



Science 1206

Complex Ionic
Compounds



Complex (Polyatomic) Ions

- More than one type of atom is in the ion
- Complex ions are listed on the back of periodic table
- Most end in -ite or -ate
- Work the same as ionic compounds
- You must still balance the charges

Table of Some Common Polyatomic Ions

1 - Ions		2 - Ions		3 - Ions	
Formula	Name	Formula	Name	Formula	Name
H_2PO_4^-	dihydrogen phosphate	HPO_4^{2-}	hydrogen phosphate	PO_4^{3-}	phosphate
H_2PO_3^-	dihydrogen phosphite	HPO_3^{2-}	hydrogen phosphite	PO_3^{3-}	phosphite
HCO_3^-	hydrogen carbonate	CO_3^{2-}	carbonate	BO_3^{3-}	borate
HSO_4^-	hydrogen sulfate	SO_4^{2-}	sulfate		
HSO_3^-	hydrogen sulfite	SO_3^{2-}	sulfite		
BrO_3^-	bromate	$\text{C}_2\text{O}_4^{2-}$	oxalate		
CH_3COO^-	acetate	CrO_4^{2-}	chromate		
$\text{C}_6\text{H}_5\text{COO}^-$	benzoate	$\text{Cr}_2\text{O}_7^{2-}$	dichromate		
ClO^-	hypochlorite	$\text{S}_2\text{O}_3^{2-}$	thiosulfate		
ClO_2^-	chlorite	SiO_3^{2-}	silicate		
ClO_3^-	chlorate	1 + Ions			
ClO_4^-	perchlorate	Formula		Name	
CN^-	cyanide	NH_4^+		ammonium	
IO_3^-	iodate	H_3O^+		hydronium	
OH^-	hydroxide				
NO_3^-	nitrate				
NO_2^-	nitrite				
MnO_4^-	permanganate				
SCN^-	thiocyanate				

Give formulas for the following:

- potassium bromate
- silver nitrate
- aluminum cyanide

- 
- ammonium carbonate (2 complex ions)

Name the following compounds

- Identify cation and anion first (Look at the tables)
- NaCH_3COO
- KMnO_4

Continued...

Man, this is

- Na_3BO_3
- NH_4NO_3



*If you see 'lots of letters',
likely complex ions!*

Periodic Chart of the Elements

IA												VIIIA							
1 1.0 H hydrogen	2 4.0 He helium											3 6.9 Li lithium	4 9.0 Be beryllium	5 10.8 B boron	6 12.0 C carbon	7 14.0 N nitrogen	8 16.0 O oxygen	9 19.0 F fluorine	10 20.18 Ne neon
11 22.99 Na sodium	12 24.31 Mg magnesium											13 26.98 Al aluminum	14 28.09 Si silicon	15 30.97 P phosphorus	16 32.07 S sulfur	17 35.45 Cl chlorine	18 39.95 Ar argon		
19 39.10 K potassium	20 40.08 Ca calcium	21 44.96 Sc scandium	22 47.88 Ti titanium	23 50.94 V vanadium	24 52.00 Cr chromium	25 54.94 Mn manganese	26 55.85 Fe iron	27 58.93 Co cobalt	28 58.71 Ni nickel	29 63.55 Cu copper	30 65.38 Zn zinc	31 69.74 Ga gallium	32 72.59 Ge germanium	33 74.92 As arsenic	34 78.96 Se selenium	35 79.90 Br bromine	36 83.80 Kr krypton		
37 85.47 Rb rubidium	38 87.62 Sr strontium	39 88.91 Y yttrium	40 91.22 Zr zirconium	41 92.91 Nb niobium	42 95.94 Mo molybdenum	43 98.91 Tc technetium	44 101.07 Ru ruthenium	45 102.91 Rh rhodium	46 106.40 Pd palladium	47 107.87 Ag silver	48 112.41 Cd cadmium	49 112.41 In indium	50 114.82 Sn tin	51 121.75 Sb antimony	52 127.60 Te tellurium	53 126.90 I iodine	54 131.30 Xe xenon		
55 132.91 Cs cesium	56 137.33 Ba barium	57-71 lanthanide	72 178.49 Hf hafnium	73 180.95 Ta tantalum	74 183.85 W tungsten	75 186.21 Re rhenium	76 190.20 Os osmium	77 192.22 Ir iridium	78 195.09 Pt platinum	79 196.97 Au gold	80 200.59 Hg mercury	81 204.37 Tl thallium	82 207.19 Pb lead	83 208.98 Bi bismuth	84 (209) Po polonium	85 (210) At astatine	86 (222) Rn radon		
87 (223) Fr francium	88 226.03 Ra radium	89-103 actinide	104 (261) Unq unnilquadium	105 (262) Unp ununpentium	106 (263) Unh ununhexium	107 (262) Uns ununseptium	108 (265) Uno ununoctium	109 (266) Une ununoctium											
57 138.91 La lanthanum	58 140.12 Ce cerium	59 140.91 Pr praseodymium	60 144.24 Nd neodymium	61 (145) Pm promethium	62 150.35 Sm samarium	63 151.96 Eu europium	64 157.25 Gd gadolinium	65 158.93 Tb terbium	66 162.50 Dy dysprosium	67 164.93 Ho holmium	68 167.26 Er erbium	69 168.93 Tm thulium	70 173.04 Yb ytterbium	71 174.97 Lu lutetium					
89 227.03 Ac actinium	90 232.04 Th thorium	91 231.04 Pa protactinium	92 238.03 U uranium	93 237.05 Np neptunium	94 244 Pu plutonium	95 243 Am americium	96 247 Cm curium	97 247 Bk berkelium	98 251 Cf californium	99 254 Es einsteinium	100 257 Fm fermium	101 258 Md mendelevium	102 259 No nobelium	103 260 Lr lawrencium					

Time for a recap!

Molecular:

- non-metal - non-metal
- prefix naming system

Ionic:

- metals - non-metals
- stock metals - non-metals
- complex ions - non-metals
- complex ions - complex ions
- metals - complex ions
- do not use prefixes