

Naming and Writing Formulas for Acids!

- 1st – determine if the compound is an acid
 - a. If you are given a formula, is the first element **hydrogen**? If yes, it's an **ACID** so follow the acid rules
 - b. If given the **name**, is the **word** acid in the name?
- Acid Naming Rules
- If the anion name ends in **-IDE**

The acid name will be hydro-----ic acid.

Br⁻¹ ends in ide, the acid is HBr = hydro**bromic** acid

Naming Acids con't

- The anion sulfate = SO_4^{2-} ends in ATE

Ending changes to -IC

H_2SO_4 = Sulfuric acid

The anion nitrite = NO_2^{1-} ends in ITE

Ending changes to -OUS

HNO_2 = Nitrous acid

If anion is...

- ide → goes to hydro-----ic acid
- ate → goes to -----ic acid
- ite → goes to -----ous acid

Acid Formula Writing Rules

- Identify anion **name** and **formula**
- Identify anion **charge**
- **Balance** anion charge with equal number of hydrogens.
- Hydrogens **precede** the anion formula.

Formula Writing

- Chromic acid
- Work backwards!! Hmmm if it ends in ic – it used to end in ate!
- Anion = chromate CrO_4^{2-}
- If charge is 2^- How many H's balance it out?

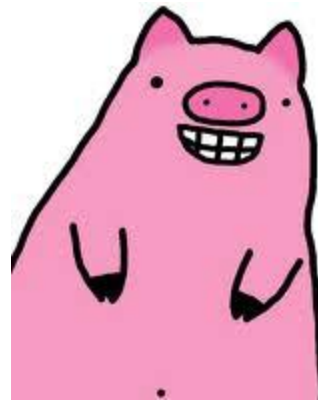
What ion does H form? H^+



Formula Writing

- Hydroiodic acid
- Work backwards!! Hmmm if it has hydro and ends in ic – it used to end in ide!
- Anion = iodide I^{1-}
- If charge is $1-$ How many H's balance it out?

HI



Hi, guys.

More formula writing...

- Phosphorous acid
- Work backwards!! Hmmm if it ends in ous – it used to end in ite!
- Anion = phosphite PO_3^{3-}
- If charge is $3-$ How many H's balance it out?
 H_3PO_3

Now your turn...

- Name these!
- H_2CO_3
- HNO_3
- HF
- HBrO_2
- Write formulas for:
- Hydrochloric acid
- Perchloric acid
- Sulfurous acid

Warm Up!

- When naming acids if the anion ends in
-ide the acid name contains _____
-ate the acid name ends in _____
-ite the acid name ends in _____

What determines the number of H^+ atoms are needed for an acid?

How many H's are needed in phosphoric acid?

Today's Agenda

- (Last naming day!) How do we name and write formulas for molecular compounds?
- Review acid naming
- Name and write formulas for molecular compounds
- Practice!

Acid Practice

1. HCl
 2. HNO₂
 3. H₃PO₄
 4. HCN
 5. HIO₄
 6. H₃PO₃
1. sulfurous acid
 2. hydrosulfuric acid
 3. chlorous acid
 4. bromic acid
 5. hydroselenic acid
 6. chromic acid

Molecular Compounds!

1. Molecular compounds are made from two (or more) **non-metals**.
2. Molecular Compound **Naming** Rules.
 - a. Prefixes are used to denote the number of atoms in each element in the compound

mono

di

tri

tetra

penta

hexa

hepta

octa

nona

deca

hendeca

dodeca

Naming Rules

- b. When there is only **one** atom of the first element in the compound, the prefix, “mono” should be **omitted**.
- c. Change the **ending** of the **last** element to – “ide”.

N_2O_7 - 2 nitrogens and 7 oxygens

prefix for 2 is di

prefix for 7 is hepta

Dinitrogen heptaoxide

Examples for Naming

- CO_2 - 1 carbon, 2 oxygens

since there is only one carbon and it's the first element, we DO NOT need a prefix.

the prefix for 2 is di

Carbon Dioxide

- EXTRA

- P_4S_{10} - 4 phosphorous, 10 sulfurs

the prefix for 4 is tetra

the prefix for 10 is deca

Tetraphosphorous decasulfide

Molecular Compound **Formula** Rules

- Prefixes are used to denote the **number** of atoms in each **element** in the compound.
- Example:
- Nitrogen monoxide - one nitrogen (no prefix) and one oxygen (mono = 1) **NO**
- Dinitrogen trioxide – two nitrogens (di = 2) and three oxygens (three=3) **N₂O₃**

Try These!

- Name these
- PF_3
- SO_3
- ICl
- Write formulas for these
- Dinitrogen monoxide
- Bromine pentafluoride
- Boron tribromide

Warm Up!

- Acid Naming

HCl

H_2SO_4

HNO_2

- Molecular Formula Writing

Nitrogen dioxide

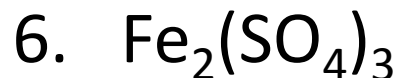
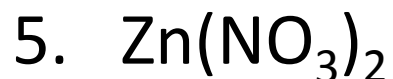
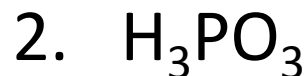
Trisulfur pentoxide

Dihydrogen

Today's Agenda

- What is the difference between an ionic compound, molecular compound, and acid?
- Distinguish different types of compounds.
- Review!!

Mixed Review – 1st ID Ionic, Acid, Molecular



A. chlorous acid

B. bromic acid

C. hydroselenic acid

D. dinitrogen monoxide

E. Boron tribromide

F. Nickel(II) nitrate

G. Cobalt (III) oxide

Warm Up!

- What is the charge on Cu in Cu_2O ?
- What is the charge on Ti in TiPO_4 ?
- What is the charge on Ni in NiCl_2 ?

- How would you find the molecular mass of these compounds?
- What is the molecular mass of NiCl_2 ?

Today's Agenda

- How can we use ratios to experimentally determine chemical formulas?
- Quiz!
- Using ratios to solve word problems.
- Atomic mass and molecular mass and how they relate to actual mass.
- **Homework:** Prelab setup in notebook and prelab practice problems. Background info due Tues. Problems due Wed.

Ratios

- A ratio is just a comparison of two different things.
- Example: if there are 15 females and 20 males in a group (total 35).
- The ratio would be 15/20 or 15:20.
- If there were 7 black labs and 12 golden labs in a doggy daycare, what's the ratio of black to goldens? 7/12 or 7:12

Ratio Problems

- If there are 50 total candies, 22 chocolate santas and 28 candy canes, what is the ratio of santas to candy canes? 22/28
- If there were 75 total candies with the same ratio, how many santas would there be?

22 santas out of 50 total – 22/50

$$22/50 = x/75$$

$$\frac{22}{50} = \frac{x}{75}$$

$$x = 33 \text{ santas}$$

Try these

- The ratio of Kate's stickers to Jenny's stickers is 7:4. Kate has 21 stickers.
How many stickers does Jenny have?
- Chef Robert's secret recipe requires 7 eggs for every 2 cups of flour. How many eggs will he need if he uses 8 cups of flour?

Warm Up!

- Ammonia is a compound consisting of a 1 : 3 ratio of nitrogen and hydrogen atoms.
- (a) If a sample of ammonia contains 1563 nitrogen atoms, how many atoms of hydrogen are present?
- (b) If a sample of ammonia contains 1425 hydrogen atoms, how many nitrogen atoms are present?

Today's Agenda

- How can we determine the chemical formula by monitoring a reaction and solving ratio's?
- Discuss math problems relevant to lab.
- Check pre-lab - discuss background information and procedures.
- Start the lab!

Lab Experiment

- Use masses that WE measure to determine the chemical formula.
- Remember that each element has a MASS associated with it! Read this from the periodic table!
- These masses are related to mass that we can measure with balances.

Equation

$$\frac{M_B}{M_A} = \frac{AM_B \times \text{number of B atoms}}{AM_A \times \text{number of A atoms}}$$

Given AB_x Find x !

$$M_B = 0.3$$

$$M_A = 0.25$$

$$AM_B = 40$$

$$AM_A = 66$$

The Experiment

- Know M_A and we will find M_{ABx}
 - How will we find M_{Bx} ?

$$M_{ABx} - M_A = M_{Bx}$$

- Use atomic masses to find x!

If we make 0.57g of M_{ABx} and we started with 0.25g of M_A , ($AM_A=58.6$, $AM_B = 25.1$), what is x? If the charge on B is -1 what is the charge on the A ion?



Warm Up!

- What are the two types of bonds?
- What are two criteria for forming an ionic compound?
- What type of ions do metals form?
- Give one example of an ionic compound, an acid, and a molecular compound.

Today's Agenda

- Welcome back!
- Review naming and properties of ionic compounds.
- Properties of metal compounds
- Ionic vs. covalent bonds
- Homework: Ch 7 (section 2 &4) - 81, 82, 83, 87, 89, 91, 93, 94 and Ch 8 – 78-86 evens

Review!

- Name these

1) FeCl_3 2) Ag_3AsO_4 3) $\text{Ba}(\text{OH})_2$ 4) H_2O

5) H_3PO_3

- Write the formulas for these compounds

6) aluminum iodide 7) ammonium phosphate

8) nitric acid 9) hydrogen sulfide

- Separate the **ions**, give their **names** and **charges** and **name the compound**. Change the anion into the **acid** and name that acid .

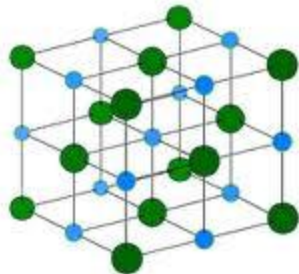
10) MgCO_3

Ionic Compounds

- Ionic compounds are made from ions with opposite charge.
- Cations are formed from metals. Their charge is called their oxidation state (or number).
- The oxidation state of Mn in MnCl_2 is +2.
(What you made in lab!)

Properties of Ionic Compounds

- Melting point, boiling point, and hardness of these crystals depend on how they organize themselves in a solid crystal



- _____ melting and boiling points, hard crystals
- **High** Conductance of electricity depends on how easily these _____ can move around. Salt crystals _____ allow for ions to move!
ions
do not

Electrolytes

- When ionic compounds are liquid or if they are dissolved in a solution, they can conduct an electric current.

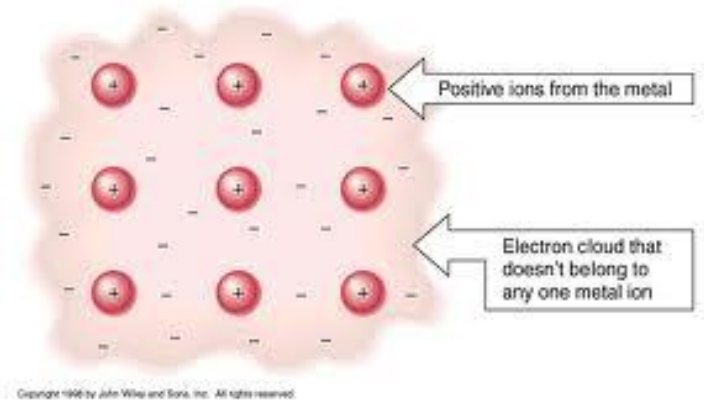
Electrolytes! Our bodies run using electrical signals and salt pumps, so we NEED electrolytes! If you sweat a lot or are sick and do not replenish your “salt” ions, you get sick because you throw off your body’s normal processes!

Metallic Compounds

- Compounds made only of metals, NOT ionic!
- Bonding of metals are similar to ionic compounds because they are based on the attraction of particles .
- 8 – 12 metal atoms closely surround each metal atom in a lattice .

Electron Sea Model

- Electrons are not directly attached to any metal atom but are delocalized.



- Metals are great conductors of electricity because their electrons can flow throughout the metallic solid structure.

Alloys

- Metal alloys – mixture of elements that have metallic properties.

Steel – increased strength because of the mixture of iron and carbon or Mn, Cr, V, W.

- Substitutional alloys – some of the atoms are replaced by other atoms of similar size (sterling silver)
- Interstitial alloys – small holes in a metallic crystal are filled with smaller atoms (steel)

Review Questions

- What are the properties of ionic compounds?
- What are the properties of metallic compounds?
- What is the electron sea model?
- Explain the difference between substitutional and interstitial alloys.