

# AP Chemistry Summer Preparation Work 2017

Mrs. Alicia Schwartz – Lemon Bay High School

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Dear future AP Chemistry student:

I am very happy to welcome you to advanced placement chemistry even before the new school year has begun. I am really excited about the coming year and I hope you are too. Many people consider AP chemistry one of the hardest AP classes. I believe that if you work hard, this class will be a real pleasure and very easy for you. The benefits of passing this class and scoring high on the AP exam make the effort worth it. If you pass the AP exam with a 5 most schools in the country will award you 8 credits of chemistry. That includes the first two college semesters of chemistry and the two laboratory classes that come with it. This is a great time and money saver for college. Even if your college does not accept these credits, you will have gained knowledge of the topics covered and you will breeze through freshman chem. The fundamentals in this class are essential to anyone planning on being an engineer, a scientist, a doctor, a nurse, a psychologist, even a chef!

If you love science like I do, there is also the bonus of learning how matter works and how our universe can be explained by understanding the interactions between matter and energy. You will also get to perform some neat laboratory experiments at the college level.

For your summer assignment, I want you all to get through all of Chapters 1, 2, and 3 from the Zumdahl textbook. I also suggest that you begin a notebook full of notes that you take while reading the textbook. If you did not pick up a textbook from the school, you can download a pdf copy of it. This is available through me.

To succeed in this class it is important to have a solid background in basic high school chemistry. If you are in this class, it is because you have had a great experience in honors chemistry and want to learn more. This summer work will help you refresh some of the fundamentals needed to succeed in AP chem. When we return from summer break, I will be giving you an exam on this material to assess your strengths and weaknesses. This test will be based on the information from the textbook and reading, so if you work with it throughout the summer, you will have no problem. If you feel that you remember mostly everything and get the problems correct, then don't kill yourself, enjoy your summer. If you don't remember how to do some of the problems then spend the time figuring it out. If you have any questions while working, feel free to contact me.

**\*\*So in summary, your summer assignment is to learn the first three chapters of the textbook. You will have online submissions periodically due throughout the summer to ensure that the assignment is completed in a timely manner and not done in the last two nights of summer.**

**For all assignments, they are due to me by 11pm of that day: You can either scan this work in to me or email me a high resolution picture (by high resolution, I mean that if you have an iphone, either choose the "actual" or "large" size option). Please ensure that I can read the document. If email does not work for you, you may snail mail the work to me. Your work must be postmarked by this date. Plan accordingly, so I can send you the address where this will be mailed.**

The timeline for summer is as follows: (Due to me by 11 pm of that day):

5/26/17- Email me @ [Alicia.Schwartz@yourcharlotteschools.net](mailto:Alicia.Schwartz@yourcharlotteschools.net) – This way I know that you have a working email that I can receive documents from you.

6/16/17- Chapter 1 material is due. You need to email me your written work from the Ch. 1 Study Guide. There are 20 problems that cover material from this chapter.

6/30/17- Chapter 2 material is due. You need to email me your written work from the Ch. 2 Study Guide. There are 20 problems that cover material from this chapter.

7/14/17- The first half of the Chapter 3 material is due. You need to email me your written work from the Ch. 3 Study Guide, numbers 1-19, covering sections 3.1-3.6.

8/04/17- The rest of the Chapter 3 material is due. You need to email me your written work from the Ch. 3 Study Guide, numbers 20-40.

Ch. 1: Chemical Foundations: 1.1: Chemistry: An overview 1.2: Scientific Method 1.3: Measurement Units 1.4: Measurement Uncertainty 1.5: Significant Figures & Calculations 1.6: Dimensional Analysis 1.7: Temperature 1.8: Density 1.9: Classification of Matter

Ch. 2: Atoms, Molecules, & Ions: 2.1: Early Chemistry History 2.2: Fundamental Chemical Laws 2.3: Dalton's Atomic Theory 2.4: Early Experiments that Characterize the Atom 2.5: Modern View of Atomic Structure: An Intro 2.6: Molecules & Ions 2.7: An Intro. to the Periodic Table 2.8: Naming Simple Compounds

Ch. 3 Stoichiometry: 3.1: Counting by Weighing 3.2: Atomic Masses 3.3: The Mole 3.4: Molar Mass 3.6: Compd. Percent Composition 3.7: Determining a Compound's Formula 3.8: Chemical Equations 3.9: Balancing Equations 3.10: Stoichiometry 3.11: Limiting Reagent

Thank you again for accepting the challenge of AP Chemistry. I hope your summer is great & look forward to seeing you in August.  
Mrs. Schwartz

## Ch. 1 Study Guide

### Section 1.3

- List the fundamental units that you would combine to get the following derived units (you may need to look up the meaning of some of the terms): a. velocity b. acceleration c. volume d. density e. pressure
- Put the following prefixes in order, from smallest to largest: femto, mega, deci, kilo, giga, hecto, micro, milli, nano, pico.

### Section 1.4

- Three students weighed the **same** copper sample 5 times. Their results are in the table:
  - Calculate the mean (average) mass of the sample determined by each student.
  - If the true mass of copper shot is **15.384 g**, which student was most accurate? Which was most precise? What could be the possible sources of error in the determinations?
- Define: a. accuracy b. precision c. random error d. systematic error

Trial	Stud. #1	Stud. #2	Stud. #3
1	17.516 g	15.414 g	13.893 g
2	17.888 g	16.413 g	13.726 g
3	19.107 g	14.408 g	13.994 g
4	21.456 g	15.637 g	13.810 g
5	19.983 g	15.210 g	13.476 g

### Section 1.5

- How many significant figures are in each of the following? a.  $6.0 \times 10^{-5}$  b. 0.003080 c.  $8.00 \times 10^8$  d. 0.0070 e. 16000
- Use exponential notation to express the number 37,100,000 with: a. 1 sig fig b. 2 sig figs c. 3 sig figs d. 6 sig figs
- Perform the calculations, & Express the final answer with the correct number of significant figures. a.  $16.81 + 3.2257$   
b.  $1.65 \times 14 \times 100.0$  c.  $7.442 - 7.429$  d.  $27/4.148$  e.  $3.14159 \times 68 / (5.18 \times 10^{-11} - 6 \times 10^{-4})$   
f.  $[(3.901 - 3.887)/3.901]$  g.  $6.404 \times 2.91 \times (18.7 - 17.1)$

### Section 1.7

- Convert 3.5 quarts to: a. liters (L) b. milliliters (mL) c. microliters ( $\mu\text{L}$ ) d. cubic centimeters ( $\text{cm}^3$ )
- If you put 8 gallons of gas in your car and it cost you a total of \$19.04, what is the cost of gas per liter?
- A student made a 27.0 kilometer drive in 16 minutes. a. How fast was the student driving? b. How many miles did the student drive? c. If the speed limit is 55 mph, was the student speeding?
- A "joule," like a calorie, is a unit of energy. There are 4.184 joules per calorie. How many joules of energy are available in one ounce of Frosted Flakes®, which has 120 kilocalories?
- During a baseball game, a pitcher threw a fastball that had a 93.7 mph velocity. a. Calculate the velocity in meters/second. b. Calculate how long it took this pitch to travel from the mound to home plate (60 ft 6 in).
- If a student weighs 185 lb, what is his mass in  $\mu\text{g}$ ?

### Section 1.8

- Convert the temperatures: a. 300. K to  $^{\circ}\text{F}$  b.  $300.^{\circ}\text{F}$  to K c.  $-40.^{\circ}\text{F}$  to  $^{\circ}\text{C}$  d.  $-100.^{\circ}\text{C}$  to K e. 1555 K to  $^{\circ}\text{C}$  f. 0.0 K to  $^{\circ}\text{F}$

### Section 1.9

- The density of an object is 1.63 g/mL. Its volume is 0.27 L. What is the mass of the object?
- An object weighing 4.0 lbs occupies 1.700 L. What is the density of the object in g/mL?
- The density of the Earth is about  $3.5 \text{ g/cm}^3$ . If the Earth has a radius of 7000 miles, what's its mass? (volume =  $[4\pi r^3/3]$ )
- Which of the following is less: a. 8.7 g/mL or  $6.1 \mu\text{g}/\mu\text{L}$ ? b. 22 miles per second, or  $3.8 \times 10^5 \text{ km per hour}$ ?

### Section 1.10

- Define the following: a. mixture b. pure substance c. homogeneous d. heterogeneous
- List and briefly describe five physical methods of separating mixtures.

## Ch. 2 Study Guide

### Section 2.2

- Sulfur & oxygen can react to form both sulfur dioxide ( $\text{SO}_2$ ) & sulfur trioxide ( $\text{SO}_3$ ). In  $\text{SO}_2$ , there are 32.06 g of S & 32.00 g of O, whereas in  $\text{SO}_3$ , 32.06 g of S combines with 48.00 g of O. What is the ratio of the weights of oxygen that combine with 32.06 g of sulfur AND how does this data illustrate the law of multiple proportions?
- A pure  $\text{H}_2\text{SO}_4$  sample contains 2.02 g H, 32.07 g S, & 64 g O. How many grams of S & of O are present in a different pure  $\text{H}_2\text{SO}_4$  sample that contains 7.27 g H?

### Section 2.3

- Describe what part of Dalton's atomic theory each chemical statement relates to. a.  $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$   
b. There are  $3.01 \times 10^{23}$  atoms in 20.04 g of calcium. c. Lead does not change to chromium when it forms lead hydroxide.

### Section 2.5

- Identify each of the following elements:

a.  ${}_{40}^{91}\text{X}$  b.  ${}_{47}^{108}\text{X}$  c.  ${}_{16}^{33}\text{X}$  d.  ${}_{36}^{85}\text{X}$  e.  ${}_{23}^{51}\text{X}$  f.  ${}_{55}^{133}\text{X}$  g.  ${}_{43}^{98}\text{X}$  h.  ${}_{75}^{186}\text{X}$  i.  ${}_{33}^{75}\text{X}$  j.  ${}_{6}^{14}\text{X}$  k.  ${}_{19}^{40}\text{X}$

### Section 2.6

- Fill in the missing information in the following tables:

Symbol	Protons	Neutrons	Electrons	Charge
${}_{35}^{80}\text{Br}^{1-}$				
___ $5+$	35	45		+5
${}_{137}^{137}$ ___	56		54	
${}_{47}^{108}\text{Ag}^{+}$				
___ Co ___		32		+2

Symbol	Protons	Neutrons	Electrons	Charge
${}_{27}^{27}$ ___	13		10	
${}_{38}^{88}$ ___				+1
___ $2+$	30	35		
${}_{35}^{35}$ ___		18	18	
___ $\text{Te}^{2-}$		76		

6. How many protons and neutrons are in each of the following elements?  
 a.  $^{89}\text{Y}$  b.  $^{73}\text{Ge}$  c.  $^{24}\text{Mg}^{2+}$  d.  $^{238}\text{U}$  e.  $^{35}\text{Cl}^-$  f.  $^{65}\text{Zn}$  g.  $^{227}\text{Ac}$  h.  $^{70}\text{Ga}$  i.  $^{11}\text{B}$  j.  $^{251}\text{Cf}$  k.  $^{239}\text{Pu}$  l.  $^{64}\text{Cu}$
7. How many protons, neutrons, and electrons are in each of the following ions?  
 a.  $^{56}\text{Fe}^{3+}$  b.  $^{40}\text{Ca}^{2+}$  c.  $^{19}\text{F}^-$  d.  $^{31}\text{P}^{3-}$  e.  $^{127}\text{I}^-$  f.  $^{127}\text{I}^{7+}$  g.  $^{28}\text{Si}^{3-}$  h.  $^{195}\text{Pt}^+$  i.  $^{40}\text{Ar}^{1-}$  j.  $^{122}\text{Sb}^{2+}$  k.  $^{184}\text{W}$

### Section 2.7

8. Name the family to which each of the following elements belongs:  
 a. Fe b. Ar c. Rb d. Cl e. Sr f. Nd g. Es h. Yb i. Fr j. I k. Kr l. Ca m. Au
9. Classify as metals or nonmetals? a. Mg b. Br c. Co d. P e. O f. Mo g. Hg h. Bi i. Xe

### Section 2.8

10. Would you expect the following atoms to gain or lose electrons when forming ions? If so, how many will be gained or lost?  
 a. Be b. Cl c. Al d. O e. F f. Li g. P
11. An element combines with 2 oxygen atoms to form a covalent compound. The element is in the same group as oxygen, but has less than 20 protons, & is in the same period as one that combines with chlorine to form a white solid that we shake on our food. Identify the element, & give the formula of the compound.
12. Predict the formula and state the name of a compound likely to be formed from the following pairs of substances:  
 a. sodium & fluorine b. aluminum & oxygen c. calcium & phosphate ion d. potassium & nitrate ion
13. What are the name and formula of the compound formed by the combination of carbon in its most negative oxidation state and hydrogen in its most positive oxidation state?
14. Name each of the following ionic compounds:  
 a.  $\text{PbI}_4$  b.  $\text{NH}_4\text{Cl}$  c.  $\text{Fe}_2\text{O}_3$  d. LiH e.  $\text{Cs}_2\text{S}$   
 f.  $\text{OsO}_4$  g.  $\text{Cr}(\text{Br})_3$  h.  $\text{NaC}_2\text{H}_3\text{O}_2$  i.  $\text{K}_2\text{Cr}_2\text{O}_7$  j.  $\text{Na}_2\text{SO}_4$   
 k.  $\text{KH}_2\text{PO}_4$  l.  $\text{MgSO}_4$  m.  $\text{Ce}_2\text{O}_3$  n.  $\text{KMnO}_4$  o. NiO  
 p.  $\text{BaI}_2$  q.  $\text{CuNO}_2$  r.  $\text{AgNO}_3$  s.  $\text{Zn}(\text{ClO}_4)_2$  t.  $\text{KHCO}_3$
15. Write formulas for each of the following compounds:  
 a. sodium cyanide b. tin(II) fluoride c. lead(II) nitrate d. ammonium dichromate e. sodium bromate  
 f. manganese(IV) oxide g. copper(I) oxide h. potassium chlorate i. magnesium oxide j. tin(IV) oxide  
 k. rubidium hypochlorite l. potassium carbonate m. barium hydroxide n. iron(III) chloride o. iron(III) oxide
16. Give the alternate or common name for each of the following compounds or cations:  
 a. sodium hydrogen carbonate ( $\text{NaHCO}_3$ ) b. iron(II) ( $\text{Fe}^{2+}$ ) c. tin(IV) ( $\text{Sn}^{4+}$ ) d. lead(II) ( $\text{Pb}^{2+}$ )
17. Name each of the following molecules compounds:  
 a.  $\text{BF}_3$  b.  $\text{PCl}_5$  c. CO d.  $\text{P}_4\text{O}_{10}$  e.  $\text{N}_2\text{O}_4$   
 f.  $\text{NH}_3$  g.  $\text{N}_2\text{O}_3$  h.  $\text{SO}_3$  i.  $\text{S}_2\text{F}_6$  j.  $\text{N}_2$
18. Write formulas for the following compounds:  
 a. dinitrogen tetroxide b. carbon tetrachloride c. diarsenic trioxide  
 d. carbon tetrafluoride e. sulfur dioxide f. tetrasulfur dinitride g. diiodine heptoxide h. iodine trichloride  
 i. xenon tetrafluoride j. nitrogen dioxide k. phosphorus trichloride l. sulfur hexafluoride m. oxygen difluoride
19. Name the following acids: a.  $\text{H}_2\text{SO}_3$  b. HI c. HBr d.  $\text{HNO}_2$  e.  $\text{H}_3\text{PO}_4$  f. HCl g.  $\text{HIO}_3$  h. HCN
20. Give formulas for the following acids: a. nitric acid b. hydrofluoric acid c. sulfuric acid d. acetic acid  
 e. hydrocyanic acid f. hydrosulfuric acid g. hydroiodic acid h. hypoiodous acid i. sulfurous acid

## Ch. 3 Study Guide

### Section 3.2

1. An element "E" is present as  $^{10}\text{E}$  with a mass value of 10.01 amu, & as  $^{11}\text{E}$  with a mass value of 11.01 amu, & natural abundances of 19.78% & 80.22% respectively. What is the average atomic mass of the element? What is the element?
2. Naturally occurring sulfur consists of four isotopes,  $^{32}\text{S} = 31.97\text{amu}$  (95.0%),  $^{33}\text{S} = 32.97\text{amu}$  (0.76%),  $^{34}\text{S} = 33.97\text{amu}$  (4.22%), &  $^{36}\text{S} = 35.97\text{amu}$  (0.014%). Using these data, calculate the atomic weight of naturally occurring sulfur.
3. A noble gas consists of three isotopes of masses 19.99 amu, 20.99 amu, and 21.99 amu. The isotope's relative abundances are 90.92%, 0.257%, and 8.82% respectively. What is the average atomic mass of this noble gas? What noble gas is this?
4. Complete the following tables of isotopic information.

Isotope	Mass (amu)	Abundance (%)
$^{20}\text{Ne}$	19.99	
$^{22}\text{Ne}$	20.99	0.257%
$^{22}\text{Ne}$	21.99	

Isotope	Mass (amu)	Abundance (%)
$^{28}\text{Si}$	27.98	
$^{29}\text{Si}$		4.70%
$^{32}\text{Si}$	29.97	3.09%

5. Gallium has two stable isotopes of masses 68.93 amu ( $^{69}\text{Ga}$ ) and 70.92 amu ( $^{71}\text{Ga}$ ).

What are the relative abundances of the two isotopes?

6. An element "X" has 5 major isotopes, listed in the table along with their abundances. What is the element?

Isotope	Mass (amu)	Abundance (%)
$^{46}\text{X}$	45.95269	8.0%
$^{47}\text{X}$	46.951764	7.3%
$^{48}\text{X}$	47.947947	73.8%
$^{49}\text{X}$	48.947841	5.5%
$^{50}\text{X}$	49.944792	5.4%

### Section 3.3

7. How many moles are in a sample of 300 atoms of nitrogen? How many grams?
8. How many atoms of gold does it take to make 1 gram of gold?
9. How many atoms of yttrium does it take to make  $5.00 \times 10^{-22}$  moles of yttrium?
10. If you buy 38.9 moles of M&M's®, how many M&M's® do you have? (1 mole of M&M's® =  $6.022 \times 10^{23}$  M&M's®)
11. Give the number of moles of each element present in 1.0 mole of each of the following substances:  
 a.  $\text{Hg}_2\text{I}_2$  b.  $\text{PbCO}_3$  c.  $\text{RbOH} \cdot 2\text{H}_2\text{O}$  d.  $\text{Ba}_3(\text{AsO}_4)_2$

**Section 3.4**

12. Calculate molar mass: a.  $\text{Cu}(\text{NH}_3)_4 \cdot 8\text{H}_2\text{O}$  b.  $\text{Zn}(\text{CN})_4$  c.  $\text{Cr}_4(\text{P}_2\text{O}_7)_3$  d.  $\text{Zr}(\text{SeO}_3)_2$  e.  $\text{Ca}_2\text{Fe}(\text{CN})_6 \cdot 12\text{H}_2\text{O}$   
 13. a. What is the mass of  $4.28 \times 10^{22}$  molecules of water? B. How many milligrams of  $\text{Br}_2$  are in  $4.8 \times 10^{20}$  molecules of  $\text{Br}_2$ ?  
 14. What is the weight in grams of a. 0.4 moles of  $\text{CH}_4$  b. 11 moles of  $\text{SO}_4^{2-}$  c. 5 moles of  $\text{Mg}(\text{OH})_2$ ?  
 15. How many milligrams of chlorine are there in a sample of  $3.9 \times 10^{19}$  molecules of chlorine gas,  $\text{Cl}_2$ ? How many atoms of Cl?  
 16. Bauxite, the principle ore used in the production of aluminum cans, has a molecular formula of  $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ .  
 a. How many grams of Al are in 0.58 moles of bauxite? b. How many atoms of Al are in 0.58 moles of bauxite?  
 c. How many grams are  $2.1 \times 10^{24}$  formula units of bauxite?

**Section 3.6**

17. Calculate the mass percent of Cl in each of the following compounds: a.  $\text{ClF}$  b.  $\text{CuCl}_2$  c.  $\text{HClO}_2$  d.  $\text{PuOCl}$   
 18. Calculate the mass percent of each element in: a.  $\text{K}_3\text{Fe}(\text{CN})_6$  b.  $\text{KAlSi}_2\text{O}_6$  c.  $\text{C}_{10}\text{H}_{14}\text{N}_2$   
 19. Chlorophyll A is essential for photosynthesis. It contains 2.72% magnesium by mass. What is chlorophyll A's molar mass, assuming there is one atom of magnesium in every molecule of chlorophyll A?

**Section 3.7**

20. Which of the following formulas are empirical? a.  $\text{CH}_4$  b.  $\text{CH}_2$  c.  $\text{KMnO}_4$  d.  $\text{N}_2\text{O}_5$  e.  $\text{B}_2\text{H}_6$  f.  $\text{Sb}_2\text{S}_3$  g.  $\text{N}_2\text{O}_4$   
 21. Determine the empirical and molecular formulas of a compound that has a mass of 31.04 g/mole and contains the following percentages of elements by mass: C = 38.66%, H = 16.24%, N = 45.10%  
 22. A compound is found, by mass spectral analysis, to contain the following percentages of elements by mass: M = 289.9 g/mole C = 49.67%, Cl = 48.92%, H = 1.39% Determine the empirical and molecular formula of the compound.  
 23. Vanillin has a mass of 152.08 g/mole and contains the following percentages of elements by mass: C = 63.18%, H = 5.26%, O = 31.56% Determine the empirical and molecular formula of vanillin.  
 24. Calculate the empirical formulas for:  
 a. an oxide of carbon that contains 42.84% carbon  
 b. an oxide of nitrogen, a sample of which contains 6.35 g of nitrogen and 3.65 g of oxygen  
 c. an oxide of copper, one gram of which contains 0.7989 g of copper  
 d. a compound of hydrogen, carbon, and nitrogen containing H = 3.70%, C = 44.44%, and N = 51.85%.

**Section 3.8**

25.  $3\text{H}_2 + \text{N}_2 \rightarrow 2\text{NH}_3$  a. What mass of hydrogen is required to produce 652 grams of ammonia?  
 b. How many moles of hydrogen react with 8.30 moles of nitrogen? How many grams of ammonia,  $\text{NH}_3$ , will be formed?  
 26. The following reaction was performed:  $\text{Fe}_2\text{O}_3(s) + 2\text{X}(s) \rightarrow 2\text{Fe}(s) + \text{X}_2\text{O}_3(s)$   
 It was found that 79.847 g of  $\text{Fe}_2\text{O}_3$  reacted with "X" to form 55.847 g of Fe and 50.982 g of  $\text{X}_2\text{O}_3$ . Identify element X.

**Section 3.9**

27. Balance the following chemical equations:  
 a.  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \rightarrow \text{Cr}_2\text{O}_3 + \text{N}_2 + \text{H}_2\text{O}$  b.  $\text{Na}_3\text{PO}_4 + \text{HCl} \rightarrow \text{NaCl} + \text{H}_3\text{PO}_4$  c.  $\text{TiCl}_4 + \text{H}_2\text{O} \rightarrow \text{TiO}_2 + \text{HCl}$   
 d.  $\text{Ba}_3\text{N}_2 + \text{H}_2\text{O} \rightarrow \text{Ba}(\text{OH})_2 + \text{NH}_3$  e.  $\text{HNO}_2 \rightarrow \text{HNO}_3 + \text{NO} + \text{H}_2\text{O}$  f.  $\text{FeS} + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3 + \text{SO}_2$   
 g.  $\text{PCl}_5 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{PO}_4 + \text{HCl}$  h.  $\text{NH}_4\text{OH} + \text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O} \rightarrow \text{Al}(\text{OH})_3 + (\text{NH}_4)_2\text{SO}_4 + \text{KOH} + \text{H}_2\text{O}$   
 28. Complete the following reactions, then balance each:  
 a. \_\_\_\_\_ +  $\text{Na}_3\text{PO}_4 \rightarrow \text{Ca}_3(\text{PO}_4)_2 + \text{NaCl}$  b.  $\text{Mg}(\text{OH})_2 + \text{HCl} \rightarrow \text{MgCl}_2 + \text{_____}$  c. \_\_\_\_\_ +  $\text{Cl}_2 \rightarrow \text{NaCl} + \text{Br}_2$

**Section 3.10 (Assume all equations to be unbalanced)**

29. How many grams of water vapor can be generated from the combustion of 18.74 g of ethanol?  $\text{C}_2\text{H}_6\text{O} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$   
 30. How many grams of sodium hydroxide are needed to make 51.63 g  $\text{Pb}(\text{OH})_2$ ?  $\text{Pb}(\text{NO}_3)_2 + \text{NaOH} \rightarrow \text{Pb}(\text{OH})_2 + \text{NaNO}_3$   
 31. How many grams of potassium iodide are necessary to completely react with 20.61 g  $\text{HgCl}_2$ ?  $\text{HgCl}_2 + \text{KI} \rightarrow \text{HgI}_2 + \text{KCl}$   
 32. How many grams of oxygen gas are necessary to completely react with 22.8 grams of methane,  $\text{CH}_4$ ? (combustion) (Write out and balance the entire reaction.)  
 33. What mass of  $\text{PbI}_2$  could be formed from  $1.0 \times 10^3$  g of  $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2$ ?  $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 + 2\text{KI} \rightarrow \text{PbI}_2 + 2\text{KC}_2\text{H}_3\text{O}_2$   
 34. How many grams of precipitate ( $\text{Hg}_2\text{Cl}_2$ ) would be formed from a solution containing 102.9 g of mercury ions that are reacted with chloride ions as follows?  $2\text{Hg}^+(aq) + 2\text{Cl}^-(aq) \rightarrow \text{Hg}_2\text{Cl}_2(s)$   
 35. Fermentation converts sugar into ethanol and carbon dioxide. If you were to ferment a bushel of apples containing 235 g of sugar, what is the maximum amount of ethanol in grams that would be produced?  $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_2\text{H}_6\text{O} + 2\text{CO}_2$   
 36. If you were to react 52.9 g of potassium chlorate ( $\text{KClO}_3$ ) with red phosphorus, how many grams of tetraphosphorus decaoxide would be produced?  $\text{KClO}_3(s) + \text{P}_4(s) \rightarrow \text{P}_4\text{O}_{10}(s) + \text{KCl}(s)$

**Section 3.11 (Assume all equations to be unbalanced)**

37. A reaction combines 133.484 g  $\text{Pb}(\text{NO}_3)_2$  with 45.010 g  $\text{NaOH}$   $\text{Pb}(\text{NO}_3)_2 + \text{NaOH} \rightarrow \text{Pb}(\text{OH})_2 + \text{NaNO}_3$   
 a. How much  $\text{Pb}(\text{OH})_2$  is formed? b. Which reactant is limiting? Which is in excess (How much left?)  
 c. If the actual yield was 80.02 g  $\text{Pb}(\text{OH})_2$ , what was the percent yield?  
 38. A reaction combines 64.81 g of silver nitrate with 92.67 g of potassium bromide.  $\text{AgNO}_3 + \text{KBr} \rightarrow \text{AgBr} + \text{KNO}_3$   
 a. How much silver bromide is formed? b. Which reactant is limiting? Which is in excess (How much left?)  
 c. If the actual yield was 14.77 g  $\text{AgBr}$ , what was the percent yield?  
 39. A reaction proceeds between 94.6 g  $\text{KClO}_3$  and 65.3 g  $\text{P}_4$ .  $\text{KClO}_3(s) + \text{P}_4(s) \rightarrow \text{P}_4\text{O}_{10}(s) + \text{KCl}(s)$   
 a. How much  $\text{KCl}$  is formed? b. Which reactant is limiting? Which is in excess (How much left?)  
 c. If the actual yield was 21.0 g  $\text{KCl}$ , what was the percent yield?  
 40. DDT, an insecticide harmful to fish, birds, & humans, is produced by the reaction:  $2\text{C}_6\text{H}_5\text{Cl} + \text{C}_2\text{HOCl}_3 \rightarrow \text{C}_{14}\text{H}_9\text{Cl}_5 + \text{H}_2$   
 In a government lab 1142 g  $\text{C}_6\text{H}_5\text{Cl}$  reacted with 485 g  $\text{C}_2\text{HOCl}_3$   
 a. How much DDT is formed? b. Which reactant is limiting? Which is in excess (How much left?)  
 c. If the actual yield was 200.0 g DDT, what was the percent yield?