

2.5 C4 Polyatomic Part 1

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Science 9- Chemistry Topic 2.5 - Concept 4: Polyatomic ions are made up of more than one atom. (Read pages 164-165)

Polyatomic ions – a charged molecule with two or more covalently bonded atoms.
e.g. carbonate ion, CO_3^{2-} = Carbon and Oxygen atoms.

Which of the following compounds involve a polyatomic ion?

magnesium phosphate PO_4^{3-} → $\text{Mg}_3(\text{PO}_4)_2$
 magnesium phosphide → Mg_3P_2
 aluminum chloride Cl → AlCl_3
 aluminum chlorate ClO_3^- → $\text{Al}(\text{ClO}_3)_3$

*How can you tell if the compound has polyatomic ions? → more than 2 elements

Names, formulas, and charges of some common polyatomic ions.

1+	1-	2-	3-
ammonium NH_4^+	Acetate CH_3COO^-	Carbonate CO_3^{2-}	Phosphate PO_4^{3-}
	Chlorate ClO_3^-	Chromate CrO_4^{2-}	Phosphite PO_3^{3-}
	Chlorite ClO_2^-	Dichromate $\text{Cr}_2\text{O}_7^{2-}$	
	Cyanide CN^-	Peroxide O_2^{2-}	
	Hydrogen carbonate or bicarbonate HCO_3^-	Sulfate SO_4^{2-}	
	Hydroxide OH^-	Sulfite SO_3^{2-}	
	Hypochlorite ClO^-		
	Nitrate NO_3^-		
	Nitrite NO_2^-		
	Perchlorate ClO_4^-		
	Permanganate MnO_4^-		

Writing Formulas

Steps	Calcium nitrate	Ammonium phosphate
1. Identify each <u>ION</u> and its <u>charge</u> .	Ca^{2+} NO_3^-	NH_4^+ PO_4^{3-}
2. Determine the numbers of <u>Ion</u> needed to <u>balance</u> positive charges with negative charges.	$\text{Ca}(\text{NO}_3)_2$	$(\text{NH}_4)_3\text{PO}_4$
3. Use <u>subscript</u> to write the formula. *If the polyatomic ion is going to take a subscript, use <u>parentheses</u> to enclose the polyatomic ion before adding the subscript.		

Practice Problems: Chemical Formula Writing

Name of Compound	Ions	Formula
potassium hydroxide		
calcium acetate	Ca^{2+} CH_3COO^-	$\text{Ca}(\text{CH}_3\text{COO})_2$
sodium hypochlorite		
silver carbonate	Ag^+ CO_3^{2-}	Ag_2CO_3
ammonium hydrogen carbonate		
sodium bicarbonate		
aluminum sulfite		
potassium permanganate		
tin(IV) chlorite	Sn^{4+} ClO_2^-	$\text{Sn}(\text{ClO}_2)_4$
tin(IV) perchlorate		
titanium(IV) nitrite		
gold(III) sulphate		
mercury(II) phosphate	Hg^{2+} PO_4^{3-}	$\text{Hg}_3(\text{PO}_4)_2$
tin(II) carbonate		
lead(II) chromate		
copper(I) sulfite		
iron(III) nitrate		
iron(II) sulfate		
nickel(II) cyanide		
cobalt(III) nitrite		
ammonium sulfate		
tin(II) permanganate		
ammonium nitrite		
cadmium(II) hydroxide		

iron(II) sulfate		
nickel(II) cyanide		
cobalt(III) nitrite		
ammonium sulfate		
tin(II) permanganate		
ammonium nitrite		
cadmium(II) hydroxide		

Formula	Name of Compound	Formula	Name of Compound
AlPO ₄		Pb(OH) ₄	
KNO ₃		Cu(ClO ₃) ₂	
NaHCO ₃		FeSO ₄	
CaCO ₃		SnSO ₄	
Mg(OH) ₂		Pb(NO ₃) ₂	
Na ₂ CrO ₄		CuHSO ₃	
Ba(CN) ₂		MnSO ₃	
NH ₄ NO ₃		Au ₂ (Cr ₂ O ₇) ₃	
Na ₂ SO ₃		Fe(CH ₃ COO) ₃	
Al(MnO ₄) ₃		HgHCO ₃	