

# A. REGULAR BINARY COMPOUNDS

## Worksheet A1

anions... $\downarrow\downarrow\downarrow$	$F^{-1}$	$O^{-2}$	$N^{-3}$	$C^{-4}$
cations... $\uparrow\uparrow\uparrow$	name: fluoride	name: oxide	name: nitride	name: carbide
$Li^{+1}$ name: lithium	$Li_1F_1$ or LiF lithium fluoride	$Li_2O_1$ or $Li_2O$ lithium oxide	$Li_3N$ lithium nitride	$Li_4C$ lithium carbide
$Be^{+2}$ name: beryllium	$Be_1F_2$ or $BeF_2$ beryllium fluoride	$BeO$ beryllium oxide	$Be_3N_2$ beryllium nitride	$Be_2C$ beryllium carbide
$B^{+3}$ name: boron	$BF_3$ boron fluoride	$B_2O_3$ boron oxide	$BN$ boron nitride	$B_4C_3$ boron carbide
$Na^{+1}$ name: sodium	$NaF$ sodium fluoride	$Na_2O$ sodium oxide	$Na_3N$ sodium nitride	$Na_4C$ sodium carbide
$Mg^{+2}$ name: magnesium	$MgF_2$ magnesium fluoride	$MgO$ magnesium oxide	$Mg_3N_2$ magnesium nitride	$Mg_2C$ magnesium carbide
$Al^{+3}$ name: aluminum	$AlF_3$ aluminum fluoride	$Al_2O_3$ aluminum oxide	$AlN$ aluminum nitride	$Al_4C_3$ aluminum carbide

\*\*\*Note: Carbon compounds, where carbon is the cation, will be named more correctly in section D.

## Worksheet A2 : More Binary Compounds

chemical name	chemical formula	chemical name	chemical formula
sodium fluoride	NaF	sodium iodide	NaI
lithium chloride	LiCl	beryllium fluoride	BeF <sub>2</sub>
beryllium bromide	BeBr <sub>2</sub>	magnesium oxide	MgO
magnesium oxide	MgO	hydrogen oxide	H <sub>2</sub> O
boron iodide	BI <sub>3</sub>	lithium sulfide	Li <sub>2</sub> S
aluminum sulfide	Al <sub>2</sub> S <sub>3</sub>	boron chloride	BCl <sub>3</sub>
potassium oxide	K <sub>2</sub> O	aluminum oxide	Al <sub>2</sub> O <sub>3</sub>
calcium fluoride	CaF <sub>2</sub>	potassium sulfide	K <sub>2</sub> S
barium nitride	Ba <sub>3</sub> N <sub>2</sub>	silver chloride	AgCl
cesium sulfide	Cs <sub>2</sub> S	calcium chloride	CaCl <sub>2</sub>
strontium oxide	SrO	boron nitride	BN
francium bromide	FrBr	cesium iodide	CsI

## **B. BINARY COMPOUNDS: MULTI-VALENT CATIONS**

**(Also known as multi-oxidation state cations)**

### **"OUS - IC" METHOD**

chemical name	chemical formula	chemical name	chemical formula
ferrous oxide	<b>FeO</b>	ferric oxide	$\text{Fe}_2\text{O}_3$
stannous chloride	<b>SnCl<sub>2</sub></b>	stannic chloride	$\text{SnCl}_4$
plumbous sulfide	<b>PbS</b>	plumbic sulfide	$\text{PbS}_2$
cuprous bromide	<b>CuBr</b>	cupric bromide	$\text{CuBr}_2$
aurous iodide	<b>AuI</b>	auric iodide	$\text{AuI}_3$
mercurous fluoride	<b>HgF</b>	mercuric fluoride	$\text{HgF}_2$

### **ROMAN NUMERAL METHOD (Also called the "STOCK SYSTEM")**

chemical name	chemical formula	chemical name	chemical formula
copper(I) fluoride	<b>CuF</b>	copper(II) fluoride	$\text{CuF}_2$
manganese(II) oxide	<b>MnO</b>	manganese(IV) oxide	$\text{MnO}_2$
nickel(II) chloride	<b>NiCl<sub>2</sub></b>	nickel(III) chloride	$\text{NiCl}_3$
tin(II) sulfide	<b>SnS</b>	tin(IV) sulfide	$\text{SnS}_2$
mercury(I) iodide	<b>HgI</b>	mercury(II) iodide	$\text{HgI}_2$

## Worksheet B

<b>chemical formula</b>	<b>"ous-ic" method name</b>	<b>Roman numeral method name (Stock System name)</b>
$\text{SbCl}_5$	antimonic chloride	antimony(V) chloride
$\text{As}_2\text{O}_3$	arsenous oxide	arsenic(III) oxide
$\text{CoS}$	cobaltous sulfide	cobalt(II) sulfide
$\text{Cu}_2\text{O}$	cuprous oxide	copper(I) oxide
$\text{Sn}_3\text{N}_4$	stannic nitride	tin(IV) nitride
$\text{Fe}_2\text{O}_3$	ferric oxide	iron(III) oxide
$\text{PbBr}_4$	plumbic bromide	lead(IV) bromide
$\text{MnO}$	manganous oxide	manganese(II) oxide
$\text{FeF}_2$	ferrous fluoride	iron(II) fluoride
$\text{HgI}_2$	mercuric iodide	mercury(II) iodide
$\text{NiS}$	nickelous sulfide	nickel(II) sulfide
$\text{SnO}$	stannous oxide	tin(II) oxide
$\text{Sn}_3\text{P}_4$	stannic phosphide	tin(IV) phosphide
$\text{SbF}_3$	antimonous fluoride	antimony(III) fluoride
$\text{As}_2\text{S}_5$	arsenic sulfide	arsenic(V) sulfide
$\text{PbO}_2$	plumbic oxide	lead(IV) oxide
$\text{Fe}_4\text{C}_3$	ferric carbide	iron(III) carbide
$\text{CuCl}_2$	cupric chloride	copper(II) chloride

## C. BINARY COMPOUNDS: TWO NONMETALS

### The Prefix Method

### Worksheet C

chemical name	chemical formula	chemical name	chemical formula
nitrogen monoxide	<b>NO</b>	carbon dioxide	CO <sub>2</sub>
silicon dioxide	<b>SiO<sub>2</sub></b>	diarsenic trioxide	As <sub>2</sub> O <sub>3</sub>
carbon monoxide	<b>CO</b>	nitrogen dioxide	NO <sub>2</sub>
sulfur trioxide	<b>SO<sub>3</sub></b>	diphosphorus pentoxide	P <sub>2</sub> O <sub>5</sub>
phosphorus pentabromide	<b>PBr<sub>5</sub></b>	carbon tetrabromide	CBr <sub>4</sub>
dinitrogen trioxide	<b>N<sub>2</sub>O<sub>3</sub></b>	sulfur hexafluoride	SF <sub>6</sub>
carbon tetrachloride	<b>CCl<sub>4</sub></b>	selenium dioxide	SeO <sub>2</sub>

## D. BINARY COMPOUNDS: "FLIP-FLOP" ELEMENTS

"flip-flop" elements	cation symbol and name	anion symbol and name
H	H <sup>+1</sup> , hydrogen	H <sup>-1</sup> , hydride
N	N <sup>+3, 5, 4, 2</sup> , nitrogen	N <sup>-3</sup> , nitride
P	P <sup>+3, 5, 4</sup> , phosphorus	P <sup>-3</sup> , phosphide
S	S <sup>+2, 4, 6</sup> , sulfur	S <sup>-2</sup> , sulfide
C	C <sup>+4, 2</sup> , carbon	C <sup>-4</sup> , carbide
Sb	Sb <sup>+3, 5</sup> , antimony	Sb <sup>-3</sup> , antimonide
As	As <sup>+3, 5</sup> , arsenic	As <sup>-3</sup> , arsenide

## Worksheet D

chemical name	chemical formula	chemical name	chemical formula
aluminum carbide	$\text{Al}_4\text{C}_3$	phosphorus mononitride	PN
lithium hydride	LiH	carbon dioxide	$\text{CO}_2$
sodium arsenide	$\text{Na}_3\text{As}$	magnesium phosphide	$\text{Mg}_3\text{P}_2$
magnesium antimonide	$\text{Mg}_3\text{Sb}_2$	hydrogen oxide	$\text{H}_2\text{O}$
calcium nitride	$\text{Ca}_3\text{N}_2$	dinitrogen pentoxide	$\text{N}_2\text{O}_5$

## E. BINARY ACIDS

### Worksheet E

binary acid formula	name of binary acid (liquid form)	name of gas (vapour form)
HF	hydrofluoric acid	hydrogen fluoride
HCl	hydrochloric acid	hydrogen chloride
HBr	hydrobromic acid	hydrogen bromide
HI	hydroiodic acid	hydrogen iodide
$\text{H}_2\text{S}$	hydrosulfuric acid	hydrogen sulfide
$\text{H}_2\text{Se}$	hydroselenic acid	hydrogen selenide

## F. DIATOMIC GASES

Name of diatomic gas	Formula for diatomic gas
hydrogen	H <sub>2</sub>
oxygen	O <sub>2</sub>
nitrogen	N <sub>2</sub>
fluorine	F <sub>2</sub>
chlorine	Cl <sub>2</sub>
bromine	Br <sub>2</sub>
iodine	I <sub>2</sub>

## G. MONATOMIC GASES

period	name of gas	formula or symbol
period 1	helium	He
period 2	neon	Ne
period 3	argon	Ar
period 4	krypton	Kr
period 5	xenon	Xe
period 6	radon	Rn

## H. BINARY COMPOUNDS: SUMMARY

Although all chemical compounds with multi-valent cations may be named using all three methods learned, there is/are preferred method(s) for naming each type of chemical compound. An asterik (\*) indicates the preferred method for the compounds summarized below. Chemical compounds having cations with only a single oxidation state only have one method for naming them.

chemical formula (metal and nonmetal)	$\text{CaCl}_2$	$\text{B}_2\text{O}_3$
chemical name	calcium chloride	boron oxide

chemical formula (multi-valent metal)	$\text{MnO}$	$\text{Mn}_2\text{O}_7$
ous-ic method	mangano <u>s</u> oxide	manganic oxide
Roman numeral method (*)	manganese(II) oxide	manganese(VII) oxide
Prefix method (seldom used, but may be written)	manganese monoxide	dimanganese heptoxide

chemical formula (two nonmetals)	$\text{P}_2\text{O}_3$	$\text{P}_2\text{O}_5$
ous-ic name (seldom used, but may be written)	phosphoro <u>s</u> oxide	phosphoric oxide
Roman numeral name (seldom used, but may be written)	phosphorus(III) oxide	phosphorus(V) oxide
Prefix name (*)	diphosphorus trioxide	diphosphorus pentoxide

chemical formula (binary acid)	$\text{HCl}$ (liquid) or $\text{HCl}$ (l)	$\text{HF}$ (gas) or $\text{HF}$ (g)
chemical name	hydrochloric acid	hydrogen fluoride

chemical formula (diatomic or monatomic gas)	$\text{Br}_2$	$\text{Rn}$
chemical name (diatomic or monatomic gas)	bromine	radon



## REVIEW WORKSHEETS

AA. BINARY COMPOUNDS - REGULAR			
Write Formulas		Write Names	
1.	sodium chloride NaCl	26.	CaO calcium oxide
2.	calcium fluoride CaF <sub>2</sub>	27.	AgCl silver chloride
3.	barium bromide BaBr <sub>2</sub>	28.	Ca <sub>3</sub> N <sub>2</sub> calcium nitride
4.	lithium carbide Li <sub>4</sub> C	29.	H <sub>2</sub> O hydrogen oxide
5.	silver iodide AgI	30.	SiBr <sub>4</sub> silicon bromide
6.	potassium oxide K <sub>2</sub> O	31.	Al <sub>2</sub> S <sub>3</sub> aluminum sulfide
7.	aluminum bromide AlBr <sub>3</sub>	32.	Ag <sub>3</sub> N silver nitride
8.	calcium nitride Ca <sub>3</sub> N <sub>2</sub>	33.	AlF <sub>3</sub> aluminum fluoride
9.	radium oxide RaO	34.	NaCl sodium chloride
10.	boron fluoride BF <sub>3</sub>	35.	KBr potassium bromide
11.	hydrogen sulfide H <sub>2</sub> S (g)	36.	BaS barium sulfide
12.	rubidium hydride RbH	37.	AlN aluminum nitride
13.	cesium oxide Cs <sub>2</sub> O	38.	BA <sub>3</sub> boron arsenide
14.	magnesium sulfide MgS	39.	HBr (l) hydrobromic acid
15.	calcium carbide Ca <sub>2</sub> C	40.	ZnCl <sub>2</sub> zinc chloride
16.	zinc oxide ZnO	41.	MgI <sub>2</sub> magnesium iodide
17.	potassium phosphide K <sub>3</sub> P	42.	K <sub>3</sub> N potassium nitride
18.	beryllium chloride BeCl <sub>2</sub>	43.	HI (g) hydrogen iodide
19.	aluminum arsenide AlAs	44.	SrCl <sub>2</sub> strontium chloride
20.	boron iodide BI <sub>3</sub>	45.	NaH sodium hydride
21.	silicon oxide SiO <sub>2</sub>	46.	SiF <sub>4</sub> silicon fluoride
22.	lithium nitride Li <sub>3</sub> N	47.	Ag <sub>2</sub> O silver oxide
23.	zinc nitride Zn <sub>3</sub> N <sub>2</sub>	48.	CaS calcium sulfide
24.	francium sulfide Fr <sub>2</sub> S	49.	Al <sub>2</sub> O <sub>3</sub> aluminum oxide
25.	hydrogen oxide H <sub>2</sub> O	50.	MgO magnesium oxide

<b>BB1. BINARY COMPOUNDS - "ous - ic" method</b>			
<b>Write Formulas</b>		<b>Write Names</b>	
1.	auric iodide $\text{AuI}_3$	26.	$\text{CuS}$ cupric sulfide
2.	aurous sulfide $\text{Au}_2\text{S}$	27.	$\text{Cu}_2\text{S}$ cuprous sulfide
3.	antimonic oxide $\text{Sb}_2\text{O}_5$	28.	$\text{HgBr}$ mercurous bromide
4.	antimonous chloride $\text{SbCl}_3$	29.	$\text{Fe}_2\text{O}_3$ ferric oxide
5.	mercuric oxide $\text{HgO}$	30.	$\text{FeO}$ ferrous oxide
6.	mercurous fluoride $\text{HgF}$	31.	$\text{SnF}_2$ stannous fluoride
7.	plumbous arsenide $\text{Pb}_3\text{As}_2$	32.	$\text{SnF}_4$ stannic fluoride
8.	plumbic nitride $\text{Pb}_3\text{N}_4$	33.	$\text{MnBr}_7$ manganic bromide
9.	stannic oxide $\text{SnO}_2$	34.	$\text{MnO}$ manganous oxide
10.	stannous fluoride $\text{SnF}_2$	35.	$\text{PbCl}_2$ plumbous chloride
11.	ferric sulfide $\text{Fe}_2\text{S}_3$	36.	$\text{PbCl}_4$ plumbic chloride
12.	ferrous hydride $\text{FeH}_2$	37.	$\text{Sb}_2\text{S}_5$ antimonik sulfide
13.	nickelic oxide $\text{Ni}_2\text{O}_3$	38.	$\text{SbAs}$ antimonous arsenide
14.	nickelous sulfide $\text{NiS}$	39.	$\text{AsI}_3$ arsenous iodide
15.	cuprous carbide $\text{Cu}_4\text{C}$	40.	$\text{NiO}$ nickelous oxide
16.	cupric oxide $\text{CuO}$	41.	$\text{CoN}$ cobaltic nitride
17.	manganous phosphide $\text{Mn}_3\text{P}_2$	42.	$\text{FeF}_2$ ferrous fluoride
18.	manganic chloride $\text{MnCl}_7$	43.	$\text{HgF}_2$ mercuric fluoride
19.	mercurous arsenide $\text{Hg}_3\text{As}$	44.	$\text{CuCl}_2$ cupric chloride
20.	cobaltic iodide $\text{CoI}_3$	45.	$\text{Sn}_3\text{As}_4$ stannous arsenide
21.	arsenous oxide $\text{As}_2\text{O}_3$	46.	$\text{NiP}$ nickelic phosphide
22.	antimonic nitride $\text{Sb}_3\text{N}_5$	47.	$\text{NiS}$ nickelous sulfide
23.	arsenic nitride $\text{As}_3\text{N}_5$	48.	$\text{FeS}$ ferrous sulfide
24.	cobaltous sulfide $\text{CoS}$	49.	$\text{PbC}$ plumbic carbide
25.	plumbic oxide $\text{PbO}_2$	50.	$\text{Hg}_2\text{O}$ mercurous oxide

<b>BB2. BINARY COMPOUNDS - Roman numeral method</b>			
<b>Write Formulas</b>		<b>Write Names</b>	
1.	phosphorus(III) sulfide $P_2S_3$	26.	$CuBr$ copper(I) bromide
2.	phosphorus(V) oxide $P_2O_5$	27.	$Cu_2O$ copper(I) oxide
3.	antimony(V) chloride $SbCl_5$	28.	$HgCl$ mercury(I) chloride
4.	antimony(III) oxide $Sb_2O_3$	29.	$Fe_2O_3$ iron(III) oxide
5.	mercury(II) fluoride $HgF_2$	30.	$FeS$ iron(II) sulfide
6.	mercury(I) arsenide $Hg_3As$	31.	$SnBr_2$ tin(II) bromide
7.	lead(II) nitride $Pb_3N_2$	32.	$SnF_4$ tin(IV) fluoride
8.	lead(IV) oxide $PbO_2$	33.	$MnO_2$ manganese(IV) oxide
9.	tin(II) fluoride $SnF_2$	34.	$MnF_2$ manganese(II) fluoride
10.	tin(IV) sulfide $SnS_2$	35.	$PbI_2$ lead(II) iodide
11.	iron(III) hydride $FeH_3$	36.	$PbCl_4$ lead(IV) chloride
12.	iron(II) oxide $FeO$	37.	$Sb_2O_5$ antimony(V) oxide
13.	nickel(III) sulfide $Ni_2S_3$	38.	$SbAs$ antimony(III) arsenide
14.	nickel(II) carbide $Ni_2C$	39.	$AsF_5$ arsenic(V) fluoride
15.	copper(I) oxide $Cu_2O$	40.	$N_2O_5$ nitrogen(V) oxide
16.	copper(II) phosphide $Cu_3P_2$	41.	$CoAs$ cobalt(III) arsenide
17.	manganese(II) chloride $MnCl_2$	42.	$PBr_5$ phosphorus(V) bromide
18.	manganese(VII) arsenide $Mn_3As_7$	43.	$PF_3$ phosphorus(III) fluoride
19.	carbon(II) iodide $Cl_2$	44.	$SF_4$ sulfur(IV) fluoride
20.	carbon(IV) oxide $CO_2$	45.	$SAs_2$ sulfur(VI) arsenide
21.	arsenic(III) nitride $AsN$	46.	$NiP$ nickel(III) phosphide
22.	sulfur(IV) chloride $SCl_4$	47.	$NiO$ nickel(II) oxide
23.	arsenic(V) sulfide $As_2S_5$	48.	$FeS$ iron(II) sulfide
24.	cobalt(II) oxide $CoO$	49.	$PbC$ lead(IV) carbide
25.	sulfur(VI) phosphide $SP_2$	50.	$Hg_2S$ mercury(I) sulfide

<b>CC. BINARY COMPOUNDS - prefix method</b>			
<b>Write Formulas</b>		<b>Write Names</b>	
1.	carbon dioxide CO <sub>2</sub>	8.	CO <sub>2</sub> carbon dioxide
2.	carbon monoxide CO	9.	SiO <sub>2</sub> silicon dioxide
3.	sulfur dioxide SO <sub>2</sub>	10.	SO <sub>2</sub> sulfur dioxide
4.	sulfur trioxide SO <sub>3</sub>	11.	NO <sub>2</sub> nitrogen dioxide
5.	carbon tetrachloride CCl <sub>4</sub>	12.	CO carbon monoxide
6.	nitrogen dioxide NO <sub>2</sub>	13.	CCl <sub>4</sub> carbon tetrachloride
7.	diphosphorus pentoxide P <sub>2</sub> O <sub>5</sub>	14.	P <sub>2</sub> O <sub>3</sub> diphosphorus trioxide

<b>EE. BINARY COMPOUNDS - binary acids</b>			
<b>Write Formulas</b>		<b>Write Names</b>	
1.	hydrochloric acid HCl (ℓ)	6.	H <sub>2</sub> S (g) dihydrogen sulfide
2.	hydrofluoric acid HF (ℓ)	7.	HCl (g) hydrogen chloride
3.	hydrobromic acid HBr (ℓ)	8.	HBr (ℓ) hydrobromic acid
4.	hydroiodic acid HI (ℓ)	9.	HF (ℓ) hydrofluoric acid
5.	hydrosulfuric acid H <sub>2</sub> S (ℓ)	10.	HI (g) hydrogen iodide

<b>FG. GASES - monatomic and diatomic</b>			
<b>Write Formulas</b>		<b>Write Names</b>	
1.	hydrogen gas H <sub>2</sub>	8.	He helium
2.	oxygen gas O <sub>2</sub>	9.	Ne neon
3.	nitrogen gas N <sub>2</sub>	10.	Ar argon
4.	fluorine gas F <sub>2</sub>	11.	Kr krypton
5.	chlorine gas Cl <sub>2</sub>	12.	Xe xenon
6.	bromine vapour Br <sub>2</sub>	13.	Rn radon
7.	iodine vapour I <sub>2</sub>		