***Unit 7: Nomenclature***

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*Important Vocabulary and formulas for chapter 5*

Metal

Nonmetal

Covalent compound

Ionic compound

Formula Unit

Systematic Name

Common name

Monoatomic Ion

Polyatomic ion

Anion

Cation

IUPAC

Binary compound

Ternary compound

Acid

*Notes: Chemical Formulas and Compounds*

**Systematic Name**: based on the formula of a compound

* Example: S = sulfur, CaO = calcium oxide, NaOH = sodium hydroxide, H2O = dihydrogen monoxide

**Common Name**: a name used every day that gives no information about chemical composition

* Example: S = brimstone, CaO = lime, NaOH = lye, caustic soda (Drano), H2O = water

## I. SIGNIFICANCE OF A CHEMICAL FORMULA

**Formula Unit:** the simplest ration in an ionic compound

* The representative particle for ionic relationships
* An ionic compound must be electrically neutral
* Positive and negative ions are held together by mutual attractions
* Examples: NaCl, FeO, MgF2

**Molecular Formula:** the simplest unit in a molecular compound (covalent relationship)

* The representative particle for covalent substances is a molecule
* Atoms in a molecule are held together by covalent bonds
* Examples: H2O, CO2, C6H12O6, N2

# II. MONOATOMIC IONS

**Monatomic Ions:** Ions formed from a single atom.

Positive Monoatomic Ions (Cations): Name of element followed by “ion.” (H will be treated as a metal.)

* Metals in Group 1A (1) have a +1 charge
* Metals in Group 2A (2) have a +2 charge
* Metals in Group 3A (3) have a +3 charge
* Example: K+1 = potassium ion, Mg+2 = magnesium ion, Al+3 = aluminum ion, H+1 = hydrogen ion

Transition Metals and some metals in groups 4A and 5A: Many can form more than one ion.

* See additional reference sheet.
* The charge on these metal ions must be indicated in the name, either by stock or classical name.
* Example: Cu+1, copper (I) ion [stock name] or cuprous ion [classical name]

Example: Cu+2, copper (II) ion [stock name] or cupric ion [classical name]

*Note: you will not have to memorize these. The reference sheet will be provided for you.*

* There are three special transition metals that form only one ion. Their charge is not indicated in the name. Memorize these! **Silver ion, Ag+1 and Zinc ion, Zn+2 and Cadmium ion, Cd+2**

Negative Monoatomic Ions (Anions): End with the suffix – ide

* Memorize these!

Hydride, H 1- Nitride, N 3- Oxide, O 2-

 Fluoride, F 1- Iodide, I 1- Phosphide, P 3-

 Sulfide, S 2- Chloride, Cl 1- Arsenide, As 3-

 Selenide, Se 2- Bromide, Br 1- Telluride, Te 2-

*Notice that hydrogen can have either a +1(hydrogen ion) or a -1 (hydride ion) charge!*

### *III. BINARY NOMENCLATURE*

**Binary Compounds** – compounds composed of two different elements.

* The second word (or name) in all binary compounds ends in the Suffix **–ide.**
* There are two types of binary compounds:
1. Binary ionic compounds – metal ion (cation) + nonmetal ion (anion)
2. Binary molecular compounds – two nonmetals (held together by a covalent bond)

Binary Ionic Compounds: Are composed of a monatomic cation and a monatomic anion.

* + All ionic compounds must be electrically neutral.
	+ The cation is written first, then the anion.
	+ Example: Magnesium (Group 2A metal) and Bromine (Group 7A nonmetal)

Magnesium ion, Mg+2 and Bromide ion, Br-1

To form an electrically neutral compound, these combine: Magnesium bromide, MgBr2

Writing Formulas:

Step 1: Write symbols for the ions side by side, with the positive (least electronegative) ion first.

Step 2: Cross over the charge values to give subscripts and reduce if possible.

Step 3: Check the subscripts and write the formula

* make sure the compound is neutral
* make sure you have the lowest possible ratio

Binary Molecular Compounds are composed of two nonmetals.

* Recall that H and the nonmetals from Groups 4A – 7A (14 – 17) are prone to covalent bonds.
* No ions are present, so no charges are present.
* Prefixes are used to indicate the number of a type of atom in a molecule. **YOU MUST MEMORIZE THESE!**

|  |
| --- |
| Numerical Prefixes |
| Number | Prefix |
| 1 | Mono- |
| 2 | *Di-* |
| 3 | *Tri-* |
| 4 | *Tetra-* |
| 5 | *Penta-* |
| 6 | *Hexa-* |
| 7 | *Hepta-* |
| 8 | *Octa-* |
| 9 | *Nona-* |
| 10 | *Deca-* |

REMEMBER: THESE PREFIXES ARE ONLY USED WITH THE NAMES OF BINARY MOLECULAR COMPOUNDS.

The prefixes are used according to the following rules:

1. A prefix is used with the name of the first element (the least electronegative one) only if more that one atom of element is present. Never use *mono* to start a binary molecular name.
2. The second element is named by combining (a) the correct numerical prefix, (b) the root of the name of the second element, and (c) the ending –ide. Always use a prefix with the second element.

Ex: CO = carbon monoxide CO2 = carbon dioxide N2O = dinitrogen monoxide

**DO NOT REDUCE THE FORMULA OF A MOLECULAR COMPOUND**

In addition – there are 7 diatomic elements – they do not exist as a single atom in nature. They occur in pairs or diatomic molecules (two alike atoms held together by a nonpolar covalent bond). **YOU MUST MEMORIZE THESE!** They are **H2, O2,N2, Cl2, Br2, I2, F2.**

*Notes: Ternary Nomenclature*

**Ternary Compounds are compounds that contain three (or sometimes more) elements.**

* We will only deal with ternary ionic compounds, or in other words, the ones containing **polyatomic ions.**
* Ternary ionic compounds are named in the same manner as binary ionic compounds.
* **Name the cation first, then the anion.**

**Remember:**

* The compound must be electrically neutral.
* If the cation is a transition metal (except for Ag, Zn, or Cd) or a group 14 or 15 metal, you must indicate the change on the cation by a Roman Numeral or the proper suffix.
* Since these are ionic compounds, no numeric prefixes (mono-, di-, tri-, etc.) should be used.
* If more than one of a polyatomic ion is needed to balance the charge, the polyatomic ion must be put in parenthesis.
* Most ternary compounds end in –ite or –ate.

# EXAMPLES

***Give the name of each of the following.***

MgSO4 K2CO3

CuCN Cd(ClO3)2

Al(NO3)3 NH4OH

***Write the formula for each of the following.***

Sodium arsenate Chromium (II) hydroxide

Silver acetate Barium perchlorate

Lithium bicarbonate Ammonium chloride

*Notes: Acid Nomenclature*

ALL COMPOUNDS MUST BE ELECTRICALLY NEUTRAL

Hydrogen is always the cation in an acid. The hydrogen cation has a +1 charge so you must use enough hydrogens to make an electrically neutral compound.

Acids are named for their anions according to the following chart.

|  |  |  |  |
| --- | --- | --- | --- |
| **Anion Ending** | **Acid Name** | **anion** | **Example** |
| -ide | Hydro-(*stem*)-ic acid | Cl­- chloride | HCl hydrochloric acid |
| -ite | (*stem*)-ous acid | NO2- nitrite | HNO2 nitrous acid |
|  | hypo-(*stem*)-ous acid | ClO- hypochlorite | HClO hypochlorous acid |
| -ate | (*stem*)-ic acid | SO42- sulfate | H2SO4 sulfuric acid |
|  | per-(*stem*)-ic acid | ClO4- perchlorate | HClO4 perchloric acid |

# EXAMPLES

I. Write the formula.

Carbonic Acid

Hydrobromic Acid

Sulfurous Acid

Arsenic Acid

## II. Give the name.

H3PO3 H2CO3

HCN HIO4

H2S HBrO

Metal Ions With More Than One Charge

Formula Stock Name Classical Name

Cu+1 copper (I) ion cuprous ion

Cu+2 copper (II) ion cupric ion

Fe+2 iron (II) ion ferrous ion

Fe+3 iron (III) ion ferric ion

\*Hg2+2 mercury (I) ion mercurous ion

Hg+2 mercury (II) ion mercuric ion

Pb+2 lead (II) ion plumbous ion

Pb+4 lead (IV) ion plumbic ion

Sn+2 tin (II) ion stannous ion

Sn+4 tin (IV) ion stannic ion

Cr+2 chromium (II) ion chromous ion

Cr+3 chromium (III) ion chromic ion

Mn+2 manganese (II) ion manganous ion

Mn+3 manganese (III) ion manganic ion

Co+2 cobalt (II) ion cobaltous ion

Co+3 cobalt (III) ion cobaltic ion

Ni+2 nickel (II) ion nickelous ion

Ni+3 nickel (III) ion nickelic ion

Sb+3 antimony (III) ion stibbonous ion

Sb+5 antimony (V) ion stibbonic ion

\* A diatomic elemental ion

*Notes: In summary*

Is the compound an acid? If yes,

* Identify the anion by removing all H’s and assigning a charge equal to the # of H’s removed.
* Name the ion. If the ion is only one element, it should be the element’s name with an –IDE ending. If the ion has more than one element, locate its name from the complex polyatomic ion list on the back of your periodic table.
* If the anion ends in –IDE, the name of the acid is Hydro + the element’s name with an –IC ending.
* If the anion ends in –IC, the name of the acid is the complex polyatomic ion’s name with an –IC ending.
* If the anion ends in –ITE, the name of the acid is the complex polyatomic ion’s name with an –OUS ending.
* ALL ACID NAMES SHOULD END WITH THE WORD ACID

Is the compound ternary? If yes,

* The name of the compound is the cation element’s name followed by the anion’s name.
* *If the cation is* ***NOT*** *a Group 1 or 2 metal, Al, Cd, Zn, or Ag,* Calculate the charge of a single cation by calculating the total negative charge produced by all the anions in the molecule and dividing this by the # of cations present in the molecule. Place this number as a roman numeral in parentheses between the cation element’s name and the anion’s name.

The compound is binary (not an acid).

 *Are both elements nonmetals? If yes,*

* The name of the compound is the prefix denoting how many cations are present , followed by the cation element’s name with the appropriate prefix in front of it (but NEVER use Mono before the cation element’s name!) followed by the anion’s name ending in –ide with the appropriate prefix in front of it.

 *If a metal is present,*

* The name of the compound is the cation element’s name followed by the anion’s name ending in -IDE.

 *If the cation is* ***NOT*** *a Group 1 or 2 metal, Al, Cd, Zn, or Ag,*

* Calculate the charge of a single cation by calculating the total negative charge produced by all the anions in the molecule and dividing this by the # of cations present in the molecule. Place this number as a roman numeral in parentheses between the cation element’s name and the anion’s name.

Writing a Formula:

*The whole idea is to create a neutral molecule where all the positive charge from the cation(s) equals all the negative charge from the anion(s).*

1. Write down each individual cation and anion with their appropriate charges (which can be found using the periodic table or from your list of complex polyatomic ions—if a roman numeral is given in the name, that is equal to the charge on the cation.
2. If the charges are equal, the formula is the cation followed by the anion—WITHOUT the charges shown in the formula!
3. If the charges are unequal, the formula is the cation with a subscript equal to the anion’s charge followed by the anion with a subscript equal to the cation’s charge—WITHOUT the charges shown in the formula!

**REMEMBER:** Parentheses must be used around complex polyatomic ions if more than one complex polyatomic ion is required, and Hg2+2 must be treated as a complex polyatomic ion!

IUPAC, International Union of Pure and Applied Chemistry must approve all names.

*Homework #1:*

***I. Write the correct formula for each of the following ionic compounds.***

|  |
| --- |
| 1. lead (II) sulifide |
| 2. sodium phosphide |
| 3. zinc phosphide |
| 4. chromium (II) sulfide |
| 5. lead (II) oxide |
| 6. calcium arsenide |
| 7. hydrogen telluride |
| 8. silver selenide |
| 9. lead (IV) nitride |
| 10. nickel (II) fluoride |
| 11. beryllium bromide |
| 12. copper (I) nitride |
| 13. cadmium carbide |
| 14. strontium oxide |
| 15. nickel (II) fluoride |
| 16. cobalt (III) bromide |
| 17. mercury (II) iodide |
| 18. mercury (I) iodide |
| 19. gallium chloride |
| 20. magnesium phosphide |
| 21. silver arsenide |
| 22. potassium selenide |
| 23. cesium hydride |
| 24. tin (IV) sulfide |
| 25. beryllium chloride |
| 26. aluminum oxide |
| 27. cobalt (II) fluoride |
| 28. potassium sulfide |
| 29. barium phosphide |
| 30. magnesium arsenide |
| 31. cesium fluoride |
| 32. silver bromide |
| 33. calcium iodide |
| 34. mercury (I) oxide |
| 35. tin (II) nitride |
| 36. zinc telluride |
| 37. strontium nitride |
| 38. cadmium arsenide |
| 39. gallium oxide |
| 40. iron (III) bromide |
| 41. chromium (III) chloride |
| 42. magnesium iodide |

***II. Write the correct name for each of the following ionic compounds.***

|  |
| --- |
| 1. H2S |
| 2. LiBr |
| 3. NaF |
| 4. KI |
| 5. CsCl |
| 6. Al2S3 |
| 7. CrO |
| 8. Hg2Cl2 |
| 9. Mg3N2 |
| 10. MnO |
| 11. CaCl2 |
| 12. CoCl2 |
| 13. NiCl2 |
| 14. BaS |
| 15. ZnO |
| 16. Ag2O |
| 17. Fe2S3 |
| 18. Cr2O3 |
| 19. CdI2 |
| 20. KCl |
| 21. MgCl2 |
| 22. Cu2S |
| 23. LiH |
| 24. RaO |
| 25. AgCl |
| 26. Ni2O3 |
| 27. HgCl2 |
| 28. Sb3P2 |
| 29. AlI3 |
| 30. Na4C |
| 31. BeS |
| 32. SnF2 |
| 33. BaBr2 |
| 34. PbS2 |
| 35. CaI2 |
| 36. K3N |
| 37. LiF |
| 38. ZnS |
| 39. CdO |
| 40. Ag3N |

***III. Write the correct formula for each of the following molecular compounds.***

|  |
| --- |
| 1. dichlorine monoxide |
| 2. chlorine trifluoride |
| 3. phosphorus pentachloride |
| 4. carbon dioxide |
| 5. silicon dioxide |
| 6. phosphorus tribromide |
| 7. carbon monoxide |
| 8. dinitrogen pentoxide |
| 9. sulfur trioxide |
| 10. nitrogen dioxide |
| 11. diphosphorous trioxide |
| 12. disulfur trioxide |

***IV. Write the correct name for each of the following molecular compounds.***

|  |
| --- |
| 1. N2O4 |
| 2. PCl3 |
| 3. N2O |
| 4. SiF4 |
| 5. P2S3 |
| 6. As2O5 |
| 7. SiO2 |
| 8. B2O3 |
| 9. P5O10 |
| 10. XeF4 |
| 11. BF3 |
| 12. N2O5 |

*Homework #2*

***I. Name the following ternary compounds.***

1. NaNO3
2. NH4NO2
3. K2SO3
4. Li2CrO4
5. Ba(ClO2)2
6. Cr2(SO4)3
7. NaCNO
8. CuSCN
9. NH4MnO4
10. Cr2(HPO4)3
11. Hg(BrO)2
12. NH4MnO4
13. CoCr2O7
14. MnPO3
15. MgSiO3
16. NaHCO3
17. CaO2
18. MgS2O3
19. Al(MnO4)3
20. Fe(HSO3)2
21. CoSO3
22. CdSiO3
23. Hg2(OH)2
24. Be(HSO4)2
25. Pb(CrO4)2
26. K3PO4
27. Sb3(AsO4)5
28. BeSO4
29. Ag2CO3
30. Li2C2O4
31. (NH4)3AsO4
32. Li3PO3
33. Li3PO3
34. NiAsO3
35. KMnO4
36. CsCN
37. Co2(SiO3)3
38. K2HPO4
39. LiOH
40. Hg2S2O3
41. CaSO4
42. NaClO3
43. Mg(C2H3O2)2
44. NaSCN
45. Zn(ClO3)2
46. Al2(CO3)3
47. Cs2SiO3
48. Ba(IO4)2
49. Mg(BrO2)2
50. Al(IO)3

***II. Write the correct formula for the following ternary compounds.***

1. potassium nitrate
2. calcium phosphate
3. potassium permanganate
4. cobalt (II) chlorite
5. barium nitrate
6. aluminum sulfate
7. manganese (II) oxalate
8. iron (III) carbonate
9. zinc hydroxide
10. cesium dichromate
11. tin (IV) cyanide
12. silver bromate
13. mercury (I) sulfite
14. lithium thiosulfate
15. lead (IV) bicarbonate
16. ammonium iodate
17. tin (II) bisulfate
18. strontium oxalate
19. sodium thiocyanate
20. magnesium bisulfate
21. mercury (II) phosphate
22. calcium acetate
23. chromium (II) hydrogen phosphate
24. lithium silicate
25. ammonium perchlorate
26. copper (II) thiosulfate
27. iron (II) arsenite
28. magnesium chromate
29. lead (II) arsenate
30. silver cyanide
31. cesium arsenate
32. aluminum oxalate
33. sodium bromate
34. ammonium iodite
35. sodium nitrite
36. strontium cyanate
37. magnesium thiosulfate
38. cadmium hydroxide
39. cobalt (III) phosphate
40. lithium hydrogen phosphate
41. lead (II) oxalate
42. tin (IV) hydroxide
43. aluminum carbonate
44. manganese (III) sulfate
45. sodium perchlorate
46. cadmium nitrate
47. hydrogen peroxide
48. magnesium sulfite
49. cadmium arsenate
50. chromium (III) nitrate

*Homeowrk #3*

***I.Name the following acids. II. Write formulas for the following acids***

|  |
| --- |
| 19. sulfurous acid |
| 20. hydrosulfuric acid |
| 21. chlorous acid |
| 22. bromic acid |
| 23. hydroiodic acid |
| 24. sulfuric acid |
| 25. periodic acid |
| 26. nitric acid |
| 27. permanganic acid |
| 28. fluoric acid |
| 29. chromic acid |
| 30. hydrobromic acid |
| 31. oxalic acid |
| 32. hydrotelluric acid |
| 33. hydroxic acid |
| 34. phosphoric acid |
| 35. cyanic acid |
| 36. arsenous acid |

|  |
| --- |
| 1. HCl |
| 2. HNO2 |
| 3. HF |
| 4. H3PO4 |
| 5. H2SO4 |
| 6. HClO4 |
| 7. H2CO3 |
| 8. H3AsO3 |
| 9. H3PO3 |
| 10. HCN |
| 11. HC2H3O2 |
| 12. HBrO |
| 13. H3AsO4 |
| 14. H2SO3 |
| 15. H2C2O4 |
| 16. HNO3 |
| 17. H2CrO4 |

*Homework #4:*

# Acid Formula Anion Acid Name Salt Formula Salt Name

1. HCl NaCl

2. H2SO4 Li2SO4

3. HNO2 Ba(NO2)2

4. H3PO4 Ca3(PO4)2

5. H2CrO4 K2CrO4

6. HClO3 Ba(ClO3)2

7. HNO3 Mg(NO3)2

8. H2S CuS

9. H2Cr2O7 Ag2Cr2O7

10. H3PO3 Sr3(PO3)2

11. HCN KCN

12. HC2H3O2 Fe(C2H3O2)2

13. HMnO4 CuMnO4

14. H2C2O4 (NH4)2C2O4

15. HClO Pb(ClO)2

16. HCNO KCNO

17. HBrO3 Zn(BrO3)2

18. HIO2 Cd(IO2)2

19. HClO4 Sn(ClO4)2

20. HF LiF

21. H2CO3 BaCO3

22. HBrO Fe(BrO)3

23. H3AsO4 CrAsO4

24. H3AsO3 Ca3(AsO3)2

25. HIO4 Sr(IO4)2

*Homework #5*

Name the following Write formulas for the following

1. Ca(NO3)2 26. Silver phosphate

2. NH4OH 27. perchloric acid

3. Fe2O3 28. barium carbonate

4. Hg(NO2)2 29. tin (IV) oxalate

5. ZnCl2 30. sodium hydrogen phosphate

6. K2CO3 31. magnesium chlorate

7. HClO3 32. cadmium sulfate

8. HNO3 33. aluminum hydroxide

9. H2SO4 34. nickel (II) sulfide

10. H3PO4 35. iron (III) sulfate

11. Mn3(PO3)2 36. cobalt (II) iodide

12. HgO 37. zinc oxide

13. Zn3N2 38. phosphorous acid

14. Mn(SCN)2 39. potassium peroxide

15. Ca(NO2)2 40. calcium hypochlorite

16. FeSO4 41. dinitrogen trioxide

17. KClO3 42. aluminum carbonate

18. Al2(S2O3)3 43. sulfurous acid

19. Pb(CNO)2 44. antimony (III) bromite

20. CaC2O4 45. ammonium selenide

21. Fe(OH)3 46. copper (II) iodide

22. N2O5 47. sodium hydrogen sulfite

23. CS2 48. potassium nitrite

24. NaHSO4 49. ammonium chlorite

25. SbCl3 50. strontium carbonate

*Homework #6*

Name the following Write formulas for the following

1. AgNO3
2. Na2Cr2O7
3. NaCNO
4. Mg(ClO)2
5. Ca(MnO4)2
6. Al(OH)3
7. FeSO4
8. Fe2(SO4)3
9. Fe2(SO3)3
10. Zn3(PO3)2
11. MnO2
12. SnCl2
13. Ca(ClO)2
14. N2O3
15. K2S
16. ZnSO4
17. Al(NO3)3
18. (NH4)2C2O4
19. HgO
20. Cu(NO3)2
21. Na2SO3
22. CaCO3
23. PbCl2
24. NaCN
25. Sb(NO2)3
26. tetraphophorus decoxide
27. soduim carbonate
28. ammonium bicarbonate
29. lithium phosphide
30. mercury (I) nitrate
31. iron (II) chloride
32. copper (II) chloride
33. potassium perchlorate
34. aluminum acetate
35. magnesium hydroxide
36. silver chloride
37. tin (IV) sulifide
38. magnesium nitride
39. aluminum carbonate
40. sulfurous acid
41. hydrobromic acid
42. barium chlorite
43. iodic acid
44. ammonium carbonate
45. cobalt (II) acetate
46. sodium nitrite
47. chloric acid
48. ammonium chromate
49. iron (II) oxalate
50. manganese (III) chloride

Homework #7 : Write names/formulas

1. Fe(NO2)2
2. SnO
3. (NH4)2S
4. MgH2
5. Mn(ClO4)2
6. CaCO3
7. PbO
8. SO3
9. CuBr2
10. Zn(ClO)2
11. AlN
12. aluminum carbonate
13. dinitrogen pentoxide
14. iron (II) hydroxide
15. tin (IV) nitride
16. ammonium oxalate
17. silver perchlorate
18. manganese (III) sulfide
19. barium nitrite
20. calcium sulfite
21. zinc carbonate
22. sodium hypobromite
23. iron (III) oxide
24. magnesium acetate
25. mercury (I) oxalate

Homework #8

***Write the correct fomula for each of the following compounds.***

1. mercury (I) sulfate 19. silver dichromate

2. magnesium phosphite 20. Hydronitric acid

3. copper (II) bromide 21. hydrochloric acid

4. manganese (II) bromate 22. copper (II) nitride

5. silican dioxide 23. potassium silicate

6. manganese (III) sulfide 24. chromium (III) nitrate

7. tin (II) sulfite 25. calcium chromate

8. sodium peroxide 26. potassium telluride

9. arsenic acid 27. strontium acetate

10. copper (I) bisulfate 28. barium selenide

11. sulfur dioxide 29. zinc selenide

12. ammonium arsenite 30. lead (II) thiocyanate

13. phosphorus trichloride 31. nitrous acid

14. bromous acid 32. lead (IV) hydrogen phosphate

15. aluminum bromite 33. nickel (III) hydroxide

16. manganese (ll) carbonate 34. xenon tetrafluoride

17. copper (I) phosphate 35. ammonium thiosulfate

18. cadmium cyanide 36. cesium perchlorate

***Write the correct name for each of the following compounds.***

37. LiHCO3 55. Zn3P2

38. (NH4)2SO3 56. NaF

39. Hg3(PO4)2 57. CS2
40. HIO4 58. (NH4)2SO4

41. NiC2O4 59. CsHSO4

42. P4O10 60. CdI2

43. Ca3As2 61. Co(IO3)2

44. CuNO2 62. SrO

45. Al(CN)3 63. H3BO3

46. Ag2CrO4 64. Fe2(SO3)3

47. B2O3 65. SrHPO4

48. Mg3(AsO4)2 66. H2S

49. Sn(MnO4)4 67. CrH2

50. Ba(ClO)2 68. Cu(OCN)2

51. SbF5 69. Ca(CN)2

52. FeCO3 70. N2O4

53. H2SO3 71. KCN

54. Cr(NO3)3 72. Sb(C2H3O2)3