Common Ions

CATIONS					
+1		**+2**		**+3**	
ammonium	NH_4^+	cadmium(*II*)	Cd^{2+}	cobalt(*III*) (blue)	Co^{3+}
copper(*I*) (green)	Cu^+	chromium(*II*)	Cr^{2+}	chromium (*III*)	Cr^{3+}
hydronium	H_3O^+	copper(*II*) (blue)	Cu^{2+}	iron(*III*)	Fe^{3+}
silver	Ag^+	cobalt(*II*) (blue)	Co^{2+}	lead(*III*)	Pb^{3+}
		iron(*II*)	Fe^{2+}	nickel(*III*)	Ni^{3+}
		lead(*II*)	Pb^{2+}	vanadium(*III*)	V^{3+}
		mercury(*I*)	Hg_2^{2+}		
		mercury(*II*)	Hg^{2+}		
		manganese(*II*)	Mn^{2+}		
+4		nickel(*II*) (green)	Ni^{2+}	**+7**	
tin(*IV*)	Sn^{4+}	tin(*II*)	Sn^{2+}	manganese(*VII*)	Mn^{7+}
lead(*IV*)	Pb^{4+}	vanadium(*II*)	V^{2+}		
vanadium(*IV*)	V^{4+}	zinc	Zn^{2+}		

ANIONS					
1-		**2-**		**3-**	
acetate	CH_3COO^- $C_2H_3O_2^-$	carbonate	CO_3^{2-}	phosphite	PO_3^{3-}
hypobromite	BrO^-	chromate (yellow)	CrO_4^{2-}	phosphate	PO_4^{3-}
bromite	BrO_2^-			arsenate	AsO_4^{3-}
bromate	BrO_3^-				
perbromate	BrO_4^-				
hypochlorite	ClO^-	dichromate (orange)	$Cr_2O_7^{2-}$		
chlorite	ClO_2^-	hydrogen phosphate	HPO_4^{2-}		
chlorate	ClO_3^-	oxalate	$C_2O_4^{2-}$		
perchlorate	ClO_4^-	peroxide	O_2^{2-}		
cyanide	CN^-	sulfite	SO_3^{2-}		
dihydrogen phosphate	$H_2PO_4^-$	sulfate	SO_4^{2-}		
formate	$HCOO^-$	thiosulfate	$S_2O_3^{2-}$		
hydrogen carbonate (bicarbonate)	HCO_3^-				
hydrogen sulfite (bisulfite)	HSO_3^-				
hydrogen sulfate (bisulfate)	HSO_4^-				
bisulfide	HS^-				
hydroxide	OH^-				
nitrite	NO_2^-				
nitrate	NO_3^-				
hypoiodite	IO^-				
iodite	IO_2^-				
iodate	IO_3^-				
periodate	IO_4^-				
permanganate (purple)	MnO_4^-				
thiocyanate	SCN^-				

STUFF I Need to Memorize in AP Chemistry

Solubility Rules of Common *Ionic Compounds* in Water at 25°C	
Soluble Compounds	**Exceptions**
alkali metals (H^+, Li^+, Na^+, K^+, Rb^+, Cs^+) ammonium ion (NH_4^+)	
nitrates (NO_3^-), bicarbonates (HCO_3^-), chlorates (ClO_3^-), perchlorates (ClO_4^-), acetates (CH_3COO^-)	
halides (Cl^-, Br^-, I^-) fluorine ion (F^-)	Ag^+, Hg_2^{2+} and Pb^{2+} (APH) Pb^{2+}, Ca^{2+}, Sr^{2+},Ba^{2+} and Mg^{2+} (CBS/PM)
sulfates (SO_4^{2-})	Ag^+, Hg_2^{2+}, Pb^{2+}, Ca^{2+}, Sr^{2+} and Ba^{2+} (CBS/APH)
Insoluble Compounds	**Exceptions**
carbonates (CO_3^{2-}), chromates (CrO_4^{2-}), oxalate ($C_2O_4^{2-}$),sulfides (S^{2-}), sulfites (SO_3^{2-}), phosphates (PO_4^{3-}),	alkali metal ions and NH_4^+
hydroxides (OH^-) and peroxides (O_2^{2-})	alkali metal ions and NH_4^+ *Ca^{2+}, *Sr^{2+} and Ba^{2+} (CBS)

Polyatomic Elements (Diatomic)	
hydrogen	H_2
nitrogen	N_2
oxygen	O_2
fluorine	F_2
chlorine	Cl_2
bromine	Br_2
iodine	I_2
astatine	At_2
phosphorus	P_4
sulfur	S_8

Metric Prefixes		
kilo-	k	10^3
deci-	d	10^{-1}
centi-	c	10^{-2}
milli-	m	10^{-3}
micro-	μ	10^{-6}
nano-	n	10^{-9}

8 Strong Acids (H^+) (all other acids are weak)	
hydrochloric acid	HCl
hydrobromic acid	HBr
hydroiodic acid	HI
perchloric acid	$HClO_4$
chloric acid	$HClO_3$
nitric acid	HNO_3
periodic acid	HIO_4
sulfuric acid	H_2SO_4

8 Strong Bases (OH^-) (all other bases are weak)	
lithium hydroxide	LiOH
sodium hydroxide	NaOH
potassium hydroxide	KOH
rubidium hydroxide	RbOH
cesium hydroxide	CsOH
calcium hydroxide	*$Ca(OH)_2$
strontium hydroxide	*$Sr(OH)_2$
barium hydroxide	$Ba(OH)_2$

*Limited solubility

AP CHEMICAL NAMING

IONIC compound
(metal + nonmetal)

1) name the first element. Use roman numerals for *d*-block *metals* with *more than 1 one oxidation number*.
2) name the second element with the *–ide* ending

Ex: NaCl – sodium chloride
$CuCl_2$ – copper(*II*) chloride

***d*-block metals**:
Cr^{2+}, Cr^{3+}, Cu^{1+}, Cu^{2+}, Co^{2+}, Co^{3+}, Fe^{2+}, Fe^{3+}, Pb^{2+}, Pb^{3+}, Pb^{4+}, Mn^{2+}, Mn^{7+}, Hg^{2+}, Hg_2^{2+}, Ni^{1+}, Ni^{2+}, Sn^{2+}, Sn^{4+}, V^{2+}, V^{3+}, V^{4+}

COVALENT compound
(nonmetal + nonmetal)

1) name the first element using the proper prefix (never use *mono-*)
2) name the second element using the proper prefix with the *–ide* ending

Ex: NO – nitrogen monoxide
N_2O_5 – dinitrogen pentoxide

Prefixes:

1	2	3	4	5	6	7	8	9	10
mono	*di*	*tri*	*tetra*	*penta*	*hexa*	*hepta*	*octa*	*nano*	*deca*

ORGANIC compound including Hydrocarbons
(compounds containing any of the following elements: **C, O, H, N)**

1) identify compound as: Alk**a**nes (all **single** bonds) = C_nH_{2n+2} *Ex*: CH_4 – meth**a**ne
Alk**e**nes (at least 1 **double** bond)= C_nH_{2n} *Ex*: C_3H_6 – prop**e**ne
Alk**y**nes (at least 1 **triple** bond)= C_nH_{2n-2} *Ex*: C_2H_2 – eth**y**ne (commonly known as acteylene)
2) using the proper prefix to represent the number of CARBON atoms in the compound.
3) if compound has an alcohol group (-OH), use the *–ol* ending. *Ex*: C_4H_9OH – butan**ol**

Prefixes according to the # of CARBON atoms:

1	2	3	4	5	6	7	8	9	10	12	17
meth	*eth*	*prop*	*but*	*pent*	*hex*	*hept*	*oct*	*non*	*dec*	*dodec*	*heptadec*

ACID
(compound *beginning* with **hydrogen**)

1) *hydrogen + halogen*
a) name *hydro-* for H atom
b) replace the *–ine* ending of the halogen with *–ic* ending
c) add the word *acid*

Ex: HCl – hydrochloric acid

2) hydrogen + polyatomic ion
a) polyatomic ion has ending:
replace *–ate* with *–ic*
replace *–ite* with *-ous*
b) add the word *acid*

Ex: H_2SO_4 – sulfuric acid
H_2SO_3 – sulfurous acid

compound w/ POLYATOMIC ION
(metal *or* nonmetal + polyatomic ion)

1) use the rules for naming ionic compounds
2) never modify the special name of the polyatomic ion

Ex: $NaHCO_3$ – sodium bicarbonate
NH_4Cl – ammonium chloride
$Fe(NO_3)_3$ – iron (III) nitrate

short-cuts:
sulfate (SO_4^{2-}) – *-ate* ending for polyatomic ions with more oxygen atoms
sulfite (SO_3^{2-}) – *-ite* ending for ions with less oxygen atoms

Ex: nitrate (NO_3^-) nitrite (NO_2^-)