Review for 1st Exam

Chapter 1-4.
Chapter 1

- What’s an:
  - element
  - atom
  - molecule
  - compound
  - ionic compound
  - molecular compound
  - 3 states of matter
    - what distinguishes them?

Classification of matter (homogeneous, solution etc.)
Chapter 1.

• Know:
  – Si units
  – prefixes (giga, deca, etc.)
  – Significant figures
  – Density mass/volume
  – Accuracy vs. precision
  – Dimensional analysis
Chapter 2.

• The atomic theory
• Cathode ray tubes (J. J. Thompson)
• Gold Foil experiment
• Radioactivity
  – What is an $\alpha$ particle? (He nucleus)
  – What is a $\beta$ particle? (an electron)

subatomic particles
Chapter 2

• Symbols of elements
  $^{12}_{6}C$

• Isotopes

• Average masses
  – calculating ave. mass from nat. abundance
  – Calculating nat. abundance from isotope data.
Chapter 2

- Periodic table

<table>
<thead>
<tr>
<th>Periodic Table</th>
<th>Metals</th>
<th>Metalloids</th>
<th>Nonmetals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>H</td>
<td>Mg</td>
<td>Ca</td>
</tr>
<tr>
<td>2A</td>
<td>Be</td>
<td>Zn</td>
<td>Sn</td>
</tr>
<tr>
<td>3A</td>
<td>Li</td>
<td>Al</td>
<td>Sb</td>
</tr>
<tr>
<td>4A</td>
<td>Na</td>
<td>Si</td>
<td>Br</td>
</tr>
<tr>
<td>5A</td>
<td>K</td>
<td>P</td>
<td>Kr</td>
</tr>
<tr>
<td>6A</td>
<td>Rb</td>
<td>As</td>
<td>I</td>
</tr>
<tr>
<td>7A</td>
<td>Cs</td>
<td>Te</td>
<td>Xe</td>
</tr>
<tr>
<td>8A</td>
<td>Fr</td>
<td>Po</td>
<td>Rn</td>
</tr>
</tbody>
</table>

- Elements:
  - Metals: Na, Mg, Al, Zn, Sn, Sb, Br, Kr, I, Xe
  - Metalloids: Li, Si, As, Po
  - Nonmetals: H, Ca, Be, Zn, Sn, Sb, Br, Kr, I, Xe, Fr, Po, Rn
Chapter 2

- The common groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Name</th>
<th>Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>Alkali metals</td>
<td>Li, Na, K, Rb, Cs, Fr</td>
</tr>
<tr>
<td>2A</td>
<td>Alkaline earth metals</td>
<td>Be, Mg, Ca, Sr, Ba, Ra</td>
</tr>
<tr>
<td>6A</td>
<td>Chalcogens</td>
<td>O, S, Se, Te, Po</td>
</tr>
<tr>
<td>7A</td>
<td>Halogens</td>
<td>F, Cl, Br, I, At</td>
</tr>
<tr>
<td>8A</td>
<td>Noble gases (or rare gases)</td>
<td>He, Ne, Ar, Kr, Xe, Rn</td>
</tr>
</tbody>
</table>
Chapter 2

• Molecular compounds
• Ionic compounds
• Diatomic elements/molecules.
• $\text{H}_2$, $\text{N}_2$, $\text{O}_2$, $\text{F}_2$, $\text{Cl}_2$, $\text{Br}_2$, $\text{I}_2$,
• Molecular versus empirical formulas
  – Glucose: molecular: $\text{C}_6\text{H}_{12}\text{O}_6$, empirical: $\text{CH}_2\text{O}$
Ions:

• Common cations:
  • Alkali, alkali earth, NH$_4^+$, H$^+$
## Ions

<table>
<thead>
<tr>
<th>Charge</th>
<th>Formula</th>
<th>Name</th>
<th>Formula</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1−</td>
<td>H⁻</td>
<td>Hydride ion</td>
<td>C₂H₃O₂⁻</td>
<td>Acetate ion</td>
</tr>
<tr>
<td></td>
<td>F⁻</td>
<td>Fluoride ion</td>
<td>ClO₃⁻</td>
<td>Chlorate ion</td>
</tr>
<tr>
<td></td>
<td>Cl⁻</td>
<td>Chloride ion</td>
<td>ClO₄⁻</td>
<td>Perchlorate ion</td>
</tr>
<tr>
<td></td>
<td>Br⁻</td>
<td>Bromide ion</td>
<td>NO₃⁻</td>
<td>Nitrate ion</td>
</tr>
<tr>
<td></td>
<td>I⁻</td>
<td>Iodide ion</td>
<td>MnO₄⁻</td>
<td>Permanganate ion</td>
</tr>
<tr>
<td></td>
<td>CN⁻</td>
<td>Cyanide ion</td>
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</tr>
<tr>
<td></td>
<td>OH⁻</td>
<td>Hydroxide ion</td>
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<td></td>
</tr>
<tr>
<td>2−</td>
<td>O²⁻</td>
<td>Oxide ion</td>
<td>CO₃²⁻</td>
<td>Carbonate ion</td>
</tr>
<tr>
<td></td>
<td>O₂⁻²⁻</td>
<td>Peroxide ion</td>
<td>CrO₄²⁻</td>
<td>Chromate ion</td>
</tr>
<tr>
<td></td>
<td>S²⁻</td>
<td>Sulfide ion</td>
<td>Cr₂O₇²⁻</td>
<td>Dichromate ion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SO₄²⁻</td>
<td>Sulfate ion</td>
</tr>
<tr>
<td>3−</td>
<td>N³⁻</td>
<td>Nitride ion</td>
<td>PO₄³⁻</td>
<td>Phosphate ion</td>
</tr>
</tbody>
</table>

*The most common ions are in boldface.*
Chap. 2, Ions

SCN$^-$  Thiocyanate
NO$_2^-$  Nitrite
HSO$_3^-$  bisulfite
HSO$_4^-$  bisulfate
HPO$_4^{2-}$  Hydrogen phosphate
H$_2$PO$_4^-$  Dihydrogen phosphate
ClO$^-$  hypochlorite
ClO$_2^-$  chlorite
Chap. 2.

- Naming compounds
- Naming acids.
Chapter 3, stoichiometry

- Balancing chemical reactions.
- Reaction types
  - precipitation
  - Combustion (especially with hydrocarbons)

Stoichiometric calculations/limiting reagents
Yield.
Chapter 4 Aqueous reactions

- Strong versus weak electrolytes
- The seven strong acids
  HCl, HBr, HI, HClO$_3$, HClO$_4$, H$_2$SO$_4$, HNO$_3$

The strong bases:
The alkali metal hydroxides (LiOH,...)
Many of the alkali earth hydroxides
  (BaOH$_2$, CaOH$_2$, SrOH$_2$).
Chapter 4

- Ionic and net ionic equations
- Acid base neutralization reactions.
- Gas forming reactions:
  - especially $\text{CO}_3^{2-} + 2\text{H}^+ \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}$
  - or: $\text{HCO}_3^{-} + \text{H}^+ \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}$
Exam

• 2 parts:
  • 1. multiple choice
  • 2. Calculations
    – Empirical formula
    – Percent yield
    – Stoichiometry for chemical reaction
    – Limiting reagent