**Podcast 5.4: Naming Acids and Hydrates**

Naming Acids: Binary acids

* All acids start with H (HCl, H**2**SO**4**)

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ : H + non-metal. HCl

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ : H + polyatomic ion. H**2**SO**4**

Binary acids: naming depends on state of acid

* If it’s **not** aqueous: hydrogen + non-metal

 HCl(g) =

* If it is aqueous: hydro- nonmetal -ic acid

 HCl(aq) =

Examples: Name the following compounds

1. HBr(s)
2. HI(aq)
3. H**2**S(aq)
4. H**2**S(g)

Naming Acids: Oxyacids – Naming does not depend on the state (aq)

 1) name the polyatomic ion

 2) replace \_\_\_\_\_\_\_ with \_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_ with \_\_\_\_\_\_\_\_

 3) change root if necessary for pronunciation

 4) add “acid” to the name

Example: H**2**SO**3**

Examples: Write the name or the formula for the following acids

1. HNO**2**
2. HClO4
3. H**3**PO**4**(aq)
4. HCO3

Writing Formulas from Names

1. Identify the \_\_\_\_\_\_\_\_\_\_\_\_\_ involved
2. If the acid starts with “\_\_\_\_\_\_\_\_\_\_\_\_\_”- then it’s NOT a polyatomic ion (no oxygen involved)
3. If there’s no hydro and the acid ends in –”\_\_\_\_\_”, the polyatomic ion must end in –”\_\_\_\_\_\_”

Remember: “I –ate something –icky “

1. If there’s no hydro and the acid ends in –”\_\_\_\_\_\_\_\_\_\_”, the polyatomic ion must end in –”\_\_\_\_\_\_\_\_\_”
2. If there’s a \_\_\_\_\_\_\_\_\_\_ on the acid name, there’s a prefix on the polyatomic ion.

Hypochlorous acid comes from hypochlorite

1. Use the \_\_\_\_\_\_\_\_\_\_\_\_ of the anion to decide how many hydrogens to use in the formula

Examples: Write the formulas

1. Carbonic acid
2. Nitrous acid
3. Sulfuric acid
4. Hydrochloric acid
5. Arsenic acid
6. Acetic acid
7. Hydrosulfuric acid
8. Phosphoric acid

Hydrates: A compound in which a specific number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_ associated with each formula unit (embedded in it’s crystal structure.)

Example: calcium acetate heptahydrate

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**: pure crystalline form of a compound (no water added)
* Example: calcium acetate or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Hydrate vs Anhydrous Forms

Anhydrous cobalt (II) chloride has a characteristic \_\_\_\_\_\_\_\_\_\_ color

Cobalt (II) chloride hexahydrate is \_\_\_\_\_\_\_\_\_\_\_\_.

Writing Formulas from Names

1. Identify the ions involved
2. Criss-cross the charges to write the formula
3. Use\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for polyatomic ions
4. Identify the number of waters in a hydrate with a \_\_\_\_\_\_\_ , and a prefix

Examples:

Magnesium sulfate heptahydrate

Cobalt (II) chloride hexahydrate

50 Ways to Name Your Compound

Write the corresponding name or formula for each of the following.

1. lead(II) sulfide
2. perchloric acid
3. hydrogen fluoride
4. zinc hydroxide
5. hydrobromic acid
6. SF6 (*l*) \*
7. HNO2 (aq)
8. HCl
9. (g)
10. PbCl2
11. ZnSO4
12. ammonium carbonate
13. chromium(III) sulfite
14. nickel(II) sulfate hexahydrate
15. hydrosulfuric acid
16. sulfur trioxide \*
17. H2CrO4
18. A12O3
19. N2O3 \*
20. H2SO3
21. HgO (aq)
22. iron(II) nitride
23. tetraphosphorus decaoxide \*
24. copper(I) oxide
25. hypochlorous acid
26. potassium peroxide
27. CuSO3
28. CO \*
29. MgS
30. KClO2
31. HI (aq)
32. nitrogen trichloride \*
33. plumbic carbonate
34. potassium hydrogen sulfite
35. boric acid
36. barium sulfite
37. SnCl2
38. CaHPO3 (s)
39. H2S (g)
40. Li2O2
41. Mn(NO2)2
42. mercuric phosphate
43. sodium hydrogen carbonate
44. copper(I) hydrogen sulfate
45. carbon tetrachloride \*
46. ammonium phosphate
47. SO2 (aq) \*
48. MgSO4·9H2O
49. HC2H3O2
50. P2O3 \*
51. H3PO3

\* compounds are COVALENT, use prefixes for naming!

**Complex Ions**

Many minerals contain three types of ions. In Arizona and Montana for instance, several minerals of copper are mined, including two forms of copper (II) carbonate hydroxide.



Malachite

2 Cu2+ + CO32- + 2 OH- 🡪 Cu2(CO3)(OH)2

 4+ + 2- + 2- = 0

Azurite

Figure Malachite Crystals

3 Cu2+ + CO32- + 2 OH- 🡪 Cu3(CO3)2(OH)2

 6+ 4- 2- = 0

Notice that more than one ratio of the ions results in their charges cancelling. Thus there is more than on epossible compound of three ion combinations. Write a possible formula for:

1. iron (III) sodium chromate

Figure 2 Azurite Crystals

1. zinc sulfate nitrate