Ionic Compounds

(occur between a metal and a nonmetal)

Is the cation from Group 1, 2, or 13 on the periodic table?

YES

Write the name of the metal as it appears on the periodic table.

Binary

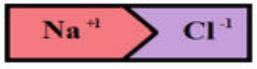
Binary compounds contain only 2 elements - a metal cation and an nonmetal anion. The anion will always end in - ide.

Example:

Na_2S sodium sulfide

NaCl sodium chloride

Na_2S
Sodium Sulfide



NaCl
Sodium Chloride

Ternary

Ternary compounds contain 3 elements - a metal cation and a polyatomic anion. The anion may end in - ide or - ate.

Examples:

NaOH sodium hydroxide

Na_2SO_4 sodium sulfate

Na_2SO_4
Sodium Sulfate

NaOH
Sodium Hydroxide

NO

Is the cation a transition metal, tin (Sn) or lead (Pb)?

YES

Include a Roman numeral, after the name of the element, equal to the oxidation # (i.e. ionic charge)

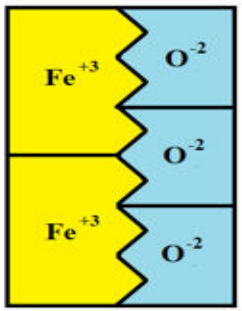
Binary

Binary compounds contain only 2 elements - a metal cation and an nonmetal anion. The anion will always end in - ide.

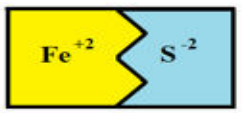
Example:

Fe_2O_3 iron III oxide

FeS iron II sulfide



Fe_2O_3
Iron III oxide



FeS
Iron II Sulfide

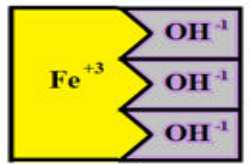
Ternary

Ternary compounds contain 3 elements - a metal cation and a polyatomic anion. The anion may end in - ide or - ate.

Examples:

$Fe(OH)_3$ iron III hydroxide

$FeSO_4$ iron II sulfate



$Fe(OH)_3$
Iron III Hydroxide

$FeSO_4$
Iron II Sulfate

NO

Then the cation must be NH_4^{+1} – which is called ammonium

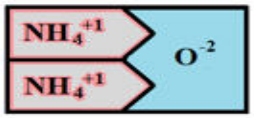
Regular Anion

A regular anion from the periodic table will have an -ide ending.

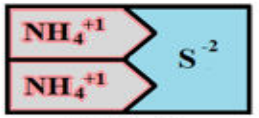
Examples:

$(NH_4)_2O$ ammonium oxide

$(NH_4)_2S$ ammonium sulfide



$(NH_4)_2O$
Ammonium Oxide



$(NH_4)_2S$
Ammonium Sulfide

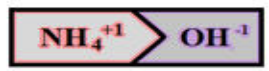
Polyatomic Anion

A polyatomic anion will have an -ide ending (for OH^-) or an -ate ending (for all other choices).

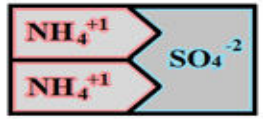
Examples:

NH_4OH ammonium hydroxide

$(NH_4)_2SO_4$ ammonium sulfate



NH_4OH
Ammonium Hydroxide



$(NH_4)_2SO_4$
Ammonium Sulfate

PERIODIC TABLE OF IONS

TABLE OF POLYATOMIC IONS

acetate	CH_3COO^-	dihydrogen phosphate	$H_2PO_4^-$	oxalate	$C_2O_4^{2-}$
arsenate	AsO_4^{3-}	hydrogen carbonate	HCO_3^-	perchlorate	ClO_4^-
arsenite	AsO_3^{3-}	hydrogen oxalate	$HC_2O_4^-$	periodate	IO_4^-
benzoate	$C_6H_5COO^-$	hydrogen sulfate	HSO_4^-	permanganate	MnO_4^-
borate	BO_3^{3-}	hydrogen sulfide	HS^-	peroxide	O_2^{2-}
bromate	BrO_3^-	hydrogen sulfite	HSO_3^-	phosphate	PO_4^{3-}
carbonate	CO_3^{2-}	hydroxide	OH^-	pyrophosphate	$P_2O_7^{4-}$
chlorate	ClO_3^-	hypochlorite	ClO^-	sulfate	SO_4^{2-}
chloride	Cl^-	iodate	IO_3^-	sulfite	SO_3^{2-}
chlorite	ClO_2^-	monohydrogen phosphate	HPO_4^{2-}	thiocyanate	SCN^-
chromate	CrO_4^{2-}	nitrate	NO_3^-	thiosulfate	$S_2O_3^{2-}$
cyanate	CNO^-	nitrite	NO_2^-	**POSITIVE POLYATOMIC IONS**	
cyanide	CN^-	orthosilicate	SiO_4^{4-}	ammonium	NH_4^+
dichromate	$Cr_2O_7^{2-}$			hydronium	H_3O^+

KEY: atomic number → 26 Fe^{3+} iron (III) ← ion charge; symbol → Fe^{2+} iron (II) ← ion name (IUPAC)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 H^+ hydrogen																1 H^- hydride	2 He helium
3 Li^+ lithium	4 Be^{2+} beryllium											5 B boron	6 C carbon	7 N^{3-} nitride	8 O^{2-} oxide	9 F^- fluoride	10 Ne neon
11 Na^+ sodium	12 Mg^{2+} magnesium											13 Al^{3+} aluminum	14 Si silicon	15 P^{3-} phosphide	16 S^{2-} sulfide	17 Cl^- chloride	18 Ar argon
19 K^+ potassium	20 Ca^{2+} calcium	21 Sc^{3+} scandium	22 Ti^{4+} titanium (IV) Ti^{3+} titanium (III)	23 V^{3+} vanadium(III) V^{5+} vanadium (V)	24 Cr^{3+} chromium (III) Cr^{2+} chromium (II)	25 Mn^{2+} manganese(II) Mn^{4+} manganese(IV)	26 Fe^{3+} iron (III) Fe^{2+} iron (II)	27 Co^{2+} cobalt (II) Co^{3+} cobalt (III)	28 Ni^{2+} nickel (II) Ni^{3+} nickel (III)	29 Cu^{2+} copper (II) Cu^+ copper (I)	30 Zn^{2+} zinc	31 Ga^{3+} gallium	32 Ge^{4+} germanium	33 As^{3-} arsenide	34 Se^{2-} selenide	35 Br^- bromide	36 Kr krypton
37 Rb^+ rubidium	38 Sr^{2+} strontium	39 Y^{3+} yttrium	40 Zr^{4+} zirconium	41 Nb^{5+} niobium (V) Nb^{3+} niobium(III)	42 Mo^{6+} molybdenum	43 Tc^{7+} technetium	44 Ru^{3+} ruthenium(III) Ru^{4+} ruthenium(IV)	45 Rh^{3+} rhodium	46 Pd^{2+} paladium(II) Pd^{4+} paladium(IV)	47 Ag^+ silver	48 Cd^{2+} cadmium	49 In^{3+} indium	50 Sn^{4+} tin (IV) Sn^{2+} tin (II)	51 Sb^{3+} antimony(III) Sb^{5+} antimony(V)	52 Te^{2-} telluride	53 I^- iodide	54 Xe xenon
55 Cs^+ cesium	56 Ba^{2+} barium	57 La^{3+} lanthanum	72 Hf^{4+} hafnium	73 Ta^{5+} tantalum	74 W^{6+} tungsten	75 Re^{7+} rhenium	76 Os^{4+} osmium	77 Ir^{4+} iridium	78 Pt^{4+} platinum(IV) Pt^{2+} platinum(II)	79 Au^{3+} gold (III) Au^+ gold (I)	80 Hg^{2+} mercury (II) Hg^+ mercury (I)	81 Tl^+ thallium (I) Tl^{3+} thallium(III)	82 Pb^{2+} lead (II) Pb^{4+} lead (IV)	83 Bi^{3+} bismuth(III) Bi^{5+} bismuth(V)	84 Po^{2+} polonium(II) Po^{4+} polonium(IV)	85 At^- astatide	86 Rn radon
87 Fr^+ francium	88 Ra^{2+} radium	89 Ac^{3+} actinium															

58 Ce^{3+} cerium	59 Pr^{3+} praseodymium	60 Nd^{3+} neodymium	61 Pm^{3+} promethium	62 Sm^{3+} samarium(III) Sm^{2+} samarium(II)	63 Eu^{3+} europium (III) Eu^{2+} europium (II)	64 Gd^{3+} gadolinium	65 Tb^{3+} terbium	66 Dy^{3+} dysprosium	67 Ho^{3+} holmium	68 Er^{3+} erbium	69 Tm^{3+} thulium	70 Yb^{3+} ytterbium(III) Yb^{3+} ytterbium(II)	71 Lu^{3+} lutetium
90 Th^{4+} thorium	91 Pa^{5+} protactinium(V) Pa^{4+} protactinium(IV)	92 U^{6+} uranium (VI) U^{4+} uranium (IV)	93 Np^{5+} neptunium	94 Pu^{4+} plutonium(IV) Pu^{6+} plutonium(VI)	95 Am^{3+} americium(III) Am^{4+} americium(IV)	96 Cm^{3+} curium	97 Bk^{3+} berkelium(III) Bk^{4+} berkelium(IV)	98 Cf^{3+} californium	99 Es^{3+} einsteinium	100 Fm^{3+} fermium	101 Md^{2+} mendelevium (II) Md^{3+} mendelevium (III)	102 No^{2+} nobelium(II) No^{3+} nobelium(III)	103 Lr^{3+} lawrencium