Section 6.1: Compounds and Molecules

Compounds
- Result from way ______ or ______ are ______
- Similarities & differences of __________________
- When _______________________, the resulting compound has ______________ very ______________ from those of ________________ that make it.
- Always have same __________________

What are bonds?
- A __________________ is an attractive ________ that holds _______ or __________________.
- Atoms bond when their __________________________ interact.
  - This way, the __________________________ of the atom is ___.

Bonds are Flexible...
- Bonds are _____ like toothpicks, they ARE like ______________ 😊
- There are many _________________________, but the atoms are not ____________________.
  - Atoms move ________________________.

Chemical Structure
- Chemical Structure is the way the ________________ are _______ to make the ________________.
- ________________ is the ______________ between the ________ of two ______.
  You can see this in the ________________ model.
- Compounds with ________ or more atoms have ____________________

<table>
<thead>
<tr>
<th>Models</th>
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<tbody>
<tr>
<td>Ball-and-stick:</td>
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<tr>
<td>Space-filling:</td>
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<tr>
<td>Structural</td>
</tr>
</tbody>
</table>
How does Structure Affect Properties?

• The ________________________ of a compound determines its ____________________.

• Network Structures:
  – Atom ____________
  – ____________ with network structures are ________________.
    • Ex) SiO₂ / ____________
  – Networks with ______________: 
    • ____________________ ions
    • High ___________and _____________ points
    • Example: NaCl / ____________
  – Compounds made of molecules:
    • Sugar, ________________
    • Weak ________________ between each ____________, despite the strong attraction __________________________ that make up each molecule.

• Different ______________ have different _______________ of ________________.
  – The stronger the attraction between molecules, the higher the boiling and melting points.
  – When ________________ is attracted to an atom of ________________, this is called a ____________________.

Section 6.2: Ionic and Covalent Bonding

Why Do Chemical Bonds Form?

• Atoms bond so each will end up with a stable ________________
  • Full outermost ______________________________
  • To become more ________________

Electron Dot Diagram

• A way of keeping track of _____________________.
  • How to write them - ____________
  • Write the ____________.
  • Put one _____ for each valence electron
  • Don’t pair up until they have to
  Example: Nitrogen 5e-

Write the electron dot diagram for the following elements.

Electron Configuration

• Cation
  o _______lose electrons to fill their outer levels
  o They make ________________.

• Anion
  o _______________ gain electrons to fill their outer levels
  o They make ________________.
What are 3 ways that atoms can form bonds?

1. Ionic Bonds

2. Covalent Bonds

3. Metallic Bonds

**Ionic Bonds**
- Valence electrons from one atom are ___________ to another atom.
- They become ________________
- ________________ charged ions are ____________ to each other.
- Very ________________ that form between ions with opposite charges.
  - Cations and anions
- In the form of ________________, not ________________.
- Forms ________________.
- When you melt or ________________ compounds in water, the ________________ to move around.
- This allows them to ________________!
- Ionic Compounds
  - ________________: NaCl, or ________ for every ______ ion.
  - ________________: CaF2, or ________ for every ______ ions.

<table>
<thead>
<tr>
<th>Chemical Formula</th>
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</thead>
<tbody>
<tr>
<td>NaCl</td>
</tr>
<tr>
<td>MgO</td>
</tr>
<tr>
<td>MgCl₂</td>
</tr>
<tr>
<td>Al₂O₃</td>
</tr>
</tbody>
</table>
• Transition metals
  o Transition metals are _____________________.
  o Form _______________ because they are _______________.
  o The ________ are important in determining the _________ of an ionic compound.
    Iron (II) _______   Iron (III) _______
    Copper (II) _______   Copper (I) _______
    Tin (IV) _______   Tin (II) _______
    Lead (II) _______   Lead (IV) _______
  o Example: iron (III) oxide __________

• Writing Ionic Formulas
  1. Write the chemical symbols for the _______(first) and_______ (second).
  2. Write the ________number on top of the Chemical Symbols for the cation and anion.
  3. ______________ the oxidation numbers writing each number as a _________ for the other ________ or ___________ ion.
  4. Reduce subscripts if they can be ___________. Ex. ________________

• Rules for Naming Ions
  1. The names of metals ____________________
  2. Changing the name of ____________:  
      ▪ Root of element name + -ide = name of ion
      ▪ Example: The name of chlorine’s ion: _______________
        The name of nitrogen’s ion: ____________________
    Sulfur ___________   Lithium _____________
    Nitrogen ___________   Bromine _____________
    Potassium ___________   Chlorine _____________
    Oxygen _____________   Hydrogen _____________
  o Name the following Ions
    1. NaF _________________   2. MgO _________________
    3. SrCl₂ _________________   4. Li₂S _________________
    5. CaO _________________   6. KI _________________
  o Name the following Ions (transition metals)
    1. CuCl _________________   2. PbO₂ __________________
    3. ZnS _________________   4. Ni₂O₃ __________________
• Polyatomic Ions
  o Ions that form after elements have ___________ electrons.
  o Each polyatomic ion already has a name.
  o Ends in _______ or ________.

SO₄²⁻ ________________  CO₃²⁻ ________________
MnO₄⁻ ________________  SO₃⁻ ________________
OH⁻ ________________  NO₃⁻ ________________

• Rules for Naming Polyatomic Ions
  Step 1: Write the symbol of the ________________.
  Step 2: Write the formula of the ______________________.
  Step 3: Determine the ________ using the periodic table and the ______ of polyatomic ions.
  Step 4: Determine the formula from the ions.
    o The atoms in _________________ reminds us they are a single ion.

  o Figure out the polyatomic ion formula.
    1. Potassium hydroxide __________
    2. Sodium carbonate __________
    3. Hydrogen carbonate __________
    4. Calcium chlorate __________

  o Figure out the polyatomic ion name.
    1. NH₄F ________________
    2. CaSO₄ ________________
    3. Mg(NO₃)₂ ________________
    4. NaOH ________________

Practice Naming Ion Compounds

CaCl₂ ________________
K₂S ________________
KMnO₄ ________________
BaO ________________
NH₄Cl ________________
CsCl ________________
MgSO₄ ________________
NaBr ________________
AlP ________________

Practice Writing Ionic Compound Formulas

potassium iodide ________________
tin (IV) chloride ________________
barium sulfate ________________
sodium chloride ________________
strontium sulfide ________________
copper (II) carbonate ________________
aluminum bromide ________________
lithium nitride ________________
Covalent Bonds

- Formed by ______________ and __________
- Nonmetals ______________ their valence electrons, but want a full outer shell
- A ______ formed when two _______________ electrons.
- Atoms may share more than ______ of electrons.
  - A ___________ is when atoms share two pair (___) of electrons.
  - A ___________ is when atoms share three pair (___) of electrons.
- Different from an _____ bond because they actually form ______________.
- Often use a ____ to indicate a bond
- Called a ______________________
  - Each line is ______________________
    - Example: ______________________
- Atoms _______ always share electrons ______.
  - ___________ Covalent Bond- electrons are shared equally.
  - ___________ Covalent Bond- Unequal sharing of electrons
- There are _____________ that exist in nature as ________molecules.
  - H₂, N₂, O₂, F₂, Cl₂, Br₂, I₂
- There are _______ of covalent compounds.
- You will be learning about the easiest type of covalent compound to name:
  - _________________ Compounds
    - What does binary mean?
    - Binary covalent compounds are between____________________________.
- Nonmetals can share electrons in many ____________________
  - Two nonmetals can create multiple compounds together.
    - Example:
      - Hydrogen only has ___________ and ___________
        - Behaves ___________ than any other element on the PT
        - This means that hydrogen can act as either a ______ or a ___________
- Prefixes
  - To show the correct ratio of elements, we use _____________.
    - Remove the _____ or _____ from a prefix before adding it to element. Leave ____________.

How would you write each of the prefixes in front of oxide?

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Number</th>
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<tbody>
<tr>
<td>mono</td>
<td>1</td>
</tr>
<tr>
<td>di</td>
<td>2</td>
</tr>
<tr>
<td>tri</td>
<td>3</td>
</tr>
<tr>
<td>tetra</td>
<td>4</td>
</tr>
<tr>
<td>penta</td>
<td>5</td>
</tr>
<tr>
<td>hexa</td>
<td>6</td>
</tr>
<tr>
<td>hepta</td>
<td>7</td>
</tr>
<tr>
<td>octa</td>
<td>8</td>
</tr>
<tr>
<td>nona</td>
<td>9</td>
</tr>
<tr>
<td>deca</td>
<td>10</td>
</tr>
</tbody>
</table>

mono- ____________   di- ____________

tri- ____________   tetra- ____________
penta- ____________   hexa- ____________
hepta- ____________   octa- ____________
nona- ____________   deca- ____________
Naming Binary Covalent Bonds

Step 1: Write the name of the first ____________.
Step 2: Write the name of the ____________ changing its ending to -ide.
Step 3: Add ________ to specify how many of each element are present.

Rules for Using Prefixes

• Rule 1: Prefixes are only for ___________________________ compounds.
• Rule 2: The prefix _______ is never used on the _______________ of a binary covalent compound. It is ___________________ that there is only 1.
  o Example: CO2 is ________________, and not monocarbon dioxide.
• Rule 3: Remove the -o or -a from a prefix before adding it to ________.
  o Example: CO is ________________, and not carbon monooxide.

Name the binary covalent compounds

| CO₂: ________________ | N₂S: ________________ |
| CS₂: ________________ | SiS₂: ________________ |
| PBr₃: ________________ | NBr₃: ________________ |
| PBr₅: ________________ | N₂Cl₄: ________________ |

Writing Covalent Bond Formulas

Step 1: Write the symbol of the _______________ and the __________ that matches the ________________.
Step 2: Write the symbol of the _______________ and the __________ that matches the ________________.

What is the formula of each of the binary covalent compounds named below.

carbon tetrachloride ________________
diphenylpentachloride ________________
dinitrogen monoxide ________________
phosphorus monocloride ________________
carbon monosulfide ________________
carbon monoxide ________________
boron trihydride ________________
iodine monochloride ________________
disulfur hexabromide ________________
tetrasulfur tetranitride ________________
silicon disulfide ________________
dihydrogen monoxide ________________
phosphorus triiodide ________________
chlorine pentafluoride ________________
nitrogen trichloride ________________
nitrogen dioxide ________________
**Metallic Bond**
- The bonding between atoms within ________.
- The sharing of ________________ electrons.
  - ________of electrons
- Metals are _______ and conduct ________________ well
  - Their atoms and electrons can ________________ throughout a metal’s packed structure.

**Empirical vs Molecular formulas**
- The empirical formula tells us the ________ formula, or the smallest ______________ ratio of atoms in a compound.
  - ________ compounds can have the same ________ formula (ratio of atoms).
- The ___________ formula tells you ___________how many atoms are in one molecule of a compound.
  - All compounds have ____________ molecular formulas.

**Acids and Bases**
- ___________________________ was a scientist who defined acids and bases.
- He defined an acid as any substance which donates a ________________________
- He defined a base as any substance which donates a ________________________

**Review**
- What elements do ionic compounds contain?
- What elements do covalent compounds contain?
- Decide whether the compounds are ionic or covalent.

- SrO_____ NCl3 _____ KF _____ AgCl ______
- N2O4_____ CBr3 _____ AlCl3 _____ NaNO3 _____
- CaF2_____ IF7 _____ CO _____ Fe2O3 ______

- Write the formulas of the compounds.
  
  hydrogen monochloride: ____________
  barium fluoride ___________________
  tin (II) sulfide _________________
  dinitrogen monoxide _____________
  carbon disulfide ________________
  disulfur hexachloride ___________
  sodium phosphate ______________
  platinum (II) chloride __________