		900		
chloride	CfCl_3	358.5	5.88			
Carbon (diamond)	C	12.011	3.513	3500 ^{63.5atm}	3930	i aq, alc
(graphite)	C		2.267	subl 3915–4020		
dioxide	CO_2	44.01	c: 1.56 ⁻⁷⁹ g: 1.975 g/L ⁰	– 78.44 subl		88 mL/100 mL ²⁰ aq
diselenide	CSe_2	169.93	2.6626 ²⁵	– 45.5	125.1	i aq; s acet, eth; misc CCl ₄ ; d alc
disulfide	CS_2	76.14	1.2555	– 111.6	46.56	FP – 30; 0.29 ²⁰ aq; s alc, eth

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Carbon (<i>continued</i>)						
hydride (methane)	CH ₄	16.04	0.415 ⁻¹⁶⁴	-182.48	-161.49	s bz
monoxide	CO	28.01	lq: 0.814 ⁻¹⁹⁵ g: 1.250 g/L ⁰	-205.05	-191.49	2.3 mL/100 mL ²⁰ aq; 16 mL/100 ml alc; s HOAc, EtAc
suboxide	C ₃ O ₂	68.03	1.114 ₄ ⁰ 2.985 g/L	-111.3	6.8	d aq to malonic acid; sl s CS ₂
tetrabromide	CBr ₄	331.65	3.42	90.1	190	i aq; s alc, chl, eth
tetrachloride	CCl ₄	153.82	1.589 ₂₃ ²³	-22.9	76.7	0.05 mL/100 mL aq; s alc, chl, eth
tetrafluoride	CF ₄	88.00	1.96 ⁻¹⁸⁴	-183.6	-127.8	sl s aq
tetraiodide	CI ₄	519.63	4.34 ₃ ²⁰	171	subl 130	slowly hyd aq; s bz, chl, eth
Carbonyl bromide	COBr ₂	187.82	2.5		64.5	hyd aq
chloride	COCl ₂	98.92	4.340 g/L	-127.9	8.2	hyd aq; s bz, HOAc
fluoride	COF ₂	66.01	lq: 1.139 g: 2.896 g/L	-114.0	-83.1	hyd aq
sulfide	COS	60.07	2.636 g/L	-138.81	-50.23	54 mL/100 mL ²⁰ aq; s alc, CS ₂
Cerium	Ce	140.11	6.773	795	3440	i aq; s acids
(III) bromide	CeBr ₃	379.83	5.18	733	1460	s aq, alc
(III) chloride	CeCl ₃	246.47	3.97 ²⁵	817	1730	s aq, alc
(III) fluoride	CeF ₃	197.11	6.157	1430	2327	i but slowly hyd aq; s H ₂ SO ₄
(IV) fluoride	CeF ₄	216.11	4.77	d > 550		i aq
(III) iodide	CeI ₃	520.83		766	1400	s aq
(III) nitrate 3-water	Ce(NO ₃) ₃ · 3H ₂ O	380.17		anhyd 150	d 200	234 g/100 mL ²⁰ aq
(IV) oxide	CeO ₂	172.11	7.65	2400		i aq; s acids
(III) sulfate	Ce ₂ (SO ₄) ₃	568.42	3.912	d 1000		9.72 g/100 mL ²¹ aq
(IV) sulfate	Ce(SO ₄) ₂	332.24	3.91	d 195		hyd aq; s dil H ₂ SO ₄
Cesium	Cs	132.9054	1.8785 ¹⁵	28.44	668.2	d aq; s acids
bromide	CsBr	212.81	4.44	636	≈1300	107 g/100 mL ¹⁸ aq; s alc; i acet
carbonate	Cs ₂ CO ₃	325.82	4.24	792		v s aq; 11 g/100 mL ²⁰ alc; s eth
chloride	CsCl	168.36	3.99	646	1300	g/100 mL: 187 ²⁰ aq; 34 ²⁵ MeOH; v s alc
fluoride	CsF	151.90	4.115	703	1231	322 g/100 mL ¹⁸ aq
hydroxide	CsOH	149.91	3.68	272	990	386 g/100 mL ¹⁵ aq; s alc

iodate	CsIO ₃	307.81	4.934 ²⁰	565		2.6 ²⁵ aq
iodide	CsI	259.81	4.510	621	≈1280	76.5 g/100 mL ²⁰ aq; s EtOH; i acet
nitrate	CsNO ₃	194.91	3.66	414	d 849	23 g/100 mL ²⁰ aq; s acet; v sl s alc
oxide	Cs ₂ O	281.81	4.65	490		v s aq
perchlorate	CsClO ₄	232.36	3.327	250		g/100 mL ²⁵ : 1.96, 0.0086 EtOH, 0.118 acet, 0.0048 BuOH; i EtOAc, eth
selenate	Cs ₂ SeO ₄	408.77	4.453			244 g/100 mL ¹² aq
sulfate	Cs ₂ SO ₄	361.87	4.243	1005		179 g/100 mL ²⁰ aq; i alc, acet, pyr
Chlorine	Cl ₂	70.905	g: 2.98 ²⁰ g/L lq: 1.5649 ⁻³⁵	-101.5	-34.04	199 mL/100 mL ²⁵ aq
dioxide	ClO ₂	67.45	2.960 g/L	-59.6	10.9	11.2 g/100 mL ¹⁰ aq
fluoride	ClF	54.45	4.057 g/L	-155.6	-100.1	d viol aq; organics burst into flame
heptoxide	Cl ₂ O ₇	182.90	1.805 ²⁵	-91.5	82	hyd aq slowly; explodes on concussion or on contact with flame or I ₂
monoxide	Cl ₂ O	86.90	3.813 g/L	-120.6	2.2	v s aq (forms HClO); s CCl ₄
pentafluoride	ClF ₅	130.44	5.724 g/L	-103	-13.1	
trifluoride	ClF ₃	92.45	g: 4.057 g/L lq: 1.825 ²⁰ g/L	-76.3	11.75	hyd viol aq; organic matter and glass wool burst into flame
trioxide (dimer)	(ClO ₃) ₂	166.90	1.92 ²⁰	3.5	≈200	reacts with aq
Chromium	Cr	51.996	7.15	1907	2679	s dil HCl
(II) acetate	Cr(C ₂ H ₃ O ₂) ₂	170.09	1.79			sl s aq, alc; s a; i eth
(III) acetate	Cr(C ₂ H ₃ O ₂) ₃	229.13				s aq
(II) bromide	CrBr ₂	211.80	4.236	842		s aq, alc
(III) bromide	CrBr ₃	291.71	4.68			s hot aq; v s alc
(II) chloride	CrCl ₂	122.90	2.88 ²⁵	814	subl 1300	v s aq
(III) chloride	CrCl ₃	158.35	2.87	1152	d >1300	s aq, alc (slow); i acet
(II) fluoride	CrF ₂	89.99	3.79	894		sl s aq; s hot HCl
(III) fluoride	CrF ₃	108.99	3.8	1400		aq, alc; s HF, HCl
(III) formate 6-water	Cr(CHO ₂) ₃ · 6H ₂ O	295.15		d >300		s aq
hexacarbonyl	Cr(CO) ₆	220.06	1.77	d 130	explodes 210	i aq, alc; s eth, chl
(III) hydroxide	Cr(OH) ₃	101.02		d		i aq; s acids
(III) nitrate 9-water	Cr(NO ₃) ₃ · 9H ₂ O	400.15	1.80	66	d >100	208 g/100 mL ¹⁵ aq; s alc
(III) oxide	Cr ₂ O ₃	151.99	5.21	2330	≈3000	i aq, alc; sl s acids, alkalis
(IV) oxide	CrO ₂	84.00	4.89	197	-O ₂ , 250	i aq; s HNO ₃
(VI) oxide	CrO ₃	99.99	2.70 ²⁵	198	d 250	61.7 g/100 mL aq; may ign organics

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Chromium (<i>continued</i>)						
(III) phosphate	CrPO ₄	146.97	4.6	>1800		i aq, acids, aq reg
potassium bisulfate 12-water	CrK(SO ₄) ₂ · 12H ₂ O	499.41	1.826 ²⁵	89	anhyd 400	22 g/100 mL ²⁵ aq; i alc
(II) sulfate 7-water	CrSO ₄ · 7H ₂ O	274.17				22.9 g/100 mL ⁰ aq; sl s alc
(III) sulfate 18-water	Cr ₂ (SO ₄) ₃ · 18H ₂ O	716.45	1.7	d 100		220 g/100 mL ²⁰ aq
Chromyl chloride	CrO ₂ Cl ₂	154.90	1.9145 ²⁵	-96.5	117	d aq; s bz, chl, eth, CCl ₄
fluoride	CrO ₂ F ₂	121.99		31.6 ^{885mm}	subl 29.6	
Cobalt						
	Co	58.9332	8.90	1494	2927	i aq; s dil HNO ₃
(II) acetate 4-water	Co(C ₂ H ₃ O ₂) ₂ · 4H ₂ O	249.08	1.705 ¹⁹	anhyd 140		s aq; 2.1 g/100 mL ¹⁵ MeOH
(III) acetate	Co(C ₂ H ₃ O ₂) ₃	236.07		d > 100		s aq, HOAc, alc
(II) bromide	CoBr ₂	218.74	4.909 ²⁵	678 (in N ₂)		112 g/100 mL ²⁰ aq; s alc, acet
(II) carbonate	CoCO ₃	118.94	4.13	d		0.18 ¹⁵ aq; s hot acids
(II) chloride	CoCl ₂	129.84	3.367 ²⁵	735	1049	53 g/100 mL ²⁰ aq; s alc, acet, eth, glyc, pyr
(II) chloride 6-water	CoCl ₂ · 6H ₂ O	237.93	1.924	anhyd 110		97 g/100 mL ²⁰ aq
(II) chromate	CoCrO ₄	174.93	≈4.0	d		i aq; s acids
(II) cyanide	Co(CN) ₂	110.97	1.872 ²⁵	d 300		0.0042 ¹⁸ aq; s KCN
(II) fluoride	CoF ₃	96.93	4.46	1127	≈1400	1.36 ²⁰ aq; s warm mineral acids
(III) fluoride	CoF ₂	115.93	3.88	926		d aq
(II) formate 2-water	Co(CHO ₂) ₂ · 2H ₂ O	185.00	2.129 ²²	anhyd 140	d 175	5.03 g/100 mL ³⁰ aq; i alc
(II) hydroxide	Co(OH) ₂	92.95	3.37	168 (vacuo)		0.00018 aq; v s acids
(III) hydroxide	Co(OH) ₃	109.96	4.46	-H ₂ O, 100	d	0.00032 aq; s acids
(II) iodide (alpha, black)	CoI ₂	312.74	5.584 ²⁵	515 (vacuo)	570 (vacuo)	203 aq
(II) nitrate 6-water	Co(NO ₃) ₃ · 6H ₂ O	291.03	1.88	55	d > 74	155 g/100 mL ³⁰ aq; v s alc
(II) oxalate	CoC ₂ O ₄	146.95	3.021	d 250		0.002 ¹⁸ aq
(II) oxide	CoO	74.93	6.44	-s1935		i aq; s acids, alkalis
(II,III) oxide	Co ₃ O ₄	240.80	6.07	d > 900		i aq; s acids, alkalis
(II) phosphate 8-water	Co ₃ (PO ₄) ₂ · 8H ₂ O	510.87	2.769	anhyd 200		v sl s aq; s mineral acids
(II) sulfate 7-water	CoSO ₄ · 7H ₂ O	281.10	2.03	anhyd 420	d 1140	65 g/100 mL ²⁰ aq; sl s alc
(II) sulfide	CoS	91.00	5.45 ¹⁸	1180		i aq; s acids
(II) thiocyanate 3-water	Co(SCN) ₂ · 3H ₂ O	229.14		anhyd 105		7.8 ¹⁸ aq; s alc, eth

Copper	Cu	63.546	8.96 ²⁰	1084.62	2561.5	i; s HNO ₃ , hot H ₂ SO ₄
(II) acetate 1-water	Cu(C ₂ H ₃ O ₂) · H ₂ O	199.65	1.882	115	d 240	8 g/100 mL aq; 0.48 MeOH; sl s eth
acetate <i>meta</i> -arsenate (1/3)	Cu(C ₂ H ₃ O ₂) ₂ · 3Cu(AsO ₂) ₂	1013.80				unstable in acids, bases; s NH ₄ OH
(II) borate(1-)	Cu(BO ₂) ₂	149.17	3.859			s a; i aq
(I) bromide	CuBr	143.45	4.98	497	1345	v sl s aq; s HCl, HBr, NH ₄ OH
(II) bromide	CuBr ₂	223.35	4.71	498	900	126 g/100 mL aq; s alc, acet, pyr; i bz
(II) carbonate hydroxide (1/1) (malachite)	CuCO ₃ · Cu(OH) ₂	221.12	4.0	d 200		i aq; s acids
(II) chlorate 6-water	Cu(ClO ₃) ₂ · 6H ₂ O	338.54		65	d 100	242 g/100 mL ¹⁸ aq; v s alc; s acet
(I) chloride	CuCl	99.00	4.14	430	≈1400	0.024 aq; s conc HCl, conc NH ₄ OH
(II) chloride	CuCl ₂	134.45	3.386	300 d		73 g/100 mL ²⁰ aq; s alc, acet
(II) chloride 2-water	CuCl ₂ · 2H ₂ O	170.48	2.51	anhyd 200	d >300	76.4 g/100 mL ²⁵ aq; v s alc; s acet
(I) chromium(III) oxide (1/1)	Cr ₂ O ₃ · Cu ₂ O	295.07	5.24 ²⁰	d >900		i aq; s HNO ₃
(II) citrate 2.5-water	Cu ₂ C ₆ H ₄ O ₇ · 2.5H ₂ O	360.22		anhyd 100		0.17 aq; s acids
(I) cyanide	CuCN	89.56	2.92	473 (in N ₂)	d	i aq; s NH ₄ OH, KCN; d hot dil HCl
(II) fluoride	CuF ₂	101.54	4.23	836	1676	4.75 g/100 mL ²⁰ aq; s acids
(II) formate	Cu(CHO ₂) ₂	153.58	1.831			12.5 aq
(II) hexafluorosilicate 4-water	Cu[SiF ₆] · 4H ₂ O	277.60	2.56	d		124 g/100 mL ²⁰ aq
(II) hydroxide	Cu(OH) ₂	97.56	3.368	d 160		i aq; s acids
(I) iodide	CuI	190.45	5.67	606	≈1290	i aq; s KCN, NH ₄ OH, KI
(II) nitrate 3-water	Cu(NO ₃) ₂ · 3H ₂ O	241.60	2.32	114.5	170 d	138 g/100 mL ⁰ aq; v s alc
(II) oleate	Cu(OOCC ₁₇ H ₃₃) ₂	626.46				i aq; sl s alc; s eth
(II) oxalate hemihydrate	CuC ₂ O ₄ · 0.5H ₂ O	160.57		anhydr >200	d 310	0.002 aq; s NH ₄ OH
(I) oxide	Cu ₂ O	143.09	6.0 ₄ ²⁵	1235	-O ₂ , 1800	i aq; s HCl
(II) oxide	CuO	79.54	6.315 ₄ ¹	1450		i aq, alc; s acids, KCN
(II) perchlorate	Cu(ClO ₄) ₂	262.45	2.225 ²³	d >130		146 g/100 mL ³⁰ aq; s eth, EtAc; i bz
(II) phosphate 3-water	Cu ₃ (PO ₄) ₂ · 3H ₂ O	434.63		d		i aq; s acids
(II) salicylate 4-water	Cu(C ₇ H ₅ O ₃) ₂ · 4H ₂ O	409.83		dehyd in air		v s aq; s alc
(II) selenate 5-water	CuSeO ₄ · 5H ₂ O	296.58	2.559	anhyd 265	d ca. 480	25 g/100 mL ²⁰ aq; v sl s acet
(I) selenide	Cu ₂ Se	206.05	6.84 ₃ ¹	1113		d HCl
(II) selenide	CuSe	142.51	6.0	d 550		s acids
(II) stearate	Cu(OOCC ₁₇ H ₃₅) ₂	630.50		≈250		i aq, alc, eth; s hot bz, pyr
(II) sulfate	CuSO ₄	159.61	3.603	d >560		14.3 g/100 mL ⁰ aq; i alc
(II) sulfate 5-water	CuSO ₄ · 5H ₂ O	249.69	2.284 ₄ ⁶	anhyd 200		32 g/100 mL ²⁰ aq; s MeOH, glyc

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
<i>Copper (continued)</i>						
(I) sulfide	Cu ₂ S	159.16	5.62 ²⁰	1130		i aq; d HNO ₃ , s KCN
(II) sulfide	CuS	95.61	4.76			i aq; s hot HNO ₃ , KCN
(I) sulfite hydrate	Cu ₂ SO ₃ · H ₂ O	225.16	3.83 ¹⁵	d		sl s aq; s HCl
(II) tartrate 3-water	CuC ₄ H ₄ O ₆ · 3H ₂ O	265.66				0.4220 aq; s acids, alkalis
(I) thiocyanate	CuSCN	121.62	2.85	1084		0.00044 aq; s NH ₄ OH, eth, alkali SCN
(II) tungstate(VI)(2-)	CuWO ₄ · 2H ₂ O	347.41				0.1 ¹⁵ aq; d acids; s NH ₄ OH
Curium-244	Cm	244.063	13.51	1340	≈3110	s acids
Cyanogen	NC—CN	52.03	2.335 g/L	-27.84	-21.15	mL/100 mL: 450 ²⁰ aq, 230 alc;
azide	NC—N ₃	68.04				s acetonitrile; pure azide detonates upon shock. Handle only in sol- vents.
bromide	NCBr	105.92	2.005	52	61.5	v s aq, alc, eth
chloride	NCCl	61.47	2.697 g/L	-6.5	13.8	s aq, alc, eth
fluoride	NCF	45.02	1.975 g/L	-82	-46	
Deuterium	D ₂ or ² H ₂	4.03	0.169 ^{mp} lq	-252.89	-249.49	sl s aq
oxide	D ₂ O	20.03	1.1056 ²⁰	3.82	101.43	misc aq
Dysprosium	Dy	162.50	8.540 ²⁵	1412	2567	s acids
bromide	DyBr ₃	402.21	4.78	880	1480	s aq
chloride	DyCl ₃	268.86	3.67	680	1530	s aq
fluoride	DyF ₃	219.50	7.465	1154	2230	i aq
oxide	Dy ₂ O ₃	373.00	7.81 ²⁷	2408		s aq
Einsteinium	Es	252.083	8.84	860		
Erbium	Er	167.26	9.066	1529	2868	s acid
chloride	ErCl ₃	273.62	4.1	776	1500	s aq; sl s alc
oxide	Er ₂ O ₃	382.52	8.640	2418		0.0005 ²⁵ aq; s acids
sulfate 8-water	Er ₂ (SO ₄) ₃ · 8H ₂ O	766.83	3.205	anhyd 110	d 630	16.0 g/100 mL ²⁰ aq
Europium	Eu	151.965	5.244	822	1527	s acids
(III) chloride	EuCl ₃	258.32	4.89	623 d		s aq
(III) oxide	Eu ₂ O ₃	351.93	7.42	2350		i aq; s acids
(III) sulfate 8-water	Eu ₂ (SO ₄) ₃ · 8H ₂ O	736.24	-8H ₂ O, 375			2.56 ²⁰ aq

Fermium-257	Fm	257.0951		1527			
Fluorine	F ₂	38.00	1.513 ^{bp} lq	-219.61	-188.13	d aq viol; ignites organics and silicates	
nitrate	FONO ₂	81.00	1.667 g/L 1.507 ^{bp} lq	-175	-45.9	hyd aq; s acet; ignites alc, eth; liquid explodes on slight concussion	
perchlorate	FOClO ₃	118.45	5.20 g/L	-167.3	-15.9	explodes on slightest provocation	
Francium-223	Fr	223.02					
Gadolinium	Gd	157.25	7.90	1312	3273	s acids	
chloride	GdCl ₃	263.61	4.52 ⁰	~609	1580	s aq	
fluoride	GdF ₃	214.25	7.047	1231	2277	i aq	
nitrate 6-water	Gd(NO ₃) ₃ · 6H ₂ O	451.36	2.332	91		s aq, alc	
oxide	Gd ₂ O ₃	362.50	7.407 ¹⁵	2340		s acids	
sulfate 8-water	Gd ₂ (SO ₄) ₂ · 8H ₂ O	746.81	3.010 ¹⁸	anhyd 400	d 500	4.08 aq	
Gallium	Ga	69.723	5.904 ^{29.6} (c) 6.095 ^{29.8} (lq)	29.7646	2203	s conc HCl, halogens, alkalis	
antimonide	GaSb	191.48	5.614	712		s HCl	
arsenide	GaAs	144.65	5.318 ₄ ²⁵	1238		s HCl	
chloride	GaCl ₃	176.08	2.47	77.9	201.2	d aq; s bz, CCl ₄ , CS ₂	
fluoride	GaF ₃	126.72	4.47	>1000	subl 950	0.004 ²⁵ aq; s HF	
nitrate	Ga(NO ₃) ₃	255.74		d 110	→ Ga ₂ O ₃ , 200	v s aq	
phosphide	GaP	100.70		1465			
selenide	GaSe	148.68	5.03 ²⁵	960	d		
triethyl	Ga(C ₂ H ₅) ₃	146.90	1.058 ³⁰	-82.3	142.8		
trimethyl	Ga(CH ₃) ₃	114.84	1.151 ¹⁵	-15.7	55.8		
Germanium	Ge	72.61	5.323	937.3	2830	i aq; s hot H ₂ SO ₄	
(IV) bromide	GeBr ₄	392.23	3.132	26.1	186.4	hyd aq; s bz, eth	
(IV) chloride	GeCl ₄	214.42	1.879	-49.5	86.5	hyd aq; s bz, eth; sl s dil HCl	
(IV) fluoride	GeF ₄	148.60	6.521 g/L	-15	d >1000	hyd aq; s dil HCl	
hydride (germane)	GeH ₄	76.64	3.363 g/L	-164.8	-88.1	sl s hot HCl	
(IV) oxide	GeO ₂	104.61	4.25	1115	1200	0.43 ²⁰ aq; s acids, alkalis	
sulfide	GeS ₂	136.74	3.01	530			
Gold	Au	196.967	19.3	1064.18	2856	s aq reg, KCN, hot H ₂ SO ₄	
(I) chloride	AuCl	232.42	7.57	289		s HCl, HBr, KCN	
(III) chloride	AuCl ₃	303.33	4.7	d >160	subl 180	68 g/100 mL ²⁰ aq; s EtOH	
(I) cyanide	AuCN	222.99	7.14 ₄ ²⁰	d		s aq reg, KCN, NH ₄ OH	
(III) cyanide 3-water	Au(CN) ₃ · 3H ₂ O	329.07		d 50		v s aq; sl s alc	

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Gold (<i>continued</i>)						
diantimonide	AuSb ₂	440.47		460		
(III) fluoride	AuF ₃	253.96	6.75	subl 300	d 500	
(III) oxide	Au ₂ O ₃	441.93		d 150		s HCl, KCN
(I) sodium thiosulfate 2-water	AuNa ₃ (S ₂ O ₃) ₂ · 2H ₂ O	526.24	3.09	anhyd 160		50 g/100 mL aq; i alc
stannide	AuSn	315.66		418		
(III) sulfide	Au ₂ S ₃	490.13	8.754	d 197		i aq; s Na ₂ S
Hafnium	Hf	178.49	13.31	2227	4450	s HF
chloride	HfCl ₄	320.30		432	subl 317	hyd aq; s acet, MeOH
oxide	HfO ₂	210.49	9.68 ²⁰	2774		i aq
Helium	He	4.00260	0.176 g/L 0.1249 (lq)	-272.15 ^{25atm}	-268.935	0.861 mL/100 mL ²⁰ aq
Holmium	Ho	164.9304	8.79	1474	2720	s acids; oxidizes in moist air
bromide	HoBr ₃	404.64	4.86	914	1470	s aq
chloride	HoCl ₃	271.29	3.7	718	1510	s aq
Hydrazine	H ₂ N—NH ₂	32.05	1.0036 ²⁵	2.0	113.5	FP 52; misc aq, alc
hydrate	H ₂ N—NH ₂ · H ₂ O	50.06	1.030	-51.7 & -65	118-119	misc aq, alc; i chl, eth
Hydrazinium(1+) chloride	H ₂ N—NH ₃ Cl	68.51	1.5	89	d 240	v s aq; i org solv
(2+) chloride	ClH ₃ N—NH ₃ Cl	104.97	1.423	198	d 200	v s aq; sl s alc
(1+) iodide	H ₂ N—NH ₃ I	159.96		125		s aq
(+1) perchlorate	H ₂ N—NH ₃ ClO ₄	132.51	1.939 ¹⁵	137	d 145	d aq; s alc
(2+) sulfate	(H ₃ NNH ₃)SO ₄	130.13	1.378	254	d	3.4 ²⁰ aq; i alc
(1+) tartrate	(H ₂ N—NH ₃) ₂ C ₄ H ₄ O ₆	182.13		183		6.0 g/100 mL ⁹ aq
Hydrogen	H ₂	2.0159 0.07099 ^{bp} (lq)	0.088 g/L	-259.35	-252.88	1.9 mL aq
amidosulfate (sulfamate)	H ₂ NSO ₃ H	97.09	2.126	205	d	14.7 g/100 mL aq; sl s alc, acet
azide	HN ₃	43.03	1.126 ⁰	-80	37	v s aq; (very explosive)
borate(1-) (cubic)	HBO ₂	43.83	2.486	236		v sl s aq
borate(3-) (ortho)	H ₃ BO ₃	61.83	1.435 ¹⁵	171.0	d 357	5.56 g/100 mL ³⁰ aq
bromide	HBr	80.91	3.388 g/L ²⁰	-86.87	-66.71	193 g/100 mL ²⁵ aq; misc alc

bromide (constant boiling)	48% HBr + H ₂ O		1.49	− 11	126	v s aq
bromide- <i>d</i>	² HBr	81.91	3.39 g/L ²⁰	− 87.46	− 66.5	v s aq
bromosulfate	HOSO ₂ Br	240.90		− 6 to − 8	d	hyd aq
chlorate (40% solution)	HClO ₃	84.46	1.282 ₄ ²⁰			
chloride	HCl	36.46	1.526 g/L ²⁰	− 114.18	− 85.05	72 g/100 mL ²⁰ aq
chloride (constant boiling)	20.24% HCl + H ₂ O		1.097		110	v s aq
chloride- <i>d</i>	² HCl	37.47	1.49 g/L ²⁵	− 114.64	− 84.72	v s aq
chlorosulfate	HSO ₃ Cl	116.52	1.753	− 80	152	hyd viol → HCl + H ₂ SO ₄
cyanate	HOCN	43.03	1.140 ₄ ²⁰	− 86	23.5	s aq d; s bz, eth
cyanide	HCN	27.03	0.687	− 13.4	25.6	misc aq
deuteride	¹ H ² H or HD	3.02		− 256.56	− 251.03	
diphosphate(IV)	(HO) ₂ OP—PO(OH) ₂	162.01	70	d 100	d	aq
diphosphate(V)	H ₄ P ₂ O ₇	177.98		61		709 g/100 mL ²³ aq
fluoride	HF	20.01	0.922 g/L ⁰	− 83.57	19.52	v s aq, alc; 2.54 g/100 g ⁵ bz
fluoride (constant boiling)	35.35% HF + H ₂ O				120	v s aq
fluoride- <i>d</i>	² HF	21.02		− 83.6	18.65	s aq
fluoroborate	H[BF ₄]	87.81		d 130		v s aq
fluorophosphate	H ₂ PO ₃ F	99.99	1.818	− 80		
fluorosulfate	HOSO ₂ F	100.07	1.726 ₄ ²⁵	− 87.3	165.5	s aq
hexafluorosilicate 2-water	H ₂ [SiF ₆] · 2H ₂ O	180.11	1.463	19		60–70% aq solution
iodate	HIO ₃	175.91	4.629 ₀ ⁹	110 → H ₅ IO ₆	220 → I ₂ O ₅	269 g/100 mL ²⁰ aq; s alc; i eth
iodide	HI	127.91	5.37 g/L ²⁰	− 50.8	− 35.1	234 g/100 mL ¹⁰ aq; misc alc
iodide (constant boiling)	57% HI + H ₂ O		1.70		127	v s aq
iodide- <i>d</i>	HI	128.91		− 51.87	− 35.7	v s aq
molybdate hydrate	H ₂ MoO ₄ · H ₂ O	179.97	3.124 ¹⁵	− H O, 70		0.133 ¹⁸ aq; s alk
nitrate	HNO ₃	63.02	1.5492 ⁰ lq	− 41.59	83	v s
nitrate (constant boiling)	69% HNO ₃ + H ₂ O		1.41 ²⁰		120.5	misc aq
oxide (water)	H ₂ O	18.02	1.000	0.00	100.00	
oxide- <i>d</i> ₂	D ₂ O or ² H ₂ O	20.03	1.1044 ²⁵	3.81	101.42	misc aq
perchlorate 2-water	HClO ₄ · 2H ₂ O	136.49	1.67 ²⁰	− 17.8	203	v s aq (commercial 72% acid)
periodate(1−) (meta)	HIO ₄	191.91		subl 110	d 138	440 g/100 mL ²⁵ aq
periodate(5−)	H ₅ IO ₆	227.94		122	d 130–140	misc aq; s alc
peroxide	H ₂ O ₂	34.01	1.463 ⁰	− 0.43	152	misc aq; s alc, eth
peroxodisulfate	HO ₃ S—O—OSO ₃ H	194.14		d 60		v s aq
phosphate(V)(1−) (meta)	HPO ₃	79.98	2.2–2.5	subl	red heat	slowly s aq → H ₃ PO ₄ ; s alc
phosphate(V)(3−) (ortho)	H ₃ PO ₄	98.00	1.868 ²⁵	42.35	d 213	v s aq
commercial 85% acid			1.685	anhyd 150	H ₄ P ₂ O ₇ , 200	→ HPO ₃ , >300

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Hydrogen (<i>continued</i>)						
phosphate(V)(3-)- d_3	$^2\text{H}_3\text{PO}_4$	101.03	1.908 ²⁵	46.0		v s aq
phosphide, <i>see</i> Phosphine						
phosphinate	HPH_2O_2	66.0	1.493 ¹⁹	26.5	d 50	s aq
phosphonate (phosphorous acid)	H_2PHO_3	82.00	1.651 ²⁵ ₄	≈73	d > 180	v s aq, alc
selenate	H_2SeO_4	144.98	2.9508 ¹⁵ ₄	58	260	vs aq (viol)
selenide	H_2Se	80.98	2.12 ₄ ^{-bp}	-65.73	-41.4	9.5 mL/100 mL ²⁰ aq; s CS_2
sulfate	H_2SO_4	98.08	1.8318 ²⁰	10.38	335.5	misc aq
sulfate- d_2	$^2\text{H}_2\text{SO}_4$ or D_2SO_4	100.09	1.8620	14.35		misc aq
sulfide	H_2S	34.08	1.5392 g/L ⁰	-85.49	-60.33	0.334 mL ²⁵ aq
tellurate(IV)	H_2TeO_3	177.63	3.0	d to TeO_2		0.0007 aq; s acid, alkali
tellurate(VI) (monoclinic)	H_6TeO_6	229.66	3.068	-2 H_2O , 120	320 → TeO	30 g/100 mL ¹⁸ aq
telluride	H_2Te	129.62	5.687 g/L	-49	-2	s aq d
trithiocarbonate	$(\text{HS})_2\text{CS}$	110.21	1.483 ²⁰ ₄	-26.9	57.8	d aq, alc
tungstate(VI)(2-)	H_2WO_4	249.86	5.5	anhyd 100		i aq; s HF, alkalis
Hydroxylamine	HONH_2	33.03	1.204 ⁴⁰ ₄	33	58 ^{22mm}	v s aq, MeOH; sl s bz, eth
Hydroxylammonium chloride	HONH_3Cl	69.49	1.680 ²⁰	150.5	d	g/100 mL: 83 ¹⁷ aq, 12.5 ²⁰ MeOH, 5.1 ²⁰ EtOH; s glyc
sulfate	$(\text{HONH}_3)_2\text{SO}_4$	164.14		170		69 g/100 mL ²⁰ aq
Indium	In	114.82	7.31	156.60	2072	s acids
antimonide	InSb	236.58	5.77	525		i aq
arsenide	InAs	189.74	5.67	942		
chloride	InCl_3	221.18	4.0	583	subl 500	212 g/100 mL ²⁵ aq
fluoride	InF_3	171.82	4.39	1170		0.040 ²⁵ aq; s dilute acids
oxide	In_2O_3	277.63	7.179		850	s hot mineral acids
phosphide	InP	145.79	4.81	1062		v sl s acids
telluride	In_2Te_3	612.44	5.75	667		
trimethyl	$\text{In}(\text{CH}_3)_3$	159.93	1.568	88.4	135.8	d aq; s acet, bz
Iodine	I_2	253.809	4.63 ²⁵	113.60	185.24	g/100 mL ²⁵ : 0.029 aq, 14.1 bz, 16.5 CS_2 , 21.4 EtOH, 25.2 eth, 2.6 CCl_4 ; s chl, HOAc

heptafluoride	IF ₇	259.89	lq: 2.8 ⁶	6.45	4.77 subl	s aq (d), s NaOH
monobromide	IBr	206.81	4.416	40	116 d	s aq, alc, eth, CS ₂
monochloride	ICl	162.36	3.10 ₃ ²⁹	27.2 α-form	97 d	d aq; s alc, eth, HOAc
pentafluoride	IF ₅	221.90	3.19 ₂₅ ²⁵	9.43	100.5	d aq viol
pentoxide	I ₂ O ₅	333.81	4.98	d 275		187 g/100 mL ¹³ aq
trichloride	ICl ₃	233.26	3.202 ⁻⁴	~33	64 subl	d aq; s alc, bz, HCl
Iridium	Ir	192.217	22.65 ₄ ²⁰	2447	~2550	s K ₂ SO ₄ fusion, KOH + KNO ₃ fusion
hexafluoride	IrF ₆	306.21	4.82	44.4	53.6	d aq
(III) oxide	Ir ₂ O ₃	432.43		d ~ 1000 to Ir + O ₂		s boiling HCl
(IV) oxide	IrO ₂	224.22	11.7	d 1100		0.0002 ²⁰ aq; s HCl
trichloride	IrCl ₃	298.58	5.30	d 763		i acids, alkalis
Iron	Fe	55.845	7.86	1535	2861	i aq; s acids
(III) arsenate 2-water	FeAsO ₄ · 2H ₂ O	230.79	3.18	1020		v sl s aq; s acids
(II) bromide	FeBr ₂	126.75	3.16	677	1023	117 g/100 mL ²⁰ aq; v s alc
(III) bromide	FeBr ₃	295.67	4.5	d		s aq, alc, eth, HOAc
(tri-) carbide	Fe ₃ C	179.55	7.694	1227		s acids
(II) carbonate	FeCO ₃	115.85	3.9	d		0.072 ¹⁸ aq; s acids
(II) chloride	FeCl ₂	126.75	3.16	677	1024	62.5 g/100 mL ²⁰ aq; v s alc, acet
(III) chloride	FeCl ₃	162.20	2.898	304	≈316	74 g/100 mL ⁹ aq; s alc, acet, eth
disulfide (pyrite)	FeS ₂	119.98	5.02	d 602		s acids d
(II) fluoride	FeF ₂	93.84	4.09	1100	1837	sl s aq; s dil HF; i alc, bz, eth
(III) fluoride	FeF ₃	112.84	3.87	subl 1000		0.091 ²⁵ aq; s HF
(III) hexacyanoferrate(II)	Fe ₄ [Fe(CN) ₆] ₃	859.23	1.80	250 d		i aq; s HCl
(II) hydroxide	Fe(OH) ₂	89.86	3.4			0.006 aq; s acids
(III) hydroxide oxide	FeO(OH)	88.85	4.26	anhyd 136		i aq, alc; s HCl
(II) iodide	FeI ₂	309.65	5.315	587	1093	s aq
(III) nitrate 9-water	Fe(NO ₃) ₃ · 9H ₂ O	404.00	1.684	47	d 100	138 g/100 mL ²⁰ aq
(di-) nitride	Fe ₂ N	125.70	6.35	d 200		s HCl
(II) oxalate 2-water	FeC ₂ O ₄ · 2H ₂ O	179.89	2.28	d 150		0.044 ¹⁸ aq; s mineral acids
(II) oxide	FeO	71.84	6.0	1377	d 3414	i aq; s acids
(II,III) oxide	Fe ₃ O ₄	231.53	5.17	1597		i aq; s acids
(III) oxide	Fe ₂ O ₃	159.69	5.25	1565		i aq; s HCl
pentacarbonyl	Fe(CO) ₅	195.90	1.49	-20.0	103.9	FP -20; i aq; s alc, bz, eth
(II) phosphate 8-water	Fe ₃ (PO ₄) ₂ · 8H ₂ O	501.60	2.58			i aq; s acids
phosphide	Fe ₂ P	142.66	6.85	1370		s hot mineral acids

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Iron (<i>continued</i>)						
(II) selenide	FeSe	134.81	6.78	d		s HCl
(II) silicate(2-)	FeSiO ₃	131.93	3.5	1140		
(II) silicate(4-)	Fe ₂ SiO ₄	203.77	4.30	1220		d HCl
(II) sulfate 7-water	FeSO ₄ · 7H ₂ O	278.01	1.89	anhyd 300	d 671	48 g/100 mL ²⁰ aq
(III) sulfate	Fe ₂ (SO ₄) ₃	399.88	3.097 ¹⁸	d 1178		slowly s aq (hyd); sl s alc
(II) sulfide	FeS	87.92	4.7	1190	d	0.0006 ¹⁸ aq; s acid
(III) thiocyanate	Fe(SCN) ₃	230.09				v s aq
Krypton	Kr	83.80	3.7493 g/L	- 157.36	- 153.22	5.94 mL/100 mL ²⁰ aq
difluoride	KrF ₂	121.80	3.24	subl- 60		s anhyd HF
Lanthanum	La	138.9055	6.162	920	3464	i aq; s HCl
chloride	LaCl ₃	245.26	3.84	852	1812	v s aq
chloride 7-water	LaCl ₃ · 7H ₂ O	371.37		anhyd 852 (in HCl atm)		v s aq; s alc
fluoride	LaF ₃	195.90	5.9	1493	2327	
nitrate 6-water	La(NO ₃) ₃ · 6H ₂ O	433.01		40	d 126	181 g/100 mL ²⁰ aq; v s alc
oxide	La ₂ O ₃	325.81	6.51	2305	4200	s acids
sulfate	La ₂ (SO ₄) ₃	566.00	3.60	d white heat		2.33 g/100 mL ²⁰ aq; i alc
sulfate 9-water	La ₂ (SO ₄) ₃ · 9H ₂ O	728.14	2.821	anhyd 400		2.92 g/100 mL ²⁰ aq; i alc
Lawrencium	Lr	262		1627		
Lead	Pb	207.2	11.34 ²⁰ (fcc)	327.43	1749	s hot conc HNO ₃ , HCl, H ₂ SO ₄
(II) acetate 3-water	Pb(C ₂ H ₃ O ₂) ₂ · 3H ₂ O	427.3	2.55	75	d > 200	g/100 mL: 63 ¹⁵ aq, 3.3 alc
(IV) acetate	Pb(C ₂ H ₃ O ₂) ₄	443.4	2.228	≈ 75-180		s hot HOAc, bz, chl, conc HX acids
(II) azide	Pb(N ₃) ₂	291.2	4.7	expl 350 or when shocked		0.023 ¹⁸ aq; v s HOAc
(II) borate(1-) hydrate	Pb(BO ₂) ₂ · H ₂ O	310.8	5.598 anhyd	anhyd 160	mp 500	s acids
(II) bromide	PbBr ₂	367.0	6.69	371	912	0.450 ⁰ aq; s acids; i alc
(II) carbonate	PbCO ₃	267.2	6.61	d 340 → PbO		i aq; s acids, alkalis
(II) chlorate	Pb(ClO ₃) ₂	374.1	3.89	d 230		140 g/100 mL ¹⁸ aq; v s alc
(II) chloride	PbCl ₂	278.1	5.98	501	950	0.99 ²⁰ aq
(II) chloride fluoride	PbClF	261.7	7.05			

(II) chromate(VI)(2-)	PbCrO ₄	323.2	6.12	844	d	i aq; s dil HNO ₃ , alkalis
(II) fluoride	PbF ₂	245.2	8.445	830	1297	0.064 ²⁰ aq
(IV) fluoride	PbF ₄	283.2	6.7	≈ 600		hyd aq
(II) formate	Pb(CHO ₂) ₂	297.2	4.63	d 190		1.6 g/100 mL ²⁰ aq
(II) hydrogen arsenate	PbHASO ₄	347.1	5.94	d 280 to Pb ₂ As ₂ O ₇		s HNO ₃ , alkalis
(II) hydroxide	Pb(OH) ₂	241.2	7.59	d 145		0.016 ²⁰ aq; s acids, alkalis
(II) iodide	PbI ₂	461.0	6.16	410	872	0.063 ²⁰ aq; s KI, Na ₂ S ₂ O ₃ , alkalis
(II) molybdate(VI)(2-)	PbMoO	367.1	6.7	1065		s acids, alkalis
(II) nitrate	Pb(NO ₃) ₂	331.2	4.53	470		g/100 mL: 56 ²⁰ aq, 1.3 MeOH
(II) oleate	Pb(C ₁₈ H ₃₃ O ₂) ₂	770.1				s alc, bz, eth
(II) oxalate	PbC ₂ O ₄	295.2	5.28	d 300		s acids, alkalis
(II) oxide (litharge)	PbO	223.2	9.35 (red)	886	1472 d	0.0017 ²⁰ aq; s HNO ₃
(IV) oxide	PbO ₂	239.2	9.64	d 290, Pb ₃ O ₄	d 595, PbO	s HCl, dil HNO ₃ + H ₂ O ₂₃ , H ₂ C ₂ O ₄
(II,IV) oxide (red lead)	Pb ₃ O ₄	685.6	8.92	d 595 → PbO		s HNO ₃ , hot HCl
(II) phosphate	Pb ₃ (PO ₄) ₂	811.5	7.0	1014		s HNO ₃ , alkalis
(II) selenide	PbSe	286.2	8.15	1078		s HNO ₃
(II) silicate(2-)	PbSiO ₃	283.3	6.5	764		s acids
(II) silicate(4-)	Pb ₂ SiO ₄	506.5	7.60	743		
(II) stearate	Pb(C ₁₈ H ₃₅ O ₂) ₂	774.2	1.4	≈ 125		0.05 ³⁵ aq; s hot alc
(II) sulfate	PbSO ₄	303.3	6.29	1170		0.00425 aq; s NaOH
(II) sulfide	PbS	239.3	7.60	1118	1300 subl	0.0006 ¹⁸ aq; s HNO ₃ , hot dil HCl
(II) telluride	PbTe	334.8	8.16	924		i acids and alkalis
tetraethyl	Pb(C ₂ H ₅) ₄	323.45	1.653	- 137	≈ 200	i aq; s bz, hydrocarbons
tetramethyl	Pb(CH ₃) ₄	267.35	1.995	- 30.2	110	s hydrocarbons
(II) thiocyanate	Pb(SCN) ₂	323.4	3.82	d 190		0.44 ¹⁸ aq, s HNO ₃ , NaOH
Lithium	Li	6.941	0.534 ²⁰	180.54	1341	d aq to LiOH
acetate 2-water	LiC ₂ H ₃ O ₂ · 2H ₂ O	102.02	1.3	58	d	63 g/100 mL ²⁰ aq; v s alc
aluminate(1-)	LiAlO ₂	65.92	2.554	1700		
amide	LiNH ₂	22.96	1.178	380	d 450 vacuo	d aq (→ LiOH + NH ₃); i bz, eth
benzoate	LiC ₇ H ₅ O ₂	128.06		> 300		g/100 mL: 33 aq; 7.7 alc
borate(1-)	LiBO ₂	49.75	2.18	849	1719	2.7 g/100 mL ²⁰ aq; i alc
borohydride	Li[BH ₄]	21.78	0.66	268	d 380	s aq, eth, THF, aliphatic amines
bromate	LiBrO ₃	134.85	3.62			179 g/100 mL ²⁰ aq
bromide	LiBr	86.84	3.464	552	1289	164 g/100 mL aq; s alc, eth
carbonate	Li ₂ CO ₃	73.89	2.11	720	d 1300	1.3 g/100 mL ²⁰ aq; i alc; s acids

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Lithium (<i>continued</i>)						
chloride	LiCl	42.39	2.07	613	1360	77 g/100 mL ²⁰ aq; s alc, acet
chromate(VI)(2-) 2-water	Li ₂ CrO ₄ · 2H ₂ O	165.91	2.15	anhyd 75		142 g/100 mL ¹⁸ aq; s EtOH
citrate 4-water	Li ₃ C ₆ H ₅ O ₇ · 4H ₂ O	281.98		anhyd 105		61 g/100 mL ¹⁵ aq; sl s alc
fluoride	LiF	25.94	2.640	848	1681	0.13 ²⁵ aq; s acids
hexafluoroaluminate(3-)	Li ₃ [AlF ₆]	161.79		1012		
hydride	LiH	7.95	0.76–0.77	680	d 950	no solvent known; flammable
hydride- <i>d</i>	Li ² H or LiD	8.96	0.881	686		
hydroxide	LiOH	23.95	1.45	471.2	1626	12.4 g/100 mL ²⁰ aq; sl s alc
iodate	LiIO ₃	181.84	4.502	450		66 g/100 mL aq; in alc
iodide	LiI	133.84	4.061	469	1174	165 g/100 mL ²⁰ aq & alc; v s acet
nitrate	LiNO ₃	68.95	2.38	~255		50 g/100 mL ²⁰ aq; s alc
nitride	Li ₃ N	34.83	1.27	813		d aq
oxide	Li ₂ O	29.88	2.013	1570	2563	forms LiOH in aq
perchlorate	LiClO ₄	106.39	2.43	236	d ~ 400 LiCl + O ₂	47.4 g/100 mL ²⁵ aq; v s organic solv
peroxide	Li ₂ O ₂	45.88	2.31	d > 195 to Li ₂ O		
silicate(2-)	Li ₂ SiO ₃	89.97	2.52 ₄ ⁵	1201		d dil HCl
sulfate	Li ₂ SO ₄	109.95	2.22	859		34.5 g/100 mL ²⁰ aq; i alc
tetraborate(2-)	Li ₂ B ₄ O ₇	169.12		917		sl s aq
tetrahydridoaluminate	Li[AlH ₄]	37.95	0.917	d 137		d aq, alc; g/100 mL: 30 eth, 13 THF; flammable
tetrahydridoborate	LiBH ₄	21.79	0.666	268	d 380	s aq pH > 7; s eth, THF
Lutetium	Lu	174.967	9.841	1663	3402	s acids
chloride	LuCl ₃	281.33	3.98	892	subl > 750	s aq
sulfate 8-water	Lu ₂ (SO ₄) ₃ · 8H ₂ O	782.25				42.3 g/100 mL ²⁰ aq
Magnesium	Mg	24.305	1.738 ²⁰	651	1100	i aq; s dilute acids
acetate	Mg(C ₂ H ₃ O ₂) ₂	142.00	1.42	323 d		53.4 g/100 mL ²⁰ aq; v s alc
aluminate(2-)	MgAl ₂ O ₄	142.25	3.6	2135		v sl s HCl
amide	Mg(NH ₂) ₂	56.35	1.39 ₄ ⁵	ign in air		d viol water giving NH ₃
borate(1-) 8-water	Mg(BO ₂) ₂ · 8H ₂ O	254.04	2.30			sl s aq; s acids
bromide	MgBr ₂	184.11	3.722	711 d	1158	101 g/100 mL ²⁰ aq

carbonate	MgCO ₃	84.31	3.05	990		0.01 aq; s acids
chloride	MgCl ₂	95.21	2.33	714	1412	54.6 g/100 mL ²⁰ aq
fluoride	MgF ₂	62.30	3.148	1263	2270	0.013 ²⁵ aq; s HNO ₃
(<i>di</i> -) germanide	Mg ₂ Ge	121.22	3.09	1115		
hexafluorosilicate 6-water	Mg[SiF ₆] · 6H ₂ O	274.47	1.788	– SiF ₄ , 120		51 g/100 mL ²⁰ aq; i alc
hydride	MgH ₂	26.32	1.45	d 200 vacuo	ign in air	d aq and alc violently
hydrogen phosphate 3-water	MgHPO ₄ · 3H ₂ O	174.33	2.13 ¹⁵	anhyd 205	d 550	sl s aq; s acids
hydroxide	Mg(OH) ₂	58.32	2.36	350 d		0.00125 aq; s acids
iodide	MgI ₂	278.12	4.43	634	0	140 g/100 mL ²⁰ aq; s alc
lactate 3-water	MgC ₆ H ₁₀ O ₆ · 3H ₂ O	256.51				4 g/100 mL aq; sl s alc
mandelate	MgC ₁₆ H ₁₄ O ₆	326.59				0.004 ¹⁰⁰ aq; i alc
nitrate	Mg(NO ₃) ₂ · 6H ₂ O	256.41	1.464	95	d 129	120 g/100 mL ²⁰ aq; v s alc
nitride	Mg ₃ N ₂	100.93	2.712	d 270		d aq; s acids
oleate	Mg(C ₁₈ H ₃₃ O ₂) ₂	587.22				sl s alc, eth, PE
oxide	MgO	40.30	3.65–3.75	2800	3600	i aq, alc; s acids
perchlorate	Mg(ClO ₄) ₂	223.21	2.21	d >251		g/100 mL ²⁵ : 73 aq, 18 EtOH, 44.6 BuOH, 54 EtOAc, 32 acet
permanganate	Mg(MnO ₄) ₂	262.19				v s aq
peroxide	MgO ₂	56.30	≈3.0	d 100		s acids
peroxoborate 7-water	Mg(BO ₃) ₂ · 7H ₂ O	268.09				sl s aq d; s dilute acids
phosphate 5-water	Mg ₃ (PO ₄) ₂ · 5H ₂ O	352.96	1.64 ¹⁵	anhyd ~400		0.02 aq; s acids
silicate(2–)	MgSiO ₃	100.39	3.192 ²⁴	d 1557		i aq; v sl s HF
silicate(4–)	Mg ₂ SiO ₄	140.69	3.21	1898		i aq; d hot HCl
(<i>di</i> -) silicide	Mg ₂ Si	76.70	2.0	1100		d aq, HCl
(<i>di</i> -) stannide	Mg ₂ Sn	167.32	3.60	778		s aq, HCl
sulfate 7-water	MgSO ₄ · 7H ₂ O	246.47	1.67	anhyd 250		27.2 g/100 mL aq; sl s alc
sulfite 6-water	MgSO ₃ · 6H ₂ O	212.46	1.725	anhyd 200	mp: 2227	0.66 ²⁵ aq
tungstate(VI)(2–)	MgWO ₄	272.14	6.89			i aq; d acids
Manganese	Mn	54.9380	7.21 ²⁰	1244 fctetr	2095	d aq; s acids
acetate 4-water	Mn(C ₂ H ₃ O ₂) ₂ · 4H ₂ O	245.09	1.589	80		38 g/100 mL ⁵⁰ aq; v s alc
bromide	MnBr ₂	214.75	4.39	698	1027	147 g/100 mL ²⁰ aq; s alc
(<i>tri</i> -) carbide	Mn ₃ C	176.83	6.89	1520		d aq; s acid
carbonate	MnCO ₃	114.95	3.125	d >200		0.0065 ²⁵ aq; s acids
chloride	MnCl ₂	125.84	2.977	650	1210	74 g/100 mL ²⁰ aq; s alc, pyr; i eth
chloride 4-water	MnCl ₂ · 4H ₂ O	187.91	2.01	97.5	anhyd 198	143 g/100 mL aq; s alc; i eth
deccarboxyl	Mn ₂ (CO) ₁₀	389.98	1.75	d 110		i aq; s organic solvents

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Manganese (<i>continued</i>)						
diphosphate	Mn ₂ P ₂ O ₇	283.82	3.707	1196		i aq; s acid
(II) fluoride	MnF ₂	92.93	3.98	930	1820	0.66 ⁴⁰ aq; s HF, conc HCl
(III) fluoride	MnF ₃	111.93	3.54	d >600		hyd aq; s acid
hydroxide	Mn(OH) ₂	88.95	3.258	d		0.002 ¹⁸ aq; s acids
iodide	MnI ₂	308.75	5.04	638	1017	s aq
nitrate 6-water	Mn(NO ₃) ₂ · 6H ₂ O	287.04	1.8	25.8		v s aq, alc
(II) oxide	MnO	70.94	5.37	1840		i aq; s acids
(III) oxide	Mn ₂ O ₃	157.87	4.89	877 d		i aq; s HCl giving off Cl ₂
(IV) oxide	MnO ₂	86.94	5.08	−O ₂ , 530		s HCl; i HNO ₃ , cold H ₂ SO ₄
(II,IV) oxide	Mn ₃ O ₄	228.81	4.84	1567		i aq; s HCl
(VII) oxide	Mn ₂ O ₇	221.87	2.396	ca. −20	ca. 25	explodes 85; v s aq
phosphinate hydrate	Mn(PH ₂ O ₂) ₂ · H ₂ O	202.93		d to PH ₃		15 g/100 mL aq; i alc
silicate, meta-	MnSiO ₃	131.02	3.48	1290		i aq, HCl
sulfate	MnSO ₄	151.00	3.25	700	d 850	52 g/100 mL aq; i alc
sulfate hydrate	MnSO ₄ · H ₂ O	169.02	2.95	anhyd 400–450		70 g/100 mL ²⁰ aq
sulfate 7-water	MnSO ₄ · 7H ₂ O	277.11	2.09	anhyd 280		115 g/100 mL ²⁰ aq
sulfide	MnS	87.00	3.99	1610		0.0006 ¹⁸ aq; s acids
titanate(IV)(2−)	Mn ₂ TiO ₄	150.84	4.54	1360		
Mercury	Hg	200.59	13.534	−38.83	356.7	i aq; s HNO ₃ , hot conc H ₂ SO ₄
(II) acetate	Hg(C ₂ H ₃ O ₂) ₂	318.68	3.28	178–180 d		g/100 mL: 40 ¹⁰ aq, 7.5 ¹⁵ MeOH
(II) benzoate	Hg(C ₇ H ₅ O ₂) ₂	424.83		165		v s NaCl soln; sl s alc
(I) bromide	Hg ₂ Br ₂	560.99	7.307	subl 393 d		i aq, alc, eth; d hot HCl
(II) bromide	HgBr ₂	360.40	6.05	237	322 subl	g/100 mL: 0.56 ²⁰ aq; 20 ²⁵ alc; v s HCl, HBr
(I) chloride	Hg ₂ Cl ₂	472.09	7.16	subl 382	d without melting	s aqua regia; i aq, alc, eth
(II) chloride	HgCl ₂	271.50	5.4	277	304	g/100 mL ²⁰ : 7.15 aq, 26 alc, 4 eth 8.3 glyc, 0.5 bz; s HOAc, EtAc
(II) cyanide	Hg(CN) ₂	252.63	4.00	d 320		g/100 mL ²⁰ : 9.3 aq, 25 MeOH, 8 EtOH
(I) fluoride	Hg ₂ F ₂	439.18	8.73	>570 d		hydrolyses in water

(II) fluoride	HgF ₂	238.59	8.95	d 645	d > 650	hyd aq; s HF
(II) fulminate	Hg(ONC) ₂	284.62	4.42	explodes		sl s aq; s alc; dangerously flammable
(I) iodide	Hg ₂ I ₂	654.99	7.70	290 d	subl 140	i aq, alc, eth; s KI
(II) iodide	HgI ₂	454.40	6.28	259	350 subl	g/100 mL: 0.006 ²⁵ aq, 0.8 alc, 0.8 eth, 1.7 acet
(I) nitrate 2-water	Hg ₂ (NO ₃) ₂ · 2H ₂ O	561.22	4.79	70 d		hyd aq; s HNO ₃
(II) nitrate	Hg(NO ₃) ₂	324.60	4.3	79	d	v s aq; s acet
(I) oxide	Hg ₂ O	417.18	9.8	d 100		i aq; s HNO ₃
(II) oxide	HgO	216.59	11.14	d 500		0.005 ²⁵ aq; s dil HCl, HNO ₃ , I ⁻ , CN ⁻
(I) sulfate	Hg ₂ SO ₄	497.24	7.56	d		0.06 ²⁵ aq; s HNO ₃
(II) sulfate	HgSO ₄	296.65	6.47	d		d aq; s acid
(II) sulfide (cinnabar)	HgS	232.66	8.17	subl 583	→ blk HgO, 386	i aq; s aqua regia
(II) thiocyanate	Hg(SCN) ₂	316.76	3.71	d 165		0.063 ²⁵ aq; s HCl
Molybdenum	Mo	95.94	10.28	2622	4825	s hot H ₂ SO ₄ , HNO ₃ , fused KNO ₃
(III) bromide	MoBr ₃	335.65	4.89	subl 977		d alkalis
(IV) chloride	MoCl ₄	237.75		317	407	s conc acids
(V) chloride	MoCl ₅	273.19	2.928	194	268	s conc acids, dry eth, dry alc
(VI) fluoride	MoF ₆	209.93	2.54	17.6	35.0	hyd aq; s alkalis; 31 g/100 g HF
hexacarbonyl	Mo(CO) ₆	264.00	1.96	150 d	subl	s bz
(IV) oxide	MoO ₂	127.94	6.47	d ≈ 1100		i aq
(VI) oxide	MoO ₃	143.94	4.696 ²⁶	801	1155	0.05 ²⁸ aq; s conc mineral acids, alk
(III) sulfide	Mo ₂ S ₃	288.07	5.91 ¹⁵	1807	d 1867	d hot HNO ₃
(IV) sulfide	MoS ₂	160.07	5.06 ¹⁵	2375	subl 450	s aqua regia
Neodymium	Nd	144.24	7.01	1024	3074	s hot aq, acids
chloride	NdCl ₃	250.60	4.134	760	1600	98 g/100 mL ²⁰ aq; s alc
oxide	Nd ₂ O ₃	336.48	7.28	1900		s dilute acids
sulfate 8-water	Nd ₂ (SO ₄) ₃ · 8H ₂ O	720.79	2.85	d 700–800		8.87 g/100 mL ²⁰ aq
Neon	Ne	20.180	0.8999 g/L ⁰	- 248.67	- 246.05	1.05 mL ²⁰ aq
Neptunium	Np	237.0482	20.2	644	> 3900	s HCl
(IV) oxide	NpO ₂	269	11.1	2547		
Nickel	Ni	58.69	8.908 ²⁰	1453	2884	i aq; s HNO ₃
acetate 4-water	Ni(C ₂ H ₃ O ₂) ₂ · 4H ₂ O	248.86	1.744	d		16 g/100 mL aq; s alc
acetylacetonate	Ni(C ₅ H ₇ O ₂) ₂	256.91	1.455 ¹⁷	230	235 ^{11atm}	s aq, alc, bz, chl; i eth
bromide	NiBr ₂	218.50	5.098	963	subl	100 g/100 mL ²⁰ aq
carbonate hydroxide (1/2)	NiCO ₃ · 2Ni(OH) ₂	304.12	2.6			s dilute acids

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Nickel (<i>continued</i>)						
carbonyl	Ni(CO) ₄	170.73	1.31	-19.3	43 (expl 60)	s EtOH, bz, acet
chloride	NiCl	129.60	3.51	1009	subl 973	61 g/100 mL ²⁰ aq
chloride 6-water	NiCl ₂ · 6H ₂ O	237.69				100 g/100 mL ²⁰ aq; s alc
cyanide 4-water	Ni(CN) ₂ · 4H ₂ O	182.79		anhyd 400		0.006 ¹⁸ aq; s KCN, NH ₄ OH
dimethylglyoxime	Ni(HC ₂ H ₆ N ₂ O ₂) ₂	288.92		subl 250		i aq; s abs alc, dilute acids
(<i>tri</i> -) disulfide	Ni ₃ S ₂	240.21	5.87	790	d 2967	s HNO ₃
fluoride	NiF ₂	96.69	4.72	1450	1740	4 g/100 mL ²⁰ aq; i alc, eth
formate 2-water	Ni(CHO ₂) ₂ · 2H ₂ O	184.78	2.154 ²⁰	anhyd 130	d 180-200	s aq; i alc
nitrate 6-water	Ni(NO ₃) ₂ · 6H ₂ O	290.81	2.05	56.7	136.7	150 g/100 mL ²⁰ aq
(II) oxide	NiO	74.71	7.45	2000		s acids
(III) oxide	Ni ₂ O ₃	165.42	4.83	-O ₂ , 600		s hot HCl, HNO ₃ , H ₂ SO ₄
sulfate	NiSO ₄	154.78	3.68	-SO ₃ , 840		29 g/100 mL ⁰ aq
sulfate 6-water	NiSO ₄ · 6H ₂ O	262.86	2.07	anhyd 280		40 g/100 mL ²⁰ aq
sulfide	NiS	90.77	5.3-5.6	976	d 2047	s HNO ₃ , KHS
tetracarbonyl	Ni(CO) ₄	170.74	1.3185 ¹⁷	-19.3	42.3	explodes 63; FP -4; s organic solvents
Niobium	Nb	92.9064	8.57 ²⁰	2468	4860	s fused alkali hydroxides
(V) chloride	NbCl ₅	270.20	2.75	206	247.0	s HCl, CCl ₄
(V) fluoride	NbF ₅	187.91	2.696 ⁸⁰	80.0	234.9	hyd aq, alc; sl s CS ₂ , CCl ₄
(V) oxide	Nb ₂ O ₅	265.82	4.55	1512		s HF, hot H ₂ SO ₄
Nitrogen	N ₂	28.0341	1.165 g/L ²⁰	-210.01	-195.79	mL/100 mL: 1.6 ²⁰ aq, 0.112 alc
	¹⁵ N ₂	30.01	1.25 g/L ²⁰	-209.952	-195.73	
(I) oxide	N ₂ O	44.02	1.843 g/L ²⁰	-90.81	-88.46	130 ⁰ mL aq; s alc, eth
(II) oxide	NO	30.01	1.249 g/L ²⁰	-163.64	-151.76	4.6 mL/100 mL ²⁰ aq
(III) oxide	N ₂ O ₃	76.02	1.447 g/L ²	-100.7	2	s eth
(IV) oxide dimer	N ₂ O ₄	92.02	1.448 ²⁰	-9.3	21.15 d	s conc HNO ₃ , conc H ₂ SO ₄ , chl
(V) oxide	N ₂ O ₅	108.01	2.05	30	47.0	v s chl; s CCl ₄
selenide	N ₄ Se ₄	371.87	4.2	explosive		sl s bz, CS ₂
sulfide	N ₄ S ₄	184.28	2.24 ¹⁸	180	185	s organic solvents
trichloride	NCl ₃	120.37	1.653 ²⁰	-27	71	i aq; s bz, CS ₂ , CCl ₄
trifluoride	NF ₃	70.01	2.96 g/L ²⁰	-208.5	-129.06	

Nitrosyl chloride	NOCl	65.47	1.592 ⁻⁵	-61.5	-5.5	hyd aq; s fuming H ₂ SO ₄
fluoride	NOF	49.01	2.788 g/L ²⁰	-132.5	-59.9	hyd aq
hydrogen sulfate	NOHSO ₄	127.08		d 73.5		d aq; s H ₂ SO ₄
tetrafluoroborate	NO[BF ₄]	116.83	2.185 ₄ ²⁵	subl 250 ^{0.01mm}		d aq
Nitryl chloride	NO ₂ Cl	81.46	2.81 g/L ¹⁰⁰	-145	-14.3	d aq
fluoride	NO ₂ F	65.00	2.7 g/L ²⁰	-166.0	-72.4	d aq
Osmium	Os	190.2	22.61 ²⁰	3045	5225	s molten alkali or oxidizing fluxes
hexafluoride	OsF ₆	304.2		32.1	45.9	hyd aq
tetrachloride	OsCl ₄	332.0	4.38 ₃ ²⁰	subl 450		slow hyd aq
tetraoxide	OsO ₄	254.20	4.91	40.6	130.0	g/100 mL: 7.24 ²⁵ aq; 375 ²⁵ CCl ₄ ; s bz, eth, alc
Oxygen	O ₂	31.9988	1.331 g/L ²⁰	-218.4	-182.96	mL/100 mL ²⁰ : 3.13 aq, 14.3 alc
difluoride	OF ₂	54.00	2.26 g/L ²⁰	-223.8	-145.3	6.8 mL/100 mL ⁰ aq
(<i>di-</i>) difluoride	O ₂ F ₂	70.00	1.45 ^{bp} (lq)	-154	d - 100	
Ozone	O ₃	48.00	1.998 g/L ²⁰	-192.5	-111.9	49.4 mL/100 mL ⁰ aq
Palladium	Pd	106.42	12.023 ²⁰	1555	3167	s hot HNO ₃ , H ₂ SO ₄
acetate	Pd(C ₂ H ₃ O ₂) ₂	224.49		205 d		i aq, alc; s acet, chl, eth
chloride	PdCl ₂	177.30	4.0 ¹⁸	680	d >680	s alc, acet, HCl
nitrate	Pd(NO ₃) ₂	230.42		d		s dil HNO ₃
oxide	PdO	122.40	8.70 ²⁰	879 d		s 48% HBr; sl s aqua regia
Perchloryl fluoride	ClO ₃ F	102.46	0.637 g/L	-147.74	-46.67	
Phosphorus (white)	P ₄ molecules	123.8950	1.823 ²⁵	44.15	280.3	g/100 mL: 2.86 bz, 2.50 chl, 1.25 CS ₂ ; 0.025 abs alc, 1.0 eth
(red)	P ₄	123.8950	2.34	597	subl 416	i aq; ignites in air, 260
hydride, <i>see</i> Phosphine						
pentabromide	PBr ₅	430.56	3.46 ²⁰	106 d		d aq; s CCl ₄ , CS ₂
pentachloride	PCl ₅	208.27	2.119 ²⁰	subl 100	166 d	hyd aq; s CCl ₄ , CS ₂
pentafluoride	PF ₅	125.98	5.805 g/L	-93.8	-84.6	hyd aq
pentoxide (dimer)	P ₄ O ₁₀	283.88	2.30	340	subl 360	d aq; s H ₂ SO ₄
pentasulfide	P ₂ S ₅	222.29	2.09	288	514	hyd aq; s alkali; 0.222 ¹⁷ CS ₂
tribromide	PBr ₃	270.73	2.85 ¹⁵	-41.5	173.2	d aq, alc; s acet, CS ₂
trichloride	PCl ₃	137.35	1.575 ₄ ²⁰	-93.6	76.1	d aq, alc; s bz, chl
trifluoride	PF ₃	87.98	3.907 g/L	-151.30	-101.38	hyd aq
trioxide (dimer)	P ₄ O ₆	219.90	2.136 ₄ ²⁰	23.8	173 (N ₂ atm)	hyd aq; s bz, CS ₂
(<i>tetra-</i>) triselenide	P ₄ Se ₃	360.80	1.31	245-246	360-400	flammable in air; s bz, acet, chl, CS ₂
(<i>tetra-</i>) trisulfide	P ₄ S ₃	220.09	2.03 ¹⁷	167	407	100 g/100 mL ¹⁷ CS ₂ ; s toluene

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Phosphine	PH ₃	34.00	1.529 g/L	− 133.81	− 87.78	mL/100 mL ¹⁷ : 1025 CS ₂ , 726 bz, 319 HOAc, 26 aq; s alc, eth
Phosphonium iodide	PH ₄ I	161.91	2.86	18.5	subl 62.5	d aq
Phosphoryl chloride difluoride	POClF ₂	120.43	1.656 ⁰	− 96.4	3.1	
dichloride fluoride	POCl ₂ F	136.89	1.5497 ²⁰	− 80.1	52.90	
tribromide	POBr ₃	286.72	2.822	56	191.7 d	s bz, CS ₂ , eth
trichloride	POCl ₃	153.35	1.645 ²⁵	1.25	105	d aq, alc
Platinum	Pt	195.08	21.09 ²⁰	1769	3824	s aqua regia, fused alkali
(II) chloride	PtCl ₂	266.00	5.87	d 581		i aq, alc; s HCl, NH ₄ OH
(IV) chloride	PtCl ₄	336.90	4.303 ²⁵	d 370		143 g/100 mL ²⁵ aq
(VI) fluoride	PtF ₆	309.08	3.826 (lq)	61.3	69.14	
(II) oxide	PtO	211.09	14.9 ¹⁵	d 550		i aq; s HCl
(IV) oxide	PtO ₂	227.09	10.2	450		i aqua regia
(IV) sulfide	PtS ₂	259.22	7.66	d 225		s HCl, HNO ₃
Plutonium	Pu	239.052	19.816 ²⁰	639.5	3230	i aq; s acids
(III) bromide	PuBr ₃	478.79	6.69	681	d > 1300	s aq
(III) chloride	PuCl ₃	345.42	5.70	760	1767	i aq; v s acids
(III) fluoride	PuF ₃	296.06	9.32	1425	d 2000	hyd aq
(IV) fluoride	PuF ₄	315.05	7.00	1037 d		i aq
(VI) fluoride	PuF ₆	353.05	4.86	51.59	62.16	
(II) hydride	PuH ₂	241.08	10.40	ca. 727		
(III) hydride	PuH ₃	242.08	9.61	ca. 327		
(II) oxide	PuO	255.05	13.9	1900		
(III) oxide	Pu ₂ O ₃	526.12	10.2	2085 (in He)		
(IV) oxide	PuO ₂	271.05	11.46	2390 (in He)	d 2800	
(III) sulfide	Pu ₂ S ₃	574.30	9.95	1727		
Polonium	Po	208.9824	9.196 alpha 9.398 beta	254	962	sl s aq; s acids
(IV) chloride	PoCl ₄	350.79		300 (in Cl ₂)	390 (in Cl ₂)	sl hyd aq; v s HCl; s alc, acet
(IV) oxide	PoO	240.98	d 550			v s dilute HCl

Potassium acetate	K KC ₂ H ₃ O ₂	39.0983 98.14	0.89 1.57	63.38 292	759	d aq to KOH; s acids g/100 mL: 200 aq, 34 alc
arsenate	K ₃ AsO ₄	256.21	2.8	1310		19 g/100 mL aq; slowly s glyc; s alc
borate(1-)	KBO ₂	81.91		947	1401	71 g/100 mL ²⁰ aq
bromate	KBrO ₃	167.00	3.27	≈350	d 370	6.9 g/100 mL ²⁰ aq
bromide	KBr	119.00	2.75	734	1435	g/100 mL: 65 ²⁰ aq, 22 glyc, 0.4 alc
carbonate	K ₂ CO ₃	138.21	2.29	901	d to K ₂ O	90 g/100 mL ²⁰ aq; i alc
chlorate	KClO ₃	122.55	2.32	368	d >400	g/100 mL: 7.3 ²⁰ aq, 2 glyc
chloride	KCl	74.55	1.988	771	1437	g/100 mL: 34 ²⁰ aq, 7 glyc, 0.4 alc
chromate(VI)	K ₂ CrO ₄	194.19	2.732	975		64 g/100 mL ²⁰ aq; i alc
citrate hydrate	K ₃ C ₆ H ₅ O ₇ · H ₂ O	324.42	1.98	anhyd 180	d 230	g/100 mL: 154 aq; 40 glyc
cyanate	KOCN	81.11	2.05	d ≈700		s aq; sl s alc
cyanide	KCN	65.12	1.55	634	1625	g/100 mL: 50 aq, 50 glyc, 4 MeOH
dichromate(VI)	K ₂ Cr ₂ O ₇	294.19	2.676 ₄ ²⁵	398	d 500	11.7 g/100 mL ²⁰ aq
dicyanoargentate(I)	K[Ag(CN) ₂]	199.01	2.36			25 g/100 mL ²⁰ aq
dihydrogen arsenate	KH ₂ AsO ₄	180.03	2.867	288		g/100 mL: 19 ⁶ aq, 63 glyc; i alc
dihydrogen phosphate	KH ₂ PO ₄	136.09	2.338	d 400 (KPO ₃)		22.6 g/100 mL ²⁰ aq; i alc
dioxide	KO ₂	71.10	2.14	509	d	v s aq with decomposition
diphosphate(V) 3-water	K ₄ P ₂ O ₇ · 3H ₂ O	384.38	2.33	anhyd 300	mp: 1090	s aq; i alc
disulfate(IV)	K ₂ S ₂ O ₅	222.32				s aq; flammable if ground
disulfate(VI) (pyrosulfate)	K ₂ S ₂ O ₇	254.32	2.28	≈325		s aq
ethyldithiocarbonate	KOCSSC ₂ H ₅	160.30	1.558	d 200		v s aq
fluoride	KF	58.10	2.48	859.9	1505	95 g/100 mL ²⁰ aq
formate	KCHO	84.12	1.91	167.5	d >mp	250 g/100 mL aq
gluconate	KC ₆ H ₁₁ O ₇	234.25		d 180		v s aq; i alc, bz, chl
heptaiodobismuthate(III)(4-)	K ₄ [BiI ₇]	1253.82				d aq; s alkali iodide solutions
hexachloroplatinate(IV)	K ₂ [PtCl ₆]	485.99	3.50	d 250		0.48 ²⁰ aq
hexacyanoferrate(II) 3-water	K ₄ [Fe(CN) ₆] · 3H ₂ O	422.39	1.85	anhyd 100	d	28 g/100 mL ²⁰ aq
hexacyanoferrate(III)	K ₃ [Fe(CN) ₆]	329.25	1.89	d		40 g/100 mL ²⁰ aq (slow); sl s alc
hexafluorosilicate	K ₂ [SiF ₆]	220.27	2.27	d		sl s aq; i alc
hexafluorozirconate	K ₂ [ZrF ₆]	283.41	3.58			2.7 g/100 mL ²⁰ aq
hexanitrocobaltate(III) 1.5-water	K ₃ [Co(NO ₂) ₆] · 1.5H ₂ O	479.30		d 200		0.089 ¹⁸ aq; s HOAc; v sl s alc
hydride	KH	40.11	1.43	417 d		d aq
hydrogen carbonate	KHCO ₃	100.11	2.17	d >100		34 g/100 mL ²⁰ aq; i alc

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Potassium (<i>continued</i>)						
hydrogen difluoride	KHF	78.10	2.37	238.80	d 477	39 g/100 mL ²⁰ aq; s alc
hydrogen phosphate	K ₂ HPO ₄	174.18		d to K ₂ P ₂ O ₇		150 g/100 mL aq
hydrogen phthalate	KHC ₈ H ₄ O ₄	204.22	1.636	d		8.3 g/100 mL aq; sl s alc
hydrogen sulfate	KHSO ₄	136.17	2.24	197	d to K ₂ S ₂ O ₇	48 g/100 mL ²⁰ aq
hydrogen sulfide	KHS	72.17	1.70	≈455		s aq, alc
hydrogen tartrate	KHC ₄ H ₂ O ₆	188.18	1.956			0.5 ²⁰ aq; s acids; v sl s alc
hydroxide	KOH	56.11	2.044	406	1323	g/100 mL: 112 ²⁰ aq, 33 alc, 40 glyc
iodate	KIO ₃	214.00	3.89	560 d		8.1 g/100 mL ²⁰ aq; i alc
iodide	KI	166.00	3.12	681	1345	g/100 mL: 144 ²⁰ aq, 4.5 alc, 50 glyc
manganate(VI)	K ₂ MnO ₄	197.13		190 d		s aq; stable in KOH
molybdate(VI)	K ₂ MoO ₄	238.14	2.3	919	d 1400	160 g/100 mL aq
nitrate	KNO ₃	101.10	2.11	333	d 400	g/100 mL: 32 ²⁰ aq, 0.16 alc, s glyc
nitrite	KNO ₂	85.10	1.915	441	d 350	306 g/100 mL ²⁰ aq; sl s alc
oxalate hydrate	K ₂ C ₂ O ₄ · H ₂ O	184.23	2.13	anhyd 160	d to K ₂ CO ₃	36 g/100 mL ²⁰ aq
oxide	K ₂ O	94.20	2.35	350 d		d aq to KOH, s alc
oxobisoxalatoquadiaquatitanate(IV)	K ₂ [TiO(C ₂ O ₄) ₂ (H ₂ O) ₂]	354.18				v s aq
perchlorate	KClO ₄	138.55	2.52	d 400		2.04 ²⁵ aq; 0.0036 ²⁵ BuOH; 0.0013 EtOAc
periodate	KIO ₄	230.010	3.618	582		0.42 ²⁰ aq, sl s KOH
permanganate	KMnO ₄	158.03	2.7	d 240 → O ₂		6.34 g/100 mL ²⁰ aq; d HCl
peroxide	K ₂ O ₂	110.20		490		d aq
peroxodicarbonate hydrate	K ₂ C ₂ O ₆ · H ₂ O	216.24				6.5 g/100 mL aq; d hot aq
peroxodisulfate	K ₂ S ₂ O ₈	270.32	2.48	d 100		2.5 g/100 mL ²⁰ aq; i alc
perrhenate	KReO ₄	289.30	4.38	555	1370	0.99 ²⁰ aq
phenolsulfonate hydrate	KC ₆ H ₄ (OH)SO ₃ · H ₂ O	240.28	1.87			s aq, alc
phosphate	K ₃ PO ₄	212.27	2.564 ¹⁷	1340		50.8 g/100 mL ²⁰ aq; i alc
selenocyanate	KSeCN	144.08		d 100		s aq
silicate(2-)	K ₂ SiO ₃	154.29		976		s aq
sodium hexanitritocobaltate(III) hydrate	K ₂ Na[Co(NO ₂) ₆] · H ₂ O	454.18	1.633	d 135		0.07 aq

sodium tartrate 4-water	$\text{KNaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$	282.23	1.790	70–80	anhyd 130–140	54 g/100 mL ¹⁵ aq
sorbate	$\text{KC}_6\text{H}_7\text{O}_2$	150.22	1.363 ²⁵ ₂₀	d > 270		g/100 mL: 58.2 ²⁰ aq, 6.5 alc
stannate(IV) 3-water	$\text{K}_2\text{SnO}_3 \cdot 3\text{H}_2\text{O}$	298.94	3.197	anhyd 140		100 g/100 mL ²⁰ aq; i alc
stearate	$\text{KOOCC}_{17}\text{H}_{35}$	322.57				readily soluble hot aq or alc
sulfate	K_2SO_4	174.26	2.66	1069	1670	g/100 mL: 11 ²⁰ aq, 1.3 glyc, i alc
sulfide	K_2S	110.26	1.74	948		
sulfite 2-water	$\text{K}_2\text{SO}_3 \cdot 2\text{H}_2\text{O}$	194.29		d		28.6 g/100 mL ²⁰ aq
tartrate hemihydrate	$\text{K}_2\text{C}_4\text{H}_4\text{O}_6 \cdot 0.5\text{H}_2\text{O}$	235.28	1.98	anhyd 155	d 200	138 g/100 mL ²⁰ aq
tellurate(IV)	K_2TeO_3	253.79				s aq
tetrachloroaurate(III)	$\text{K}[\text{AuCl}_4]$	377.88	3.75	d 357		61.8 g/100 mL ²⁰ aq
tetrafluoroborate	$\text{K}[\text{BF}_4]$	125.90	2.505 ²⁰ ₄	530		0.45 ²⁰ aq
tetrahydridoborate	$\text{K}[\text{BH}_4]$	53.94	1.11	d 497		g/100 mL: 21 ²⁵ aq, 3.5 ²⁰ MeOH
tetraiodocadmte 2-water	$\text{K}_4[\text{CdI}_4] \cdot 2\text{H}_2\text{O}$	698.21	3.359 ²¹			g/100 mL: 137 ¹⁵ aq, 71 ¹⁵ alc, 4 eth
tetraiodomercurate(II)	$\text{K}_2[\text{HgI}_4]$	786.48				v s aq; s alc, acet, eth
thiocyanate	KSCN	97.18	1.89	173	d 500	g/100 mL: 217 ²⁰ aq, 200 acet, 8 alc
thiosulfate	$\text{K}_2\text{S}_2\text{O}_3$	190.33		d 400		155 g/100 mL ²⁰ aq; i alc
trihydrogen bisoxalate 2-water	$\text{KH}_3(\text{C}_2\text{O}_4) \cdot 2\text{H}_2\text{O}$	254.20	1.836	d		1.8 aq
trisoxalatoantimonate(III)	$\text{K}_3[\text{Sb}(\text{C}_2\text{O}_4)_3]$	503.12				a aq
trithiocarbonate	K_2CS_3	186.41		d		v s aq
uranyl(VI) acetate hydrate	$\text{K}(\text{UO}_2)(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot \text{H}_2\text{O}$	504.28	3.296 ¹⁵	anhyd 275		s aq
Praseodymium	Pr	140.9077	6.475 α -form	935	3520	s hot water and acids
chloride	PrCl_3	247.27	4.0	769 to 782	1710	104 g/100 mL ¹³ aq; s alc
(III) oxide	Pr_2O_3	329.81	7.07	oxidizes to Pr_6O_{11}		i aq; s acids
(IV)	PrO_2	172.91	6.82	tr 350 to Pr_6O_{11}		
Promethium-147	Pm	146.915	7.22	1080	3000 est	
bromide	PmBr_3	386.7	5.38	727	1667	s aq
chloride	PmCl_3	153.4		737	1670	s aq
Protoactinium	Pa	231.0359	15.37	1568(8)	4227	
(IV) chloride	PaCl_4	372.85	4.72	subl 400		i aq; s HCl
(V) chloride	PaCl_5	408.31	3.74	301	420	hyd aq; s THF, CH_3CN
Radium	Ra	226.03	5.5	700.1	1737	d aq; s acids
bromide	RaBr_2	385.88	5.79	728	subl 900	s aq
chloride	RaCl_2	296.93	4.91	1000		s aq
Radon	Rn	222.0	9.73 g/L	– 71	– 62	23 mL/100 mL ²⁰ aq; s org solv

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Rhenium	Re	186.207	21.02	3180	5678	s HNO ₃
chloride trioxide	ReClO ₃	269.66		4.5	128	hyd in water to HReO ₄ ; s CCl ₄
(IV) fluoride	ReF ₄	262.20	5.38	124.5	795	hyd aq
(VI) fluoride	ReF ₆	300.20	3.58	18.5	33.8	52.5 g/100 mL anhyd HF; s HNO ₃
(VII) fluoride	ReF ₇	319.20	3.65	48.3	73.7	hyd aq
(VI) oxide	ReO ₃	234.20	6.9–7.4	disprop 400	750	s HNO ₃
(VII) oxide	Re ₂ O ₇	484.41	6.1	300.3	360.3	v s aq, org solv
(VII) sulfide	Re ₂ S ₇	596.88	4.866	d 460		i aq; s HNO ₃
(VI) tetrachloride oxide	ReCl ₄ O	344.02	3.309	29.3	225	hyd aq; s CCl ₄
Rhodium	Rh	102.9055	12.41 ²⁰	1963	3727	s fused KHSO ₄
(III) chloride	RhCl ₃	209.26	5.38	d 450		i aq; s KOH, KCN
(III) fluoride	RhF ₃	159.90	5.4	subl 600		i acids, alkalis
(III) oxide	Rh ₂ O ₃	253.81	8.20	d 1100		i aq reg, KOH
tetracarbonyldi- μ -chloro-dichloride	Rh ₂ (CO) ₄ Cl ₂	388.76		124–125		s org solv except hydrocarbons
Rubidium	Rb	85.4678	1.532	39.31	691	d aq to RbOH
acetate	RbC ₂ H ₃ O ₂	144.52		246		86 g/100 mL ⁴⁵ aq
bromide	RbBr	165.37	3.35	682	1346	108 g/100 mL ²⁰ aq
carbonate	Rb ₂ CO ₃	230.95		837	d 900	g/100 mL: 450 ²⁰ aq, 0.74 ₁₉ alc
chlorate	RbClO ₃	168.94	3.184	342		5.4 g/100 mL ²⁰ aq
chloride	RbCl	120.92	2.76	715	1390	g/100 mL: 91 ²⁰ aq, 1.1 MeOH
dihydrogen phosphate	RbH ₂ PO ₄	182.47		840		s aq
fluoride	RbF	104.47	3.2	833	1410	131 g/100 mL ¹⁸ aq
hexachloroplatinate(IV)	Rb ₂ [PtCl ₆]	578.75	3.94	d		0.028 ²⁰ aq
hydroxide	RbOH	102.47	3.20	301		180 g/100 mL ¹⁸ aq; s alc
iodide	RbI	212.37	3.55	642	1304	163 g/100 mL ²⁵ aq; s alc
nitrate	RbNO ₃	147.47	3.11	305		19.5 g/100 mL ²⁰ aq
oxide	Rb ₂ O	186.93	4.0	400 d		s aq → RbOH
sulfate	Rb ₂ SO ₄	267.00	3.5	1050		48 g/100 mL ²⁰ aq
Ruthenium	Ru	101.07	12.45 ²⁰	2334	4150	s fused alkali, oxidizing fluxes
(III) chloride (hexagonal)	RuCl ₃	207.43	3.11	d >500		i aq; s HCl, alc
(V) fluoride	RuF ₅	196.06	3.90	86.5	227	d aq
(IV) oxide	RuO ₂	133.07	6.97	d		i aq; s fused alkali

Samarium	Sm	150.36	7.52	1074	1794	s acids
(II) chloride	SmCl ₂	221.27	3.687	855	2030	s aq dec; i alc
(III) chloride	SmCl ₃	256.72	4.46	682	d	93.4 g/100 mL ²⁰ aq
(III) fluoride	SmF ₃	207.36	6.643	1306	2427	i aq; s H ₂ SO ₄
(III) oxide	Sm ₂ O ₃	348.72	8.347	2335		s acids
(III) sulfate 8-water	Sm ₂ (SO ₄) ₃ · 8H ₂ O	733.03	2.93	anhyd 450		2.7 g/100 mL ²⁰ aq
Scandium	Sc	44.956	2.985 hex	1541	2836	d aq
chloride	ScCl ₃	151.31	2.39	967	967	v s aq; i alc
oxide	Sc ₂ O ₃	137.91	3.864	2485		s hot or conc acids
sulfate 5-water	Sc ₂ (SO ₄) ₃ · 5H ₂ O	468.17	2.519	anhyd 250	d 550	54.6 g/100 mL ²⁵ aq
Selenium (hexagonal)	Se	78.96	4.81 ₄ ²⁰	217	685	s eth, KOH, KCN; i aq, alc
(IV) bromide	SeBr ₄	398.58	4.029	123		d aq; s HBr, chl, CS ₂
(IV) chloride	SeCl ₄	220.77	2.6	305	subl 196	d aq
(di-) dibromide	Se ₂ Br ₂	317.73	3.604 ₄ ¹⁵		225 d	d aq; s chl, CS ₂
dibromide oxide	SeBr ₂ O	254.77	3.38 ²⁰	41.6	217 d	d aq
(di-) dichloride	Se ₂ Cl ₂	228.83	2.774 ₄ ²⁵	- 85	127 dec	d aq; s bz, chl, CS ₂
dichloride oxide	SeCl ₂ O	165.867	2.44	8.5	177.2	d aq; misc bz, chl, CCl ₄ , CS ₂
difluoride oxide	SeF ₂ O	132.96	2.8	15	125	d aq
(IV) fluoride	SeF ₄	154.95	2.75	- 10	106	reacts aq viol; misc alc, eth; s chl
(VI) fluoride	SeF ₆	192.95	8.467 g/L	- 34.6		
(di-) hexasulfide	Se ₂ S ₆	350.32	2.44	121.5		s CS ₂ ; 1.2 g/100 mL ²⁰ bz
(IV) oxide	SeO ₂	110.96	3.95	340	subl 315	w/w %: 38 ¹⁴ aq, 10 ¹² MeOH, 4.35 acet, 6.7 ¹⁴ EtOH, 1.1 ¹² HOAc; s H ₂ SO ₄
(tetra-) tetrasulfide	Se ₄ S ₄	444.10	3.20	113 d		i aq; 0.04 g/100 mL ²⁰ bz; s CS ₂
Silane	SiH ₄	32.12	1.409 g/L	- 185	- 111.9	d aq slowly; i alc, bz, chl, eth
chloro-	SiH ₃ Cl	66.56	2.921 g/L	- 118	- 30.4	
dichloro-	SiH ₂ Cl ₂	101.01	4.432 g/L	- 122	8.3	d aq
iodo-	SiH ₃ I	158.01	2.035	- 57	45.5	d aq
trichloro-	SiHCl ₃	135.45	1.331	- 128	33	d aq; s bz, chl
Silicon	Si	28.0855	2.33	1412	3265	s HF + HNO ₃ , fused alkali oxides
carbide (beta)	SiC	40.10	3.16	2830		s fused alkali oxides
dioxide (α quartz)	SiO ₂	60.08	2.648	573 tr	2950	i aq; s HF
				β quartz		
dioxide - tungsten trioxide - water (silicotungstic acid)	SiO ₂ · 12WO ₃ · 26H ₂ O	3310.66				v s aq, alc
disulfide	SiS ₂	92.22	2.04	1090		s d aq, alc; i bz

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Silicon (<i>continued</i>)						
tetrabromide	SiBr ₄	347.70	2.81	5.2	154	hyd aq viol
tetrachloride	SiCl ₄	169.90	1.5	-68.8	57.6	hyd aq; s bz, CCl ₄ , eth
tetrafluoride	SiF ₄	104.08	4.567 g/L	-90.3	-86	hyd aq; s HF
tetraiodide	SiI ₄	535.70	4.1	120.5	287.3	d aq; 2.2 g/100 mL ²⁷ CS ₂
(<i>tri</i> -) tetranitride	Si ₃ N ₄	140.28	3.17	1878		i aq; s HF
Silver	Ag	107.8682	10.49	961.78	2164	s HNO ₃
acetate	AgC ₂ H ₃ O ₂	166.91	3.259	d		1.04 ²⁰ aq; s dil HNO ₃
antimonide	Ag ₃ Sb	445.35		559		
azide	AgN ₃	149.89	4.9	exp ~252		i aq; s KCN, HNO ₃ (explosive)
bromide	AgBr	187.77	6.473	432	1500	i aq; s KCN
carbonate	Ag ₂ CO ₃	275.75	6.077	218		0.003 ²⁰ aq; s KCN, HNO ₃ , NH ₄ OH
chlorate	AgClO ₃	191.32	4.430 ²⁰	231	d 270	10 g/100 mL ¹⁵ aq
chloride	AgCl	143.32	5.56	455	1547	i aq; 7.7 g/100 mL NH ₄ OH, KCN, Na ₂ S ₂ O ₃
chromate(VI)	Ag ₂ CrO ₄	331.73	5.625 ²⁵			0.002 ²⁰ aq; s HNO ₃ , NH ₄ OH
cyanide	AgCN	133.89	3.95	320 d		i aq; s KCN
fluoride	AgF	126.87	5.852	435	≈1150	182 g/100 mL ²⁰ aq; s HF, CH ₃ CN
(II) fluoride	AgF ₂	145.87	4.57	690	d 700	hyd viol aq
iodate	AgIO ₃	282.77	5.525 ²⁰	>200	d	0.053 ²⁵ aq; 40 g/100 mL 10% NH ₄ OH
iodide (alpha)	AgI	234.77	5.683 ³⁰	558	1505	i aq; s KCN, KI, (NH ₄) ₂ CO ₃
nitrate	AgNO ₃	169.87	4.352 ¹⁹	212	d 440	g/100 mL: 216 ²⁰ aq, 3.3 alc, 0.4 acet
nitrite	AgNO ₂	153.87	4.453	d >140		0.33 ²⁵ aq; d dilute acids
oxalate	Ag ₂ C ₂ O ₄	303.76	5.03 ⁴	explodes 140		0.004 ²⁰ aq; s HNO ₃ , NH ₄ OH
oxide	Ag ₂ O	231.73	7.22 ²⁵	d 200 (d light)		0.002 ²⁵ aq; s dil HNO ₃ , NH ₄ OH
(II) oxide	AgO	123.87	7.483 ²⁵	d >100		i aq; d alk and acids
perchlorate	AgClO ₄	207.32	2.806 ²⁵	d 486		557 g/100 mL ²⁰ aq; s bz, glyc, pyr
permanganate	AgMnO ₄	226.80	4.49	d by light		0.9 aq; d alc

phosphate	Ag_3PO_4	418.62	6.37	849		0.006 aq; v s dil HNO_3 , KCN, $(\text{NH}_4)_2\text{CO}_3$
selenate(IV)	Ag_2SeO_3	342.69	5.93	530	d > 530	sl s aq; s HNO_3
sulfate	Ag_2SO_4	311.80	5.45	660	d 1085	0.80 ²⁰ aq (slow); s HNO_3 , NH_4OH , H_2SO_4
sulfide (agentite)	Ag_2S	247.80	7.234 ²⁰	845	d	i aq; s HNO_3 , alk CN's
Sodium	Na	22.98977	0.968 ²⁰	97.82	881.4	d aq to NaOH
acetate	$\text{NaC}_2\text{H}_3\text{O}_2$	82.03	1.528	324		75 g/100 mL ²⁰ aq
acetate 3-water	$\text{NaC}_2\text{H}_3\text{O}_2 \cdot 3\text{H}_2\text{O}$	136.08	1.45	anhyd 120	d > 120	g/100 mL: 125 ²⁰ aq, 5.1 alc
aluminate(1-)	NaAlO_2	81.97	4.63	1650		v s aq; i alc
aluminum sulfate 12-water	$\text{NaAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$	458.28	1.61	- 60		110 g/100 mL ¹⁵ aq; i alc
amide	NaNH_2	39.01	1.39	210	subl 400	d > 500, reacts aq viol
ammonium phosphate 4-water	$\text{NaNH}_4\text{HPO}_4 \cdot 4\text{H}_2\text{O}$	209.07	1.54	≈ 80	anhyd > 280	14.3 g/100 mL aq
arsenate(III)(1-)	NaAsO_2	129.91	1.87			v s aq; sl s alc
ascorbate	$\text{NaC}_6\text{H}_7\text{O}_6$	198.11		d 218		62 g/100 mL ²⁰ aq
azide	NaN_3	65.01	1.846 ²⁰	d to Na + N ₂		41 g/100 mL ²⁰ aq; 0.3 alc
benzoate	$\text{NaO}_2\text{C}_6\text{H}_5$	144.11				g/100 mL: 63 ²⁵ aq; 1.3 alc
bismuthate(V)(1-)	NaBiO_3	279.96		d		i cold aq; dec by hot aq & acids
bismuthide	Na_3Bi	277.95		766		d aq
bromate	NaBrO_3	150.89	3.34	381 d		40 g/100 mL ²⁰ aq; i alc
bromide	NaBr	102.89	3.200 ²⁰	755	1390	g/100 mL: 90 ²⁰ aq, 6 alc; 16 MeOH
carbonate	Na_2CO_3	105.99	2.533 ²⁰	858.1	d	29 g/100 mL ²⁰ aq; s glyc; i alc
carbonate hydrate	$\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$	124.00	2.25	anhyd 100		g/100 mL: 33 aq, 14 glyc; i alc
carbonate 10-water	$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$	286.14	1.46	34 d		50 g/100 mL aq; s glyc
carbonate - hydrogen	$\text{Na}_2\text{CO}_3 \cdot \text{NaHCO}_3$	226.02	2.112			13 g/100 mL ⁰ aq
carbonate 2-water (trona)	$\cdot 2\text{H}_2\text{O}$					
chlorate(V)	NaClO_3	106.44	2.5	248	d > 300 → O ₂	g/100 mL: 96 ²⁰ aq, 0.77 alc, 25 glyc
chloride	NaCl	58.44	2.17	800.8	1465	g/100 mL: 36 ²⁰ aq, 10 glyc
chlorite	NaClO_2	90.44		d 180-200		34 g/100 mL ¹⁷ aq
chromate(VI)	Na_2CrO_4	161.97	2.72	792		84 g/100 mL ²⁰ aq
citrate 2-water	$\text{Na}_3\text{C}_6\text{H}_5\text{O}_7 \cdot 2\text{H}_2\text{O}$	294.10		anhyd 150		77 g/100 mL ²⁵ aq; i alc
cyanate	NaOCN	65.01	1.89	550		s aq d; 0.22 ⁰ alc
cyanide	NaCN	49.01	1.6	563		58.7 g/100 mL ²⁰ aq
cyanohydrindoborate	$\text{Na}[\text{BH}_3\text{CN}]$	62.84	1.12	> 240 d		g/100 mL: 212 aq, 37.2 THF; v s NaOH; i bz, eth

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Sodium (<i>continued</i>)						
dichromate 2-water	$\text{Na}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$	298.00	2.348 ₄ ²⁵	anhyd 100; mp 356	d 400	73.1 g/100 mL ²⁰ aq
diethyldithiocarbamate	$\text{NaS}_2\text{CN}(\text{C}_2\text{H}_5)_2 \cdot 3\text{H}_2\text{O}$	225.31		anhyd 94–96		s aq, alc
dihydrogen arsenate(V)	$\text{NaH}_2\text{AsO}_4 \cdot \text{H}_2\text{O}$	181.94	2.53	anhyd 130	d 200	s aq
hydrate						
dihydrogen diphosphate(V)	$\text{Na}_2\text{H}_2\text{P}_2\text{O}_7$	221.94	1.9	d 220		4.5 g/100 mL ⁰ aq
dihydrogen phosphate(V)	$\text{NaH}_2\text{PO}_4 \cdot 2\text{H}_2\text{O}$	156.01	1.91	anhyd 100	d NaPO_3 , 200	71 g/100 mL ⁰ aq; i alc
dihydrate						
dimethylarsenate 3-water	$\text{NaO}_2\text{As}(\text{CH}_3)_2$	214.03		anhyd 120		g/100 mL: 200 aq, 40 alc
(cacodylate)						
dioxide	NaO_2	54.99		552		
diphosphate(V)	$\text{Na}_4\text{P}_2\text{O}_7$	265.90	2.53	988		2.26 ⁰ aq
dithionate(V) 2-water	$\text{Na}_2\text{S}_2\text{O}_6 \cdot 2\text{H}_2\text{O}$	242.14	2.19	anhyd 110	d 267 to $\text{Na}_2\text{SO}_4 + \text{SO}_2$	13.4 g/100 mL ²⁰ aq; i alc
dithionate(III)	$\text{Na}_2\text{S}_2\text{O}_4$	174.11		d		22 g/100 mL ²⁰ aq; sl s alc
diuranate(VI)	$\text{Na}_2\text{U}_2\text{O}_7$	634.03				i aq; s acids
dodecylbenzenesulfonate	$\text{NaO}_3\text{SC}_6\text{H}_4\text{C}_{12}\text{H}_{25}$	348.49				
dodecylsulfate	$\text{NaO}_3\text{SOC}_{12}\text{H}_{25}$	288.38				10 g/100 mL aq
ethoxide	NaOC_2H_5	68.06		>300		d aq; s abs alc
ethylenebis(imino-diacetate) (EDTA)	$(\text{NaOOCCH}_2)_2\text{NC}_2\text{H}_4\text{-N}(\text{CH}_2\text{COONa})_2$	380.20				103 g/100 mL aq
ethylsulfate	$\text{NaO}_3\text{SOC}_2\text{H}_5$	148.12				140 g/100 mL aq; s alc
fluoride	NaF	41.99	2.78	996	1704	4 g/100 mL ¹⁵ aq; i alc
formate	NaHCO_2	68.01	1.92	253	d >253	81 g/100 mL ²⁰ aq; s glyc; sl s alc
gluconate	$\text{NaC}_6\text{H}_{11}\text{O}_7$	218.14				59 g/100 mL ²⁵ aq; sl s alc; i eth
glycerophosphate	$\text{Na}_2\text{C}_3\text{H}_5(\text{OH})_2\text{PO}_4$	216.04		d >130		67 g/100 mL aq; i alc
hexachloroplatinate(IV)	$\text{Na}_2[\text{PtCl}_6] \cdot 6\text{H}_2\text{O}$	561.88	2.50	–6H ₂ O, 110		v s aq; s alc
6-water						

hexacyanoferrate(II) 10-water	$\text{Na}_4[\text{Fe}(\text{CN})_6] \cdot 10\text{H}_2\text{O}$	484.06	1.46	anhyd 82	d 435	28 g/100 mL ²⁰ aq
hexacyanoferrate(III) hy- drate	$\text{Na}_3[\text{Fe}(\text{CN})_6] \cdot \text{H}_2\text{O}$	298.93				18.9 g/100 mL ⁰ aq
hexafluoroaluminate	$\text{Na}_3[\text{AlF}_6]$	209.94	2.97	1009		s aq
hexanitrocobaltate(III) hydride	$\text{Na}_3[\text{Co}(\text{NO}_2)_6]$ NaH	403.98 24.00				v s aq; sl s alc
hydrogen arsenate(V) 7-water	$\text{Na}_2\text{HAsO}_4 \cdot 7\text{H}_2\text{O}$	312.01	1.87	anhyd 130	d 150	ign spontaneously moisture; d alc viol
hydrogen carbonate	NaHCO_3	84.01	2.20	to Na_2CO_3	270	61 g/100 mL ¹⁵ aq; s glyc; sl s alc
hydrogen difluoride	NaHF_2	62.00	2.08	d > 160		8 g/100 mL ²⁰ aq; i alc
hydrogen phosphate 7-water	$\text{Na}_2\text{HPO}_4 \cdot 7\text{H}_2\text{O}$	268.07	1.7	d		3.7 g/100 mL ²⁰ aq
hydrogen sulfate	NaHSO_4	120.06	2.435	315	d	25 g/100 mL ⁴⁰ aq; v sl s alc
hydrogen sulfide	NaHS	56.06	1.79	350		50 g/100 mL ²⁰ aq; d alc
hydrogen sulfite	NaHSO_3	104.06	1.48	d		s aq, alc, eth
hydroxide	NaOH	40.00	2.130	323	1388	g/100 mL: 29 aq, 1.4 alc
hydroxymethanesulfinate dihydrate	$\text{Na}[\text{HOCH}_2\text{SO}_2] \cdot 2\text{H}_2\text{O}$	154.12		63–64	d > 64	g/100 mL: 108 ²⁰ aq, 14 abs alc, 24 MeOH; s glyc
hypochlorite 5-water	$\text{NaClO} \cdot 5\text{H}_2\text{O}$	164.52	1.6	18	d by CO_2 from air	v s aq; i abs alc, bz, eth
iodate	NaIO_3	197.89	4.28	d		29 g/100 mL ⁰ aq
iodide	NaI	149.89	3.67	660	1304	8.1 g/100 mL ²⁰ aq
lactate	NaOOCCHOHCH_3	112.06		d		g/100 mL: 200 ²⁰ aq, 100 glyc, 50 alc; s acet
methoxide	NaOCH_3	54.02		> 300		misc aq, alc
molybdate(VI) 2-water	$\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$	241.95	≈ 3.5	anhyd 100	mp 687	d aq; s alc
nitrate	NaNO_3	85.00	2.26	307	d ≈ 500	65 g/100 mL ²⁰ aq
nitrite	NaNO_2	69.00	2.17	271	d > 320	g/100 mL: 88 ²⁰ aq, 0.8 alc
oxalate	$\text{Na}_2\text{C}_2\text{O}_4$	134.00	2.34	d ≈ 250		67 g/100 mL ²⁰ aq
oxide	Na_2O	61.98	2.27	dull red heat	d > 400	3.4 g/100 mL ²⁰ aq; i alc
pentacyanonitrosylfer- rate(III) 2-water (nitro- prusside)	$\text{Na}_2[\text{Fe}(\text{CN})_5\text{NO}] \cdot 2\text{H}_2\text{O}$	297.65	1.72			d aq to NaOH violently
						40 g/100 mL ¹⁶ aq

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Sodium (<i>continued</i>)						
perchlorate	NaClO ₄	122.44	2.52	480 d		g/100 mL ²⁵ ; 114 aq, 1.5 BuOH, 8.4 EtOAc
periodate	KIO ₄	213.89	3.865	d ≈ 300		10.3 g/100 mL ²⁰ aq
peroxide	Na ₂ O ₂	77.98	2.805	675	d	v s aq (dec)
peroxoborate 4-water	NaBO ₃ · 4H ₂ O	153.88		d > 60		2.5 g/100 mL aq
peroxodisulfate(VI)	Na ₂ S ₂ O ₈	238.11		d		55 g/100 mL aq; d by alc
perrhenate	NaReO ₄	273.19	5.24	300		33 g/100 mL ²⁰ aq
phosphate	Na ₃ PO ₄	163.94	2.537	1340		12.1 g/100 mL ²⁰ aq
phosphate 12-water	Na ₃ PO ₄ · 12H ₂ O	380.12	1.62	73.4	– 11H ₂ O, 100	28.3 g/100 mL ²⁰ aq; i alc
phosphinate hydrate	NaPH ₂ O ₂ · H ₂ O	105.99		anhyd 200	d to PH ₃	100 g/100 mL ²⁰ aq; s glyc, alc
propanoate	NaOOCCH ₂ CH ₃	96.06				g/100 mL ²⁵ ; 100 aq, 4.1 alc
salicylate	NaOOCCH ₂ CH ₂ OH	160.10				g/100 mL: 110 ²⁰ aq, 11 alc, 25 glyc
selenate(VI)	Na ₂ SeO ₄	188.94	3.098			27 g/100 mL ²⁰ aq
silicate(2–) meta-	Na ₂ SiO ₃	122.06	2.614	1089		s aq; hyd by hot aq; i alc
silicate(2–) 5-water	Na ₂ SiO ₃ · 5H ₂ O	212.14	1.749	72.2	anhyd 100	v s aq
silicate(4–)	Na ₄ SiO ₄	184.04		1018		s aq
stannate(IV) 3-water	Na ₂ SnO ₃ · 3H ₂ O	266.71		d 140 (slow)		59 g/100 mL ²⁰ aq; i alc
stearate	NaOOC(C ₁₇ H ₃₅)	306.47		d		sl s aq
sulfate	Na ₂ SO ₄	142.04	2.7	8800	d 2227	28 g/100 mL ²⁰ aq
sulfate 10-water	Na ₂ SO ₄ · 10H ₂ O	322.20	1.46	32.4	anhyd 100	67 g/100 mL ²⁵ aq; s glyc; i alc
sulfide	Na ₂ S	78.05	1.856	1172 vacuo		18.6 g/100 mL ²⁰ aq; sl s alc
sulfide 9-water	Na ₂ S · 9H ₂ O	240.18	1.43	d ≈ 50		200 g/100 mL aq; sl s alc
sulfite	Na ₂ SO ₃	126.04	2.63	d		31 g/100 mL ²⁰ aq; s glyc; i alc
tartrate dihydrate	Na ₂ C ₄ H ₄ O ₆ · 2H ₂ O	230.08	1.82	anhyd ~ 120		29 g/100 mL ⁶ aq; i alc
tetraborate	Na ₂ B ₄ O ₇	201.22	2.4	742.5		2.6 ²⁰ aq
tetraborate 10-water (bo- rax)	Na ₂ B ₄ O ₇ · 10H ₂ O	381.37	1.73	75 d	anhyd 320	g/100 mL: 6.3 aq, 100 glyc
tetrachloroaluminate	Na[AlCl ₄]	191.78	2.01	151		s aq
tetrachloroaurate	Na[AuCl ₄] · 2H ₂ O	397.80		d > 100		166 g/100 mL ²⁷ aq; s alc, chl
tetrafluoroborate	Na[BF ₄]	109.82	2.47	384	d	108 g/100 mL ²⁷ aq
tetrahydridoborate	Na[BH ₄]	37.83	1.074	497	d 315	18 ²⁵ DMF; 16.4 ²⁰ MeOH (reacts)

thiocyanate	NaSCN	81.07		287		134 g/100 mL ²⁰ aq
thiosulfate	Na ₂ S ₂ O ₃	158.11	2.345			s aq; i alc
thiosulfate 5-water	Na ₂ S ₂ O ₃ · 5H ₂ O	248.19	1.69	anhyd 100	d >100	70 g/100 mL ²⁰ aq (dec slowly)
trimetaphosphate 6-water	(NaPO ₃) ₃ · 6H ₂ O	414.04	1.786	53	anhyd 100	22 g/100 mL aq; i alc
tungstate(VI) dihydrate	Na ₂ WO ₄ · 2H ₂ O	329.85	3.25	anhyd 100	mp: 695.6	88 g/100 mL ⁰ aq; i alc
vanadate(V)	NaVO ₃	121.93				s hot aq
Strontium	Sr	87.62	2.64	757	1366	d to Sr(OH) ₂ in water
bromide	SrBr ₂	247.43	4.216	657	2045	100 g/100 mL ²⁰ aq
carbonate	SrCO ₃	147.63	3.5	d 1100 to SrO + CO ₂		i aq; s acids
chlorate	Sr(ClO ₃) ₂	254.52	3.152	120 d → O ₂		167 g/100 mL ²⁰ aq
chloride	SrCl ₂	158.53	3.052	874	1250	52.9 g/100 mL ²⁰ aq
chromate(VI)	SrCrO ₄	203.61	3.89	d		0.12 ²⁰ aq; s HCl
fluoride	SrF ₂	125.62	4.24	1477	2460	0.011 ²⁰ aq; s hot HCl
hydrogen phosphate	SrHPO ₄	183.60	3.544			i aq; s acids
hydroxide	Sr(OH) ₂	121.64	3.625	535	− H ₂ O, 744	0.8 ²⁰ aq
iodate	Sr(IO ₃) ₂	437.43	5.045 ¹⁵			0.03 ¹⁵ aq
iodide	SrI ₂	341.43	4.42	402	1773 d	178 g/100 mL ²⁰ aq; s alc
lactate 3-water	Sr(OOCCHOHCH ₃) ₂ · 3H ₂ O	319.81		anhyd 150		33 g/100 mL aq
nitrate	Sr(NO ₃) ₂	211.63	2.99	570	645	69.5 g/100 mL ²⁰ aq; sl s alc, acet
oxide	SrO	103.62	4.7	2430		0.69 ²⁰ aq
perchlorate	Sr(ClO ₄) ₂	286.52	3.00 ²⁵			g/100 mL ²⁵ : 157 aq, 71 BuOH, 77 EtOAc, 90 acet
peroxide	SrO ₂	119.62	4.78	215 d		0.018 ²⁰ aq; d hot aq
sulfate	SrSO ₄	183.68	3.96	1607		0.013 ²⁰ aq; sl s acid
sulfide	SrS	119.69	3.70	2227		sl s aq; s acid (dec)
Sulfinyl bromide (Thionyl)	SOBr ₂	207.87	2.688 ₄ ²⁰	− 52	140	hyd aq (slow); misc bz, chl, CCl ₄
chloride	SOCl ₂	118.97	1.638	− 104.5	76	hyd aq; misc bz, chl, CCl ₄
fluoride	SOF ₂	86.06	3.776 g/L	− 129.5	− 43.8	hyd aq; s bz, chl, eth
Sulfonyl chloride (Sulfonyl)	SO ₂ Cl ₂	134.97	1.6674 ₄ ²⁰	− 54.1	69.3	hyd aq; misc bz, eth, HOAc
diamide	SO ₂ (NH ₂) ₂	96.11	1.807	93	d 250	s aq, hot EtOH, acet
fluoride	SO ₂ F ₂	102.06	4.478 g/L	− 135.8	− 55.38	mL gas/100 mL: 4 aq, 24 alc, 136 CCl ₄ , 210 toluene
Sulfur (gamma)	S	32.066	1.92	106.8	444.72	23 g/100 mL ⁰ CS ₂ ; s alc, bz
(alpha) orthorhombic	S ₈	256.53	2.08 ²⁰	tr 94.5 to beta form	444.6	i aq; s organic solvents
(beta) monoclinic tr slowly to rhombic	S ₈	256.53	1.96	115.21	444.6	23 g/100 mL ⁰ CS ; s alc, bz

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Sulfur (<i>continued</i>)						
(<i>di</i> -) decafluoride	S ₂ F ₁₀	254.11	2.08	-52.7	30	d fusion with KOH
(<i>di</i> -) dichloride	ClSSCl	135.04	1.688	-77	137	hyd aq; s alc, bz, eth, CS ₂ , CCl ₄
dichloride	SCl ₂	102.97	1.622	-122	59.5	hyd aq
dioxide	SO ₂	64.07	2.811 g/L	-75.47	-10	mL/100 mL: 3937 ²⁰ aq, 25 alc, 32 MeOH; s chl, eth
hexafluoride	SF ₆	146.06	6.409 g/L	-50.8	subl -63.8	sl s aq; s alc, KOH
tetrafluoride	SF ₄	108.06	4.742 g/L	-121.0	-38	d aq viol; v s bz
trioxide (alpha)	SO ₃	80.06		62.3	vp 73mm at 25	stable modification
(beta)	SO ₃	80.06		32.5	vp 344mm at 25	
(gamma)	SO ₃	80.06	1.92	16.8	44.8	v s aq (slow)
Sulfuryl, <i>see</i> Sulfonyl						
Tantalum	Ta	180.9479	16.69	2996	5429	s HF, fused alkali (slowly)
(V) bromide	TaBr ₅	580.47	4.99	265	349	hyd aq; s abs alc, eth
carbide	TaC	192.96	14.3	3880	4780	sl s HF
(<i>di</i> -) carbide	Ta ₂ C	373.91	15.1	3327		
(V) chloride	TaCl ₅	358.21	3.68	216	239.3	hyd aq; s abs alc
diboride	TaB ₂	202.57	11.2	3140		
(V) fluoride	TaF ₅	275.94	4.74 ²⁰	96.8	229.5	s aq, eth, conc HNO ₃
(V) iodide	TaI	815.47	5.80	496	543	hyd aq; s eth
nitride	TaN	194.95	13.7	3090		sl s aq reg; reacts alkalis
(V) oxide	Ta ₂ O ₅	441.89	8.2	1785		s HF; d fused KHSO ₄ or KOH
Technetium-98	Tc	97.9072	11	2157	4265	s HNO ₃ , aq reg, conc H ₂ SO ₄
(VI) fluoride	TcF ₆	212.91	3.0	37.4	55.3	s HCl
(IV) oxide	TcO ₂	130.91	6.9	subl 1000		s acid, alkali
(VII) oxide	Tc ₂ O ₇	309.81		119.5	310.6	s aq
Tellurium	Te	127.60	6.24	449.8	989.9	s HNO ₃ , KOH, conc H ₂ SO ₄
(IV) bromide	TeBr	447.22	4.3	380	≈20 d	s HBr, eth, HOAc
(II) chloride	TeCl ₂	198.51	6.9	208	328	disprop with eth, diox; s acid
(IV) chloride	TeCl ₄	269.41	3.0	225	380	hyd aq; s HCl, abs alc, bz
(IV) fluoride	TeF ₄	203.59		129	d > 195	d aq
(VI) fluoride	TeF ₆	241.59	10.601 g/L	-37.68	subl -38.9	hyd aq, KOH

(IV) iodide	TeI ₄	635.22	5.05	280		hyd aq; s HI, alkali; sl s acet
(IV) oxide	TeO ₂	159.60	5.9	733	1245	s HCl, HF, NaOH
Terbium	Tb	158.9254	8.23	1356	3230	s acids
chloride	TbCl ₃	265.28	4.35	588	1550	v s aq
nitrate 6-water	Tb(NO ₃) ₃ · 6H ₂ O	453.03		89.3		s aq
Thallium	Tl	204.383	11.85	303.5	1457	i aq; s HNO ₃
(I) bromide	TlBr	284.29	7.5	460	820	0.05 ²⁰ aq; s alc
(I) carbonate	Tl ₂ CO ₃	468.78	7.11	272		4.1 g/100 mL ²⁰ aq; i alc
(I) chloride	TlCl	239.84	7.00	430	720	0.33 ²⁰ aq; i alc
(I) cyanide	TlCN	230.40	6.523	d		16.8 g/100 mL ²⁸ aq; s alc, acid
(I) ethoxide	TlOC ₂ H ₅	249.44	3.49	– 3	d 130	s eth; sl s alc; d aq
(I) fluoride	TlF	223.38	8.36	326	826	78.6% ¹⁵ aq
(III) fluoride	TlF ₃	261.38	8.65	550 d		d aq
(I) iodide (rhombic)	TlI	331.29	7.1	442	823	i aq, alc; s KI
(I) nitrate	TlNO ₃	266.39	5.55	206	d 450	9.55 g/100 mL ²⁰ aq; i alc
(I) oxide	Tl ₂ O	424.77	9.52	579	1080	v s aq; s acid, alc
(III) oxide (hexagonal)	Tl ₂ O ₃	456.77	10.2	834	– O ₂ , 875	i aq; d by HCl, H ₂ SO ₄
(I) selenate(VI)	Tl ₂ SeO ₄	551.73	6.875	>400		2.8 g/100 mL ²⁰ aq; i alc, eth
(I) selenide	Tl ₂ Se	487.73	9.05	340		i aq, acid
(I) sulfate	Tl ₂ SO ₄	504.83	6.77	632	d	4.87 g/100 mL ²⁰ aq
(I) sulfide	Tl ₂ S	440.83	8.39	448	1367	0.02 ²⁰ aq; s mineral acids
Thiocarbonyl chloride	S=CCl	114.98	1.509 ¹⁵		73.5	d aq; s eth
Thiocyanogen	(SCN) ₂	116.16		ca. – 2		d aq; s alc, CS ₂ , eth
Thionyl, <i>see</i> Sulfanyl						
Thiophosphoryl tribromide	PSBr ₃	302.78	2.85 ¹⁷	38.0	209 d	s aq, eth, CS ₂
trichloride (alpha)	PSCl ₃	169.41	1.635	– 40.8	125	hyd aq; s bz, chl, CS ₂
trifluoride	PSF ₃	120.03		– 148.8	– 52.2	
Thiosulfanyl difluoride	S=SF ₂	102.13		– 165	– 10.6	hyd aq
Thorium	Th	232.038	11.7	1750	4788	s acids
chloride	ThCl ₄	373.85	4.59	770	921	s aq, alc
fluoride	ThF ₄	308.03	6.1	1110	1680	s acids
iodide	ThI ₄	739.66	6.00	570	837	hyd aq
nitrate	Th(NO ₃) ₄	400.06		d 630, ThO ₂		191 g/100 mL ²⁰ aq; v s alc
oxide	ThO ₂	264.04	10.0	3390	4400	s hot H ₂ SO ₄
sulfate 9-water	Th(SO ₄) ₂ · 9H ₂ O	586.30	2.77	anhyd 400		1.57 g/100 mL ²⁵ aq
Thullium	Tm	168.9342	9.32	1545	1950	s acids
chloride	TmCl ₃	275.29		824	1490	s aq, alc
fluoride	TmF ₃	225.93	7.971	1158	2230	s H ₂ SO ₄

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Tin (white)	Sn	118.710	7.265	231.928	2602	s conc HCl, hot H ₂ SO ₄
(II) acetate	Sn(C ₂ H ₃ O ₂) ₂	236.80	2.31	182.5	240	d aq; s dilute HCl
(II) bromide	SnBr ₂	278.52	5.12	215	639	85 g/100 mL ⁰ aq; s alc, eth
(IV) bromide	SnBr ₄	438.33	3.34	31	205	v a (hyd) aq; s acet, alc
(II) chloride	SnCl ₂	189.61	3.90	246.9	623	84 g/100 mL ⁰ aq; s acet, alc, eth
(IV) chloride	SnCl ₄	260.52	2.234	-3.3	114.1	s aq (hyd), alc, acet, bz, eth
(II) fluoride	SnF ₂	156.71	4.57	213	850	30% aq
(IV) fluoride	SnF ₄	194.70	4.78		subl 705	hyd aq
hexafluorozirconate	Sn[ZrF ₆]	323.92	4.21			s aq
(II) iodide	SnI ₂	372.52	5.285	320	714	0.98 ²⁰ aq (d); s bz, chl, alk Cl ⁻ or I ⁻
(IV) iodide	SnI ₄	626.33	4.46	143	364	hyd aq; s alc, bz, chl, eth, CCl ₄ , CS ₂
(II) oxalate	SnC ₂ O ₄	206.73	3.56	280 d		s dilute HCl
(II) oxide	SnO	134.71	6.45	to SnO ₂ , 300		s acids, conc KOH
(IV) oxide	SnO ₂	150.71	6.95	1630		s hot conc KOH (slow)
(II) selenide	SnSe	197.67	6.179	861		s aqua regia, alkali sulfides
(II) sulfate	SnSO ₄	214.77	4.15	to SnO ₂ , 378		18.9 g/100 mL ²⁰ aq; s dilute H ₂ SO ₄
(II) sulfide	SnS	150.78	5.08	880	1210	s conc HCl, hot conc H ₂ SO ₄
(IV) sulfide	SnS ₂	182.84	4.5	d 600		s aq reg, alkali hydroxides & sul- fides
(II) telluride	SnTe	246.31	6.5	790		i aq
Titanium (hexagonal)	Ti	47.867	4.506	1668	3287	s hot acid, HF
(III) bromide	TiBr ₃	287.58	4.24		subl 794	
(IV) bromide	TiBr ₄	367.48	3.37	39	230	hyd aq; 187 g/100 mL abs alc
(II) chloride	TiCl ₂	118.77	3.13	1035	1500	d aq; s alc
(III) chloride	TiCl ₃	154.23	2.64	425 d		s aq (heat evolved), alc
(IV) chloride	TiCl ₄	189.68	1.73	-25	136.4	s cold aq, alc
dihydride	TiH ₂	49.88	3.752	d 450		
(IV) fluoride	TiF ₄	123.86	2.798	>400	subl 285.5	s aq (slow hyd); s alc, pyr
(IV) iodide	TiI ₄	555.49	4.3	150	377	s dry nonpolar solvents
(IV) isopropoxide	Ti[OCH(CH ₃) ₂] ₄	284.22	0.9711 ²⁰ ₄	~20	220	d aq; s bz, chl, eth
(II) oxide	TiO	63.87	4.95	1750	3660	s H ₂ SO ₄

(III) oxide	Ti ₂ O ₃	143.73	4.486	1842		s H ₂ SO ₄ , hot HF
(IV) oxide (rutile)	TiO ₂	79.87	4.23	1843		s HF, hot conc H ₂ SO ₄
oxide sulfate	TiOSO ₄	159.94				d aq
(III) sulfate	Ti ₂ (SO ₄) ₃	383.93				s dilute HCl, dilute H ₂ SO ₄
Tungsten	W	183.84	19.25	3387	5900	s HNO ₃ + HF, fusion NaOH + NaNO ₃
(V) bromide	WBr ₅	583.36		286	333	hyd aq; s chl, eth
(VI) bromide	WBr ₆	663.26	6.9	309	subl 327	hyd aq; s eth CS ₂
(V) chloride	WCl ₅	361.10	3.875	242	286	hyd aq
(VI) chloride	WCl ₆	396.56	3.52	279	347	hyd aq; s CS ₂ , CCl ₄
dichloride dioxide	WCl ₂ O ₂	286.74	4.67	265	d 369	hyd aq; s HCl
(VI) fluoride	WF ₆	297.83	3.441	2.3	17.5	hyd aq; s anhyd HF
(IV) oxide	WO ₂	215.84	10.8	1550	d 1724	s acids, KOH
(VI) oxide	WO ₃	231.84	7.16	1472	1837	i aq; s hot alkali
(IV) sulfide	WS ₂	247.97	7.6	d 1250		s HNO ₃ + HF
tetrachloride oxide	WCl ₄ O	341.65	11.92	211	227	hyd aq
tetrafluoride oxide	WF ₄ O	275.83	5.07	106	186	
Uranium	U	238.0289	19.1	1135	4131	s acid
(IV) bromide	UBr ₄	557.65	5.55	519	777	v s aq
(III) chloride	UCl ₃	344.39	5.51	837	1657	v s aq
(IV) chloride	UCl ₄	379.84	4.725	590	790	v s aq (d); s polar org solvents
(V) chloride	UCl ₅	415.29		287	527	d aq; s CS ₂
(VI) chloride	UCl ₆	450.75	3.6	177	392	hyd aq; s chl
(IV) fluoride	UF ₄	314.02	6.70	1036	1417	s conc acids (d); alk (d)
(VI) fluoride	UF ₆	352.02	5.09	64.0	subl 56.5	hyd aq; s chl, CCl ₄
(III) hydride	UH ₃	241.05	11.1			i aq
(IV) iodide	UI ₄	745.65	5.6	506	757	s aq
(IV) oxide (pitchblende)	UO ₂	270.03	10.97	2827		s conc HNO ₃
(VI) oxide	UO ₃	286.03	7.29	d 1300		i aq; s HCl, HNO ₃
octaoxide [(V,VI) oxide]	U ₃ O ₈	842.08	8.38	d 1300 to UO ₂		s HNO ₃
peroxide 2-water	UO ₄ ·2H ₂ O	338.06		d 90–195 to U ₂ O ₇ (slow)	d >200 to UO ₂	d by HCl
Uranyl(VI) acetate 2-water	UO ₂ (C ₂ H ₃ O ₂) ₂ ·2H ₂ O	422.13	2.893	anhyd 110	d 275	7.7 g/100 mL ¹⁵ aq; sl s alc
chloride	UO ₂ Cl ₂	340.93	5.43	577		320 g/100 mL ¹⁸ aq; s acet, alc
fluoride	UO ₂ F ₂	308.03	6.37	d 300		v s aq
nitrate 6-water	UO ₂ (NO ₃) ₂ ·6H ₂ O	502.13	2.807	60	d 118	155 g/100 mL ²⁰ aq; v s alc, eth
sulfate 3-water	UO ₂ SO ₄ ·3H ₂ O	420.14	3.28	d 100		g/100 mL: 21 aq, 4 alc

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Vanadium	V	50.9415	6.11 ¹⁹	1917	3421	s HF, HNO ₃ , hot H ₂ SO ₄ , aq reg
(IV) chloride	VCl ₄	192.75	1.82	-25.7	148	hyd aq; s nonpolar solvents
dichloride oxide	VCl ₂ O	137.86	2.88	disprop 384		hyd (slow) aq; s abs alc, HOAc
(III) fluoride	VF ₃	107.94	3.363	≈1400	subl 800	i almost all organic solvents
(IV) fluoride	VF ₄	126.94	3.15	subl 120 (vac) & disprop		s aq, acet, HOAc
(V) fluoride	VF ₅	145.93	2.50	19.5	48	hyd aq; v s anhyd HF, acet, alc
(II) oxide	VO	66.94	5.76	1790		s HCl
(III) oxide	V ₂ O ₃	149.88	4.87	1940		sl s acids
(IV) oxide	VO ₂	82.94	4.34	1967		s acids, alkalis
(V) oxide	V ₂ O ₅	181.88	3.35	670	d 1800	0.07 aq; s conc acids, alkalis
(IV) oxide sulfate	VO ₂ SO ₄	163.00				s aq
(III) sulfate	V ₂ (SO ₄) ₃	390.07		410 (vac)		s (slow) aq, HNO ₃
(III) sulfide	V ₂ S ₃	198.08	4.72	d 600		s hot acids, alkali sulfides
Xenon	Xe	131.29	5.761 g/L	-111.8	-108.04	10.8 mL/100 mL ²⁰ aq
difluoride	XeF ₂	169.29	4.32	129.0	subl 114.3	2.5 g/100 mL ⁹ aq
hexafluoride	XeF ₆	245.28	3.56	49.5	75.6	hyd aq
tetrafluoride	XeF ₄	207.28	4.04	117.1	subl 115.7	hyd aq; s F ₃ CCOOH
trioxide	XeO ₃	179.29	4.55	explodes 25		s aq giving xenic acid
Ytterbium	Yb	173.04	6.90	819	1196	s acids
(II) chloride	YbCl ₂	243.95	5.27	721	1930	s aq
(III) chloride 6-water	YbCl ₃ · 6H ₂ O	387.49	2.57	anhyd 180	mp: 865	v s aq
(III) fluoride	YbF ₃	230.04	8.17	1157	2230	s H ₂ SO ₄
(III) nitrate 4-water	Yb(NO ₃) ₃ · 4H ₂ O	431.12				s aq
(III) oxide	Yb ₂ O ₃	394.08	9.18	2435		s dilute acids
(III) sulfate 8-water	Yb ₂ (SO ₄) ₃ · 8H ₂ O	778.39	3.3			34.8 g/100 mL ²⁰ aq
Yttrium	Y	88.9059	4.472	1522	3345	s hot water (d)
chloride	YCl ₃	195.26	2.61	721	1510	79 g/100 mL ²⁰ aq; s alc
fluoride	YF ₃	145.90	4.0	1152	2230	s conc acids (d)

nitrate 6-water oxide	$Y(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$	383.01	2.68	$-3\text{H}_2\text{O}$, 100		171 g/100 mL ²⁰ aq
	$Y_2\text{O}_3$	225.81	5.03	2440	4300	s acids
sulfate 8-water	$Y_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$	610.12	2.56	anhyd 400	d > 1000	9.6 g/100 mL ²⁰ aq
	Zn	65.39	7.14	419.527	907	i aq; s acids, alkalis (slow)
Zinc acetate dihydrate	$\text{Zn}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 2\text{H}_2\text{O}$	219.51	1.735	237 d		g/100 mL: 41.6 ²⁰ aq, 3.3 alc
	arsenate(III)(1-)	$\text{Zn}(\text{AsO}_3)_2$	279.23			s acids
arsenate(V)(3-) 8-water bromide	$\text{Zn}_3(\text{AsO}_4)_2 \cdot 8\text{H}_2\text{O}$	618.13	3.33			s acids and alkalis
	ZnBr_2	225.20	4.5	394	697	g/100 mL: 471 ²⁵ aq, 200 alc; s KOH, eth
carbonate chloride	ZnCO_3	125.40	4.4	$-\text{CO}_2$, 300		0.02 ²⁵ aq; s acids, KOH, NH_4 salts
	ZnCl_2	136.29	2.907	290	732	g/100 ml: 395 ²⁰ aq, 77 alc, 50 glyc; v s acet
chromate(VI) cyanide	ZnCrO_4	181.39	3.40			s acids
	$\text{Zn}(\text{CN})_2$	117.43	1.852	d 800		0.058 ¹⁸ aq; s acids, KCN, KOH
fluoride hexafluorosilicate 6-water	ZnF_2	103.39	4.9	872	1500	s HNO_3 , HCl, NH_4OH
	$\text{Zn}[\text{SiF}_6] \cdot 6\text{H}_2\text{O}$	315.56	2.104	d 100		v s aq
iodate iodide	$\text{Zn}(\text{IO}_3)_2$	415.20	5.063	d		0.87 ²⁰ aq; s HNO_3 , KOH
	ZnI_2	319.20	4.74	446	625 d	g/100 mL: 332 ²⁰ aq, 50 glyc; v s alc
nitrate 6-water oxide	$\text{Zn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$	297.49	2.067	$-6\text{H}_2\text{O}$, 131		146 g/100 mL ⁰ aq; v s alc
	ZnO	81.39	5.60	1975		i aq; s acids, KOH, NH_4OH
peroxide 1,4-phenolsulfonate 8-water	ZnO_2	97.39	1.57	d > 150	explodes 212	d (slow) aq; s dilute acids (d)
	$\text{Zn}[\text{C}_6\text{H}_4(\text{OH})\text{SO}_3]_2 \cdot 8\text{H}_2\text{O}$	555.84		anhyd 120		g/100 mL: 63 aq, 56 alc
phosphate(V) phosphide	$\text{Zn}_3(\text{PO}_4)_2$	386.11	3.998	900		s acids, NH_4OH
	Zn_3P_2	258.12	4.55	420	1100	d aq, HCl (viol); s bz, CS_2
propionate selenide	$\text{Zn}(\text{C}_3\text{H}_5\text{O}_2)_2$	211.53				32% ¹⁵ aq; 2.8% ¹⁵ alc
	ZnSe	144.35	5.65	> 1100		d dilute HNO_3
silicate(2-) stearate	Zn_2SiO_4	222.86	4.10	1512		i aq or dilute acids
	$\text{Zn}(\text{C}_{18}\text{H}_{35}\text{O}_2)_2$	632.34	1.095	130		d dil acids; s bz; i aq, alc, eth
sulfate sulfate 7-water	ZnSO_4	161.45	3.8	680 d		53.8% ²⁰ aq
	$\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$	287.56	1.97	anhyd 280	d > 500	g/100 mL: 167 aq, 40 glyc; i alc
sulfide (wirzite) telluride	ZnS	97.46	4.09	1722		i aq; s dilute mineral acids
	ZnTe	192.99	6.34	1239		d (slow) aq or dilute HCl
thiocyanate	$\text{Zn}(\text{SCN})_2$	181.56				0.14 aq; s alc

TABLE 3.2 Physical Constants of Inorganic Compounds (*Continued*)

Name	Formula	Formula weight	Density	Melting point, °C	Boiling point, °C	Solubility in 100 parts solvent
Zirconium	Zr	91.224	6.52	1852	3577	s aq reg, HF, hot H ₃ PO ₄ , fusion with KOH + KNO ₃
(IV) bromide	ZrBr ₄	410.84	3.98	450	subl 357	
carbide	ZrC	103.23	6.73	3532	5100	sl s conc H ₂ SO ₄
(II) chloride	ZrCl ₂	162.13	3.6	727	1292	d aq
(IV) chloride	ZrCl ₄	233.03	2.80	437 (25 atm)	subl 334	hyd aq to ZrCl ₂ O; s alc, eth
diboride	ZrB ₂	112.85	6.17	3245	d 4193	
dichloride oxide 8-water	ZrCl ₂ O · 8H ₂ O	322.25	1.91	anhyd 210	d 410	v s aq, alc
dihydride	ZrH ₂	93.24	5.61			i aq
(IV) fluoride	ZrF ₄	167.22	4.436	932 ^{mp}	subl 912	1.32 g/100 mL ²⁰ aq
(IV) hydroxide	Zr(OH) ₄	159.25	3.25	to ZrO ₂ , 500		s mineral acids
(IV) iodide	ZrI ₄	598.84		499 (sealed tube)	subl 432.5	s aq (d), eth
(IV) nitrate 5-water	Zr(NO ₃) ₄ · 5H ₂ O	429.32		d 100		v s aq; s alc
(IV) oxide	ZrO ₂	123.22	5.68	2678	4300	s hot H ₂ SO ₄ , HF (slow)
(IV) silicate(4-)	ZrSiO ₄	183.31	4.56	d 1540 to ZrO ₂ + SiO ₂		unaffected by aqueous reagents
sulfate 4-water	Zr(SO ₄) ₂ · 4H ₂ O	355.41	2.80	anhyd 380		52.5 g/100 g aqueous solution

TABLE 3.3 Synonyms and Mineral Names

Acanthite, <i>see</i> Silver sulfide	Cementite, <i>see</i> tri-Iron carbide
Alabandite, <i>see</i> Manganese sulfide	Cerargyrite, <i>see</i> Silver chloride
Alamosite, <i>see</i> Lead(II) silicate(2-)	Cerussite, <i>see</i> Lead carbonate
Altaite, <i>see</i> Lead telluride	Chalcanthite, <i>see</i> Copper(II) sulfate 5-water
Alumina, <i>see</i> Aluminum oxide	Chalcocite, <i>see</i> Copper(I) sulfide
Alundum, <i>see</i> Aluminum oxide	Chalk, <i>see</i> Calcium carbonate
Alunogenite, <i>see</i> Aluminum sulfate 18-water	Chile nitre, <i>see</i> Sodium nitrate
Amphibole, <i>see</i> Magnesium silicate(2-)	Chile saltpeter, <i>see</i> Sodium nitrate
Andalusite, <i>see</i> Aluminum silicon oxide (1/1)	Chloromagnesite, <i>see</i> Magnesium chloride
Anglesite, <i>see</i> Lead sulfate	Chlorosulfonic acid, <i>see</i> Hydrogen chlorosulfate
Anhydrite, <i>see</i> Calcium sulfate	Cinnabar, <i>see</i> Mercury(II) sulfide
Anhydronite, <i>see</i> Magnesium perchlorate	Claudetite, <i>see</i> Arsenic(III) oxide dimer
Aragonite, <i>see</i> Calcium carbonate	Clausthalite, <i>see</i> Lead selenide
Arcanite, <i>see</i> Potassium sulfate	Clinoenstatite, <i>see</i> Magnesium silicate(2-)
Argentite, <i>see</i> Silver sulfide	Columbium, <i>see</i> under Niobium
Argol, <i>see</i> Potassium hydrogen tartrate	Corrosive sublimate, <i>see</i> Mercury(II) chloride
Arkansite, <i>see</i> Titanium(IV) oxide	Corundum, <i>see</i> Aluminum oxide
Arsenolite, <i>see</i> Arsenic(III) oxide dimer	Cotunite, <i>see</i> Lead chloride
Arsine, <i>see</i> Arsenic hydride	Covellite, <i>see</i> Copper(II) sulfide
Auric and aurous, <i>see</i> under Gold	Cream of tartar, <i>see</i> Potassium hydrogen tartrate
Azoimide, <i>see</i> Hydrogen azide	Crocoite, <i>see</i> Lead chromate(VI)(2-)
Azurite, <i>see</i> Copper(II) carbonate—dihydroxide (2/1)	Cryolite, <i>see</i> Sodium hexafluoroaluminate
Baddeleyite, <i>see</i> Zirconium(IV) oxide	Cryptohalite, <i>see</i> Ammonium hexafluorosilicate
Baking soda, <i>see</i> Sodium hydrogen carbonate	Cupric and cuprous, <i>see</i> under Copper
Barite (barytes), <i>see</i> Barium sulfate	Cuprite, <i>see</i> Copper(I) oxide
Bieberite, <i>see</i> Cobalt sulfate 7-water	Dakin's solution, <i>see</i> Sodium hypochlorite
Bismuthine, <i>see</i> Bismuth hydride	Dehydrite, <i>see</i> Magnesium perchlorate
Bismuthinite, <i>see</i> Bismuth sulfide	Dental gas, <i>see</i> Nitrogen(I) oxide
Bleaching powder, <i>see</i> Calcium hydrochloride	Diamond, <i>see</i> Carbon
Bleaching solution, <i>see</i> Sodium hydrochlorite	Dichlorodisulfane, <i>see</i> di-Sulfur dichloride
Blue copperas, <i>see</i> Copper(II) sulfate 7-water	Diuretic salt, <i>see</i> Potassium acetate
Boracic acid, <i>see</i> Hydrogen borate	Dolomite, <i>see</i> Calcium magnesium carbonate (1/1)
Borax, <i>see</i> Sodium tetraborate 10-water	Dry ice, <i>see</i> Carbon dioxide (solid)
Braunite, <i>see</i> Manganese(III) oxide	Enstatite, <i>see</i> Magnesium silicate(2-)
Brimstone, <i>see</i> Sulfur	Epsom salts, <i>see</i> Magnesium sulfate 7-water
Bromellite, <i>see</i> Beryllium oxide	Epsomite, <i>see</i> Magnesium sulfate 7-water
Bromosulfonic acid, <i>see</i> Hydrogen bromosulfate	Eriochalcite, <i>see</i> Copper(II) chloride
Bromyrite, <i>see</i> Silver bromide	Fayalite, <i>see</i> Iron(II) silicate(4-)
Brookite, <i>see</i> Titanium(IV) oxide	Ferric and ferrous, <i>see</i> under Iron
Brucite, <i>see</i> Magnesium hydroxide	Fluorine oxide, <i>see</i> Oxygen difluoride
Bunsenite, <i>see</i> Nickel oxide	Fluoristan, <i>see</i> Tin(II) fluoride
Cacodylate, <i>see</i> Sodium dimethylarsenate 3-water	Fluorite, <i>see</i> Calcium fluoride
Caesium, <i>see</i> under Cesium	Fluorosulfonic acid, <i>see</i> Hydrogen fluorosulfate
Calamine, <i>see</i> Zinc carbonate	Fluorspar, <i>see</i> Calcium fluoride
Calcia, <i>see</i> Calcium oxide	Forsterite, <i>see</i> Magnesium silicate(4-)
Calcite, <i>see</i> Calcium carbonate	Freezing salt, <i>see</i> Sodium chloride
Calomel, <i>see</i> Mercury(I) chloride	Fulminating mercury, <i>see</i> Mercury fulminate
Caro's acid, <i>see</i> Hydrogen peroxosulfate	Galena, <i>see</i> Lead sulfite
Cassiopeium, <i>see</i> Lutetium	Glauber's salt, <i>see</i> Sodium sulfate 10-water
Cassiterite, <i>see</i> Tin(IV) oxide	Goethite, <i>see</i> Iron(II) hydroxide oxide
Caustic potash, <i>see</i> Potassium hydroxide	Goslarite, <i>see</i> Zinc sulfate 7-water
Caustic soda, <i>see</i> Sodium hydroxide	Graham's salt, <i>see</i> Sodium phosphate(1-)
Celestite, <i>see</i> Strontium sulfate	Graphite, <i>see</i> Carbon

TABLE 3.3 Synonyms and Mineral Names (*Continued*)

Greenockite, <i>see</i> Cadmium sulfide	Moissanite, <i>see</i> Silicon carbide
Gruenerite, <i>see</i> Iron(II) silicate(2-)	Molybdenite, <i>see</i> Molybdenum disulfide
Guanajuatite, <i>see</i> Bismuth selenide	Molybdate, <i>see</i> Molybdenum(VI) oxide
Gypsum, <i>see</i> Calcium sulfate 2-water	Molysite, <i>see</i> Iron(III) chloride
Halite, <i>see</i> Sodium chloride	Montroydite, <i>see</i> Mercury(II) oxide
Hausmannite, <i>see</i> Manganese(II,IV) oxide	Morenosite, <i>see</i> Nickel sulfate 7-water
Heavy hydrogen, <i>see</i> Hydrogen[² H] or name followed by <i>-d</i>	Mosaic gold, <i>see</i> Tin disulfide
Heavy water, <i>see</i> Hydrogen[² H] oxide	Muriatic acid, <i>see</i> Hydrogen chloride, aqueous solutions
Heazlewoodite, <i>see</i> <i>tri</i> -Nickel disulfide	Nantokite, <i>see</i> Copper(I) chloride
Hematite, <i>see</i> Iron(III) oxide	Natron, <i>see</i> Sodium carbonate
Hermannite, <i>see</i> Manganese silicate	Naumannite, <i>see</i> Silver selenide
Hessite, <i>see</i> Silver telluride	Neutral verdigris, <i>see</i> Copper(II) acetate
Hieratite, <i>see</i> Potassium hexafluorosilicate	Nitre (niter), <i>see</i> Potassium nitrate
Hydroazotic acid, <i>see</i> Hydrogen azide	Nitric oxide, <i>see</i> Nitrogen(II) oxide
Hydrophilite, <i>see</i> Calcium chloride	Nitrobarite, <i>see</i> Barium nitrate
Hydro sulfite, <i>see</i> Sodium dithionate(III)	Nitromagnesite, <i>see</i> Magnesium nitrate 6-water
Hypo (photographic), <i>see</i> Sodium thiosulfate 5-water	Nitroprusside, <i>see</i> Sodium pentacyanonitrosylferate(II) 2-water
Hypophosphite, <i>see</i> under Phosphinate	Oldhamite, <i>see</i> Calcium sulfide
Ice, <i>see</i> Hydrogen oxide (solid)	Opal, <i>see</i> Silicon dioxide
Iceland spar, <i>see</i> Calcium carbonate	Orpiment, <i>see</i> Arsenic trisulfide
Iodyrite, <i>see</i> Silver iodide	Oxygen powder, <i>see</i> Sodium peroxide
Jeweler's borax, <i>see</i> Sodium tetraborate 10-water	Paris green, <i>see</i> Copper acetate arsenate(III) (1/3)
Jeweler's rouge, <i>see</i> Iron(III) oxide	Pawellite, <i>see</i> Calcium molybdate(VI)(2-)
Kalinite, <i>see</i> Aluminum potassium bis(sulfate)	Pearl ash, <i>see</i> Potassium carbonate
Kernite, <i>see</i> Sodium tetraborate	Perborax, <i>see</i> Sodium peroxoborate
Kyanite, <i>see</i> Aluminum silicon oxide (1/1)	Periclase, <i>see</i> Magnesium oxide
Laughing gas, <i>see</i> Nitrogen(I) oxide	Persulfate, <i>see</i> Peroxodisulfate
Lautarite, <i>see</i> Calcium iodate	Phosgene, <i>see</i> Carbonyl chloride
Lawrencite, <i>see</i> Iron(II) chloride	Phosphine, <i>see</i> Hydrogen phosphide
Lechatelierite, <i>see</i> Silicon dioxide	Pickling acid, <i>see</i> Hydrogen sulfate
Lime, <i>see</i> Calcium oxide	Pitchblende, <i>see</i> Uranium(IV) oxide
Litharge, <i>see</i> Lead(II) oxide	Plaster of Paris, <i>see</i> Calcium sulfate hemihydrate
Lithium aluminum hydride, <i>see</i> Lithium tetrahydroaluminat	Plattnerite, <i>see</i> Lead(IV) oxide
Lodestone, <i>see</i> Iron(II,III) oxide	Polianite, <i>see</i> Manganese(IV) oxide
Lunar caustic, <i>see</i> Silver nitrate	Polishing powder, <i>see</i> Silicon dioxide
Lye, <i>see</i> Sodium hydroxide	Potash, <i>see</i> Potassium carbonate
Magnesia, <i>see</i> Magnesium oxide	Potassium acid phthalate, <i>see</i> Potassium hydrogen phthalate
Magnesite, <i>see</i> Magnesium carbonate	Prussic acid, <i>see</i> Hydrogen cyanide
Magnetite, <i>see</i> Iron(II,III) oxide	Pyrite, <i>see</i> Iron disulfide
Malachite, <i>see</i> Copper carbonate dihydroxide	Pyrochroite, <i>see</i> Manganese(II) hydroxide
Manganosite, <i>see</i> Manganese(II) oxide	Pyrohyttophosphite, <i>see</i> diphosphate(IV)
Marcasite, <i>see</i> Iron disulfide	Pyrolusite, <i>see</i> Manganese(IV) oxide
Marshite, <i>see</i> Copper(I) iodide	Pyrophanite, <i>see</i> Manganese titanate(IV)(2-)
Mascagnite, <i>see</i> Ammonium sulfate	Pyrophosphate, <i>see</i> Diphosphate(V)
Massicotite, <i>see</i> Lead oxide	Pyrosulfuric acid, <i>see</i> Hydrogen disulfate
Mercuric and mercurous, <i>see</i> under Mercury	Quartz, <i>see</i> Silicon dioxide
Metacinnabar, <i>see</i> Mercury(II) sulfide	Quicksilver, <i>see</i> Mercury
Millerite, <i>see</i> Nickel sulfide	Realgar, <i>see</i> di-Arsenic disulfide
Mirabilite, <i>see</i> Sodium sulfate	Red lead, <i>see</i> Lead(II,IV) oxide
Mohr's salt, <i>see</i> Ammonium iron(II) sulfate 6-water	Rhodochrosite, <i>see</i> Manganese carbonate

TABLE 3.3 Synonyms and Mineral Names (*Continued*)

Rhodonite, <i>see</i> Manganese silicate(1-)	Sylvite, <i>see</i> Potassium chloride
Rochelle salt, <i>see</i> Potassium sodium tartrate 4-water	Szmkite, <i>see</i> Manganese(II) sulfate hydrate
Rock crystal, <i>see</i> Silicon dioxide	Tarapacaite, <i>see</i> Potassium chromate(VI)
Rutile, <i>see</i> Titanium(IV) oxide	Tellurite, <i>see</i> Tellurium dioxide
Sal soda, <i>see</i> Sodium carbonate 10-water	Tenorite, <i>see</i> Copper(II) oxide
Saltpeper, <i>see</i> Potassium nitrate	Tephroite, <i>see</i> Manganese silicate(1-)
Scacchite, <i>see</i> Manganese chloride	Thenardite, <i>see</i> Sodium sulfate
Scheelite, <i>see</i> Calcium tungstate(VI)(2-)	Thionyl, <i>see</i> Sulfinyl
Sellaite, <i>see</i> Magnesium fluoride	Thorianite, <i>see</i> Thorium dioxide
Senarmonite, <i>see</i> Antimony(III) oxide	Topaz, <i>see</i> Aluminum hexafluorosilicate
Siderite, <i>see</i> Iron(II) carbonate	Tridymite, <i>see</i> Silicon dioxide
Siderotil, <i>see</i> Iron(II) sulfate 5-water	Troilite, <i>see</i> Iron(II) sulfide
Silica, <i>see</i> Silicon dioxide	Trona, <i>see</i> Sodium carbonate—hydrogen carbonate dihydrate
Silicotungstic acid, <i>see</i> Silicon oxide—tungsten oxide—water (1/12/26)	Tschermigite, <i>see</i> Aluminum ammonium bis(sulfate)
Sillimanite, <i>see</i> Aluminum silicon oxide (1/1)	Tungstenite, <i>see</i> Tungsten disulfide
Smithsonite, <i>see</i> Zinc carbonate	Tungstite, <i>see</i> Hydrogen tungstate
Soda ash, <i>see</i> Sodium carbonate	Uraninite, <i>see</i> Uranium(IV) oxide
Spelter, <i>see</i> Zinc metal	Valentinite, <i>see</i> Antimony(III) oxide
Sphalerite, <i>see</i> Zinc sulfide	Verdigris, <i>see</i> Copper acetate hydrate
Sphero-cobaltite, <i>see</i> Cobalt(II) carbonate	Vermillion, <i>see</i> Mercury(II) sulfide
Spinel, <i>see</i> Magnesium aluminate(2-)	Villiamite, <i>see</i> Sodium fluoride
Stannic and stannous, <i>see</i> under Tin	Vitamin B ₃ , <i>see</i> Calcium (+)pantothenate
Stibine, <i>see</i> Antimony hydride	Washing soda, <i>see</i> Sodium carbonate 10-water
Stibnite, <i>see</i> Antimony(III) sulfide	Whitlockite, <i>see</i> Calcium phosphate
Stolzite, <i>see</i> Lead tungstate(VI)(2-)	Willemite, <i>see</i> Zinc silicate(4-)
Strengite, <i>see</i> Iron(III) phosphate	Wolfram, <i>see</i> Tungsten
Strontianite, <i>see</i> Strontium carbonate	Wuestite, <i>see</i> Iron(II) oxide
Sugar of lead, <i>see</i> Lead acetate	Wulfenite, <i>see</i> Lead molybdate(VI)(2-)
Sulfamate, <i>see</i> Amidosulfate	Wurtzite, <i>see</i> Zinc sulfide
Sulphate, <i>see</i> Sulfate	Zincite, <i>see</i> Zinc oxide
Sulfurated lime, <i>see</i> Calcium sulfide	Zincosite, <i>see</i> Zinc sulfate
Sulfuretted hydrogen, <i>see</i> Hydrogen sulfide	Zincspar, <i>see</i> Zinc carbonate
Sulphur, <i>see</i> Sulfur	Zirconia, <i>see</i> Zirconium oxide
Sulfuryl, <i>see</i> Sulfonyl	
Sycoporite, <i>see</i> Cobalt sulfide	
