

Ionic bonding—Simple binary

1. Describe basic binary ionic bonding rules. Include the terms cation, anion, and describe when to use -ide in the name.

name the cation first

Name the anion second with -ide ending

2. Fill in the table below. Make compounds in each box using the cation and anion listed.

	F ⁻	S ²⁻	N ³⁻	O ²⁻
Na ⁺	NaF	Na ₂ S	Na ₃ N	Na ₂ O
Mg ²⁺	MgF ₂	MgS	Mg ₃ N ₂	MgO
K ⁺	KF	K ₂ S	K ₃ N	K ₂ O
Al ³⁺	AlF ₃	Al ₂ S ₃	AlN	Al ₂ O ₃
Sr ²⁺	SrF ₂	SrS	Sr ₃ N ₂	SrO
Ca ²⁺	CaF ₂	CaS	Ca ₃ N ₂	CaO
Li ⁺	LiF	Li ₂ S	Li ₃ N	Li ₂ O

3. Name the following

1. NaI sodium iodide
2. KBr potassium bromide
3. MgF₂ magnesium fluoride
4. CaO calcium oxide
5. BaS barium sulfide
6. CaI₂ calcium iodide
7. AlCl₃ aluminum chloride
8. Na₂O sodium oxide
9. Li₃N lithium nitride
10. ZnS zinc sulfide
11. AlN aluminum nitride
12. AgCl silver chloride
13. KF potassium fluoride
14. Al₂S₃ aluminum sulfide
15. BeI₂ beryllium iodide

*transition metal
with one charge

16. $ZnBr_2$ zinc bromide
 17. CaF_2 calcium fluoride
 18. Ag_2O silver oxide
 19. BaO barium oxide
 20. Na_3P sodium phosphide

4. Write formulas for the following

1. Sodium iodide NaI
 2. Potassium bromide KBr
 3. Magnesium fluoride MgF₂
 4. Calcium oxide CaO
 5. Barium sulfide BaS
 6. Calcium iodide CaI₂
 7. Aluminum chloride AlCl₃
 8. Sodium oxide Na₂O
 9. Lithium nitride Li₃N
 10. Zinc sulfide ZnS
 11. Aluminum nitride AlN
 12. Silver chloride AgCl
 13. Potassium fluoride KF
 14. Aluminum sulfide Al₂S₃
 15. Beryllium iodide BeI₂
 16. Zinc bromide ZnBr₂
 17. Calcium fluoride CaF₂
 18. Silver oxide Ag₂O
 19. Barium oxide BaO
 20. Sodium phosphide Na₃P

Ionic Bonding - Ternary (Polyatomic Ions)

5. How is polyatomic ion nomenclature different from binary ionic nomenclature?

Keep polyatomic ion the same name

6. Write the formulas for the following compounds

1. Sodium nitrate NaNO₃
 2. Aluminum phosphate AlPO₄
 3. Potassium phosphate K₃(PO₄)

4. Ammonium sulfide $(\text{NH}_4)_2\text{S}$
5. Chromium (III) carbonate $\text{Cr}_2(\text{CO}_3)_3$ → transition metal
6. Magnesium hydroxide Mg OH
7. Cobalt (II) carbonate Co CO_3 → transition
8. Iron (II) hydroxide $\text{Fe}(\text{OH})_2$ → transition
9. Ammonium carbonate $(\text{NH}_4)_2\text{CO}_3$
10. Zinc phosphate $\text{Zn}_3(\text{PO}_4)_2$

7. Write the names for the following compounds

1. $\text{Fe}(\text{OH})_2$ iron (II) hydroxide → transition
2. $(\text{NH}_4)_2\text{CO}_3$ ammonium carbonate
3. $\text{Zn}_3(\text{PO}_4)_2$ zinc phosphate
4. AlPO_4 aluminum phosphate
5. NaNO_3 sodium nitrate
6. $\text{Cr}_2(\text{CO}_3)_3$ chromium (III) carbonate → transition
7. $\text{Mg}(\text{OH})_2$ magnesium hydroxide → transition
8. CoCO_3 cobalt (II) carbonate
9. K_3PO_4 potassium phosphate
10. $(\text{NH}_4)_2\text{S}$ ammonium sulfide

Ionic Bonding with Transition Metals

8. What does the roman numeral stand for in the name iron (III) oxide? Why must roman numerals be used?

↳ charge
 ↳ multiple charges possible on transition metals (plus Sn + Pb)
 ↑
 +3 charge on Fe

9. What are the charges of the common ions of Silver, Cadmium, and Zinc?

+1 +2 +2

10. Write formulas for the following

1. Iron (II) sulfide Fe S
2. Gold (III) oxide Au_2O_3
3. Manganese (IV) oxide Mn O_2
4. Tin (IV) fluoride Sn F_4
5. Lead (IV) oxide Pb O_2
6. Nickel (II) fluoride Ni F_2

7. Tin (II) iodide SnI_2
8. Cobalt (II) oxide CoO
9. Iron (III) oxide Fe_2O_3
10. Iron (III) iodide Fe_3I
11. Tin (II) sulfide SnS
12. Copper (I) nitride Cu_3N
13. Chromium (III) phosphide Cr_3P
14. Mercury (II) bromide HgBr_2
15. Gold (III) chloride AuCl_3
16. Mercury (II) sulfide HgS
17. Chromium (III) chloride Cr_2Cl_3
18. Manganese (II) bromide MnBr_2

11. Write the names for the following

1. FeI_3 Iron (III) iodide
2. Fe_2O_3 Iron (III) oxide
3. SnS Tin (II) sulfide
4. Cu_3N Copper (I) nitride
5. FeS Iron (II) sulfide
6. Au_2O_3 Gold (III) oxide
7. MnO_2 Manganese (IV) oxide
8. SnF_4 Tin (IV) fluoride
9. PbO_2 Lead (IV) oxide
10. CoO Cobalt (II) oxide
11. CrCl_3 Chromium (III) chloride
12. MnBr_2 Manganese (II) bromide
13. CrP Chromium (III) phosphide
14. NiF_2 Nickel (II) fluoride
15. SnI_2 Tin (II) iodide
16. HgBr_2 Mercury (II) bromide
17. AuCl_3 Gold (III) chloride
18. HgS Mercury (II) sulfide

Binary Molecular Nomenclature

12. Write the names of the following molecules

1. NO nitrogen monoxide
2. P_2O_5 diphosphorus pentoxide
3. CF_4 carbon tetrafluoride

4. SO_2 Sulfur dioxide
5. CCl_4 Carbon tetrachloride
6. CO Carbon monoxide
7. N_2O_4 dinitrogen tetroxide
8. PCl_5 Phosphorus pentachloride
9. SO_3 Sulfur trioxide
10. SiO_2 Silicon dioxide

13. Write the formulas for the following molecules

1. Nitrogen monoxide NO
2. Carbon tetrafluoride CF₄
3. Sulfur dioxide SO₂
4. Carbon tetrachloride CCl₄
5. Carbon monoxide CO
6. Dinitrogen tetroxide N₂O₄
7. Silicon dioxide SiO₂
8. Phosphorus pentachloride PCl₅
9. Sulfur trioxide SO₃
10. Diphosphorus pentoxide P₂O₅

Acids

14. Write the formulas for the following acids.

Name	Formula	Name	Formula
Nitric acid	HNO_3	Hydroiodic acid	HI
Chloric acid	HClO_3	Phosphorous acid	H_3PO_3
Acetic acid	$\text{HC}_2\text{H}_3\text{O}_2$	Carbonic acid	H_2CO_3
Hydrobromic acid	HBr	Perchloric acid	HClO_4
Sulfurous acid	H_2SO_3	Permanganic acid	HMnO_4
Chlorous acid	HClO_2	Sulfuric acid	H_2SO_4
Hydrochloric acid	HCl	Hydrocyanic acid	HCN
Phosphoric acid	H_3PO_4		
Nitrous acid	HNO_2		
Hydrofluoric acid	HF		
Hypochlorous acid	HClO		

15. Name the following acids based on the formula.

Formula	Name	Formula	Name
HClO	hypochlorous acid	HCN	hydrocyanic acid
H ₃ PO ₄	phosphoric acid	HClO ₃	chloric acid
HCl	hydrochloric acid	H ₂ CO ₃	carbonic acid
H ₃ (BO ₃) _X	boric acid	H ₂ SO ₃	sulfurous acid
H ₂ SO ₄	sulfuric acid	HClO ₂	chlorous acid
HNO ₂	nitrous acid	HNO ₃	nitric acid
HI	hydroiodic acid	HBr	hydrobromic acid
HC ₂ H ₃ O ₂	acetic acid		
HF	hydrofluoric acid		
H ₃ PO ₃	phosphorous acid		

All compounds practice--Writing Formulas/Nomenclature

Determine whether each compound is ionic (I) or covalent (C) and then write the name

- I 1. Na₂CO₃ sodium carbonate
- C 2. P₂O₅ diphosphorus pentoxide
- C 3. NH₃ nitrogen trihydride
- I 4. FeSO₄ iron (II) sulfate
- C 5. SiO₂ silicon dioxide
- I 6. GaCl₃ gallium chloride
- I 7. CoBr₂ cobalt (II) bromide
- C 8. B₂H₄ diboron tetrahydride
- C 9. CO carbon monoxide
- C 10. N₂ nitrogen (diatomic)
- I 11. NaBr sodium bromide

- 1 12. HI hydroiodic acid
- 1 13. $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$ calcium acetate
- C 14. P_2O_5 diphosphorus pentoxide
- 1 15. $\text{Ti}(\text{SO}_4)_2$ titanium (IV) sulfate
- 1 16. FePO_4 iron (III) phosphate
- 1 17. H_3PO_4 phosphoric acid
- 1 18. K_3N potassium nitride
- C 19. SO_2 sulfur dioxide
- 1 20. CuOH copper (I) hydroxide
- 1 21. $\text{Zn}(\text{NO}_2)_2$ zinc nitrite
- 1 22. V_2S_3 vanadium (III) sulfide
- 1 23. HNO_2 nitrous acid
- C 24. BBr_3 boron tribromide
- 1 25. CaSO_4 calcium sulfate
- C 26. C_2Br_6 dibromine hexabromide
- 1 27. $\text{Cr}(\text{CO})_3$ chromium (VI) carbonyl
- 1 28. Ag_3P silver (I) phosphide
- C 29. IO_2 iodine dioxide
- 1 30. VO_2 vanadium (IV) oxide
- 1 31. PbS lead (II) sulfide
- C 32. CH_4 carbon tetrahydride
- C 33. N_2O_3 dinitrogen trioxide
- 1 34. HNO_3 nitric acid

Determine whether each formula is ionic or covalent and write the formula

- C 35. tetraphosphorus triselenide P_4Se_3
- I 36. potassium acetate $K(C_2H_3O_2)$
- I 37. iron (II) phosphide Fe_3P_2
- C 38. disilicon hexabromide Si_2Br_6
- I 39. Hydrochloric acid HCl
- I 40. titanium (IV) nitrate $Ti(NO_3)_4$
- C 41. diselenium diiodide Se_2I_2
- I 42. copper (I) phosphate Cu_3PO_4
- I 43. gallium oxide Ga_2O_3
- C 44. tetrasulfur dinitride S_4N_2
- C 45. nitrogen N_2 diatomic
- I 46. acetic acid $HC_2H_3O_2$
- C 47. silicon dioxide SiO_2
- I 48. nickel (III) sulfide Ni_2S_3
- I 49. manganese (II) phosphate $Mn_3(PO_4)_2$
- I 50. silver acetate $AgC_2H_3O_2$
- C 51. diboron tetrabromide B_2Br_4
- I 52. magnesium sulfate $MgSO_4$
- I 53. potassium carbonate K_2CO_3
- I 54. ammonium oxide $(NH_4)_2O$
- I 55. hydrosulfuric acid H_2S
- I 56. tin (IV) selenide $SnSe_2$
- C 57. carbon tetrachloride CCl_4

C 58. dinitrogen trioxide N_2O_3

C 59. nitrogen dioxide NO_2

C 60. carbon tetrahydride CH_4

I 61. lithium acetate $LiC_2H_3O_2$

C 62. phosphorus trifluoride PF_3

I 63. phosphoric acid H_3PO_4

I 64. vanadium (V) oxide V_2O_5

I 65. aluminum hydroxide $Al(OH)_3$

I 66. zinc sulfide ZnS

C 67. silicon tetrafluoride SiF_4

I 68. silver phosphate Ag_3PO_4

