Summary Chapter One

1. Scientific Method (know definitions).
2. Quantitative versus Qualitative measurements.
3. Accuracy versus Precision.
5. Significant Figures.
6. Dimensional Analysis.
7. Density.
Solid sodium has a density of 0.968 g/cm\(^3\). What is the average volume occupied by one atom of sodium in units of cm\(^3\)?
Significant Figures

\[
\frac{18.015 + 26.32 + 0.6}{(26.3)(0.0010)}
\]

(a) 2000
(b) 1700
(c) 1710
(d) 1708
(e) 1708.6
Summary Chapter Two

1. There are lots of names and dates in this chapter, what was covered in class is what I find important.
2. Lavoisier – law of conservation of mass.
7. Nuclear Atom.
8. Isotopes
9. Periodic Table (groups, periods, metals, nonmetals)
10. Memorize names of elements 1-36, Tables 2.5-2.8.
11. Simple molecule formation.
12. Nomenclature of ionic and covalent compounds.
Identify the isotope which has a mass number of 185 and whose +3 ion has 72 electrons:

a) $^{185}_{77}$Ir
b) $^{188}_{77}$Ir
c) $^{185}_{75}$Re
d) $^{185}_{69}$Tm
e) $^{254}_{69}$Tm
Which of the following statements is FALSE?

a) An atom is mostly empty space.
b) Glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) is an example of a covalent compd.
c) CaF$_2$ contains an alkali metal and a halogen.
d) When a metal forms a compound with a nonmetal, an ionic compound generally results.
e) Metals generally form stable cations in ionic compounds.
1. Atomic mass, relative atomic mass.
2. The mole.
3. Molar mass.
5. Empirical versus molecular formula.
6. Combustion analysis and mass % problems.
7. Stoichiometry and Limiting Reactant problems.
How many sulfur atoms are present in 0.25 mol of aluminum sulfide?
A binary compound between an unknown element E and hydrogen contains 91.27% E and 8.73% H by mass. If the formula is $E_3H_8$, what is the identity of E?
A sample of LSD (D-lysergic acid diethylamide, \( \text{C}_{24}\text{H}_{30}\text{N}_{3}\text{O} \)) is added to some table salt (sodium chloride) to form a mixture. Given that a 1.00 g sample of the mixture undergoes combustion to produce 1.20 g of carbon dioxide, what is the mass % of LSD in the mixture?
For the next two questions, consider the following reaction between two hypothetical elements A and B:

\[ 2A \text{ (g)} + 3B_3 \text{ (g)} \rightarrow A_2B_9 \text{ (g)} \]

Molar masses: A: 40.0 g/mol; A_2B_9: 125 g/mol

Initially a reaction vessel contains 11.0 moles of A and 12.0 moles of B_3. Assuming the above reaction goes to completion answer the following questions:

1. If 4.0 moles of A_2B_9 are formed in the reaction, how many moles of A are left unreacted?
2. What is the total mass of B_3 consumed in the reaction?
Summary Chapter 4

1. Water as a solvent.
2. Solubility Rules.
3. Identifying strong, weak and nonelectrolytes.
4. Concentration.
5. Dilution.
6. Precipitation reactions.
7. Solution stoichiometry.
8. Acid/Base Definitions.
9. Titration definitions.
10. Titration problems.
Electrolytes

How many of the following substances are strong electrolytes? 
Sr(OH)$_2$, AgCl, Na$_2$S, HNO$_3$, CH$_3$COOH

<table>
<thead>
<tr>
<th>TABLE 4.1 Simple Rules for the Solubility of Salts in Water</th>
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<tbody>
<tr>
<td>1. Most nitrate (NO$_3^-$) salts are soluble.</td>
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<tr>
<td>2. Most salts containing the alkali metal ions (Li$^+$, Na$^+$, K$^+$, Cs$^+$, Rb$^+$) and the ammonium ion (NH$_4^+$) are soluble.</td>
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<tr>
<td>3. Most chloride, bromide, and iodide salts are soluble. Notable exceptions are salts containing the ions Ag$^+$, Pb$^{2+}$, and Hg$_2^{2+}$.</td>
</tr>
<tr>
<td>4. Most sulfate salts are soluble. Notable exceptions are BaSO$_4$, PbSO$_4$, Hg$_2$SO$_4$, and CaSO$_4$.</td>
</tr>
<tr>
<td>5. Most hydroxide salts are only slightly soluble. The important soluble hydroxides are NaOH and KOH. The compounds Ba(OH)$_2$, Sr(OH)$_2$, and Ca(OH)$_2$ are marginally soluble.</td>
</tr>
<tr>
<td>6. Most sulfide (S$^{2-}$), carbonate (CO$_3^{2-}$), chromate (CrO$_4^{2-}$), and phosphate (PO$_4^{3-}$) salts are only slightly soluble. Exceptions: Salts of alkali metals and ammonium cations.</td>
</tr>
</tbody>
</table>
Dilution

A solution is made by mixing 50.0 mL of 6.00 M HCl with 400.0 mL of 0.250 M HCl. This mixture is diluted by adding water until the final solution volume is 800.0 mL. What is the molarity of the final solution of HCl?
Consider the following information for the next three questions. 100.0 mL of 0.100 M lead (II) nitrate is added to 75.0 mL of 0.100 M ammonium phosphate and a precipitate forms.

1. What is the net ionic equation.
2. How many moles of precipitate are formed assuming 100% yield?
3. Calculate the molarity of ammonium ions after the precipitation is complete.
What volume of 0.0521 M Ba(OH)\(_2\) is required to react completely with 14.20 mL of 0.141 M H\(_3\)PO\(_4\)? Phosphoric acid contains three acidic hydrogens.
1. When $\Delta H > 0$ the reaction needs heat to proceed to products (heat is a reactant). This is called an endothermic reaction.

2. When $\Delta H < 0$ the reaction releases when reactants are converted to products (heat is a product). This is called an exothermic reaction.

3. Stoichiometry implied from reaction.

$$4 \text{ Fe (s) + 3 O}_2 \text{ (g) } \rightarrow 2 \text{ Fe}_2\text{O}_3 \text{ (s)} \quad \Delta H = -1652 \text{ kJ}$$
1. Properties of gases.
4. Ideal gas law.
5. Dalton’s law of partial pressures.
Properties of Gases

A bag of potato chips is packed and sealed in L.A. California, and later shipped to Deming, New Mexico. In Deming it is noticed that the volume of the bag of potato chips has increased. Which of the following external conditions (a-c) could cause the volume of the bag of potato chips to increase in Deming as compared to L.A.? (Assume no gas molecules can enter or leave the bag of potato chips and assume no chemical reaction occurs inside the bag).

a) The temperature outside the bag decreased.
b) The pressure outside the bag decreased.
c) The moles of air molecules outside the bag increased.
d) None of the above.
Two Condition Problem

An ideal gas in a flexible container occupies a volume of 10.0 L at 38°C and 0.20 atm. If the gas sample is cooled to 7°C and the volume is decreased to 3.60 L, what is the new pressure of the gas sample?
Ideal Gas

The gases \( \text{N}_2 \) and \( \text{H}_2 \) in a closed container fitted with a movable piston (the piston allows the volume of the container to change in order to keep the pressure constant). Stoichiometric amounts of the gases are chosen so that neither is limiting (after the reaction below goes to completion, no \( \text{N}_2 \) or \( \text{H}_2 \) are present). If the original volume of the container is 8.0 L, what will be the volume of the container after the following unbalanced reaction goes to completion? Assume \( \text{P} \) and \( \text{T} \) are constant.

\[
\text{N}_2 \,(\text{g}) + \text{H}_2 \,(\text{g}) \rightarrow \text{NH}_3 \,(\text{g})
\]