

AP Chemistry Summer Preparation Work 2018

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, 3, and (almost all) 4 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 four 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):

5/25/18- Email me @ Alicia.Schwartz@yourcharlotteschools.net – This way I know that you have a working email that I can receive documents from you.

6/11/18- Chapter 1 material is due. You need to email me your written work from the Ch. 1 Study Guide. There are 17 problems that cover material from this chapter.

6/25/18- Chapter 2 material is due. You need to email me your written work from the Ch. 2 Study Guide. There are 18 problems that cover material from this chapter.

7/16/18- Chapter 3 material is due. You need to email me your written work from the Ch. 3 Study Guide. There are 23 problems that cover material from this chapter.

8/06/18- Chapter 4 material is due. You need to email me your written work from the Ch. 4 Study Guide. There are 22 problems that cover material from this chapter.

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

Ch. 4: Types of Chemical Rxns. & Solution Stoich.: 4.1: Water 4.2: Strong & Weak Electrolytes 4.3: Solution Composition 4.4: Types of Rxns. 4.5 Precipitation Rxns. 4.6 Describing Rxns. in Solution 4.7 Stoich. of Precipitation Rxns. 4.8 Acid-Base Rxns. 4.9 REDOX Rxns. (Skip 4.10)

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

CHAPTER 1: Section 1.3: 1. Put the following prefixes in order, from smallest to largest:
femto, mega, deci, kilo, giga, hecto, micro, milli, nano, pico.

Section 1.4: 2. Three students weighed the **same** copper sample 5 times. Their results are in the table: a. Calculate the mean (average) mass of the sample determined by each student. b. 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?

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

3. Define: a. accuracy b. precision c. random error d. systematic error

Section 1.5: 4. Determine the number of significant figures: a. 6.0×10^{-5} b. 0.003080 c. 8.00×10^8 d. 0.0070 e. 16000

5. 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

6. 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. $3.14159 \times 68 / (5.18 \times 10^{-11} - 6 \times 10^{-4})$

Section 1.7: 7. Convert 3.5 quarts to: a. liters (L) b. milliliters (mL) c. microliters (μL) d. cubic centimeters (cm^3)

8. 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?

9. 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?

10. 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).

11. If a student weighs 185 lb, what is his mass in μg ?

Section 1.8: 12. Convert the temperatures: a. $300. \text{K} \rightarrow ^\circ\text{F}$ b. $-40.^\circ\text{F} \rightarrow ^\circ\text{C}$ c. $-100.^\circ\text{C} \rightarrow \text{K}$ d. $1555 \text{K} \rightarrow ^\circ\text{C}$ e. $0.0^\circ\text{F} \rightarrow \text{K}$

Section 1.9: 13. The density of an object is 1.63 g/mL. Its volume is 0.27 L. What is the mass of the object?

14. The density of the Earth is about 3.5 g/cm^3 . If the Earth has a radius of 7000 miles, what's its mass? (volume = $[4\pi r^3/3]$)

15. 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: 16. Define the following: a. mixture b. pure substance c. homogeneous d. heterogeneous

17. List and briefly describe five physical methods of separating mixtures.

CHAPTER 2: Section 2.2:

1. Sulfur & oxygen can react to form both sulfur dioxide (SO_2) & sulfur trioxide (SO_3). In SO_2 , there are 32.06 g of S & 32.00 g of O, whereas in 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?

2. A pure H_2SO_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 H_2SO_4 sample that contains 7.27 g H?

Section 2.3:

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 3.01×10^{23} atoms in 20.04 g of calcium. c. Lead does not change to chromium when it forms lead hydroxide.

Section 2.5: 4. Identify the 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: 5. Fill in the missing information in the following tables:

Symbol	Protons	Neutrons	Electrons	Charge	Symbol	Protons	Neutrons	Electrons	Charge
${}_{35}^{80}\text{Br}^{1-}$					${}_{27}^{_____}$	13		10	
$_____^{5+}$	35	45		+5	${}_{88}^{_____}$				+1
${}_{137}^{_____}$			54		$_____^{2+}$	30	35		
${}_{47}^{108}\text{Ag}^+$					${}_{35}^{_____}$		18	18	
$_____^{\text{Co}}$		32		+2	$_____^{\text{Te}^{2-}}$		76		

6. How many protons, neutrons, & electrons 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. ${}^{64}\text{Cu}$

Section 2.7: 7. Which group do the following belong to? a. Fe b. Ar c. Rb d. Cl e. Sr f. Nd g. Es h. Yb i. Fr j. Kr

8. 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: 9. Do the following elements generally gain or lose electrons when forming ions & how many will be gained or lost?

a. Be b. Cl c. Al d. O e. F f. Li g. P

10. 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.

11. 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

12. Name each of the following ionic compounds:

a. PbI_4 b. NH_4Cl c. Fe_2O_3 d. LiH e. Cs_2S f. 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. Na_2SO_4 k. KH_2PO_4 l. MgSO_4 m. Ce_2O_3 n. KMnO_4
 o. NiO p. BaI_2 q. CuNO_2 r. AgNO_3 s. $\text{Zn}(\text{ClO}_4)_2$ t. KHCO_3

13. 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
14. Give the alternate or common name for each of the following compounds or cations:
 a. sodium hydrogen carbonate (NaHCO₃) b. iron(II) (Fe²⁺) c. tin(IV) (Sn⁴⁺) d. lead(II) (Pb²⁺)
15. Name each of the following molecular compounds:
 a. BF₃ b. PCl₅ c. CO d. P₄O₁₀
 e. N₂O₄ f. NH₃ g. N₂O₃ h. SO₃ i. S₂F₆ j. N₂
16. 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
17. Name the following acids:
 a. H₂SO₃ b. HI c. HBr d. HNO₂ e. H₃PO₄ f. HCl g. HIO₃ h. HCN
18. 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

CHAPTER 3: Section 3.2: 1. An element "E" is present as ¹⁰E with a mass value of 10.01 amu, & as ¹¹E with a mass value of 11.01 amu, & natural abundances of 19.78% & 80.22% respectively. What is the element and what is its average atomic mass?

2. Complete the following tables of isotopic information.

Isotope	Mass (amu)	Abundance (%)	Isotope	Mass (amu)	Abundance (%)
²⁰ Ne	19.99		²⁸ Si	27.98	
²² Ne	20.99	0.257%	²⁹ Si		4.70%
²² Ne	21.99		³² Si	29.97	3.09%

3. Gallium has two stable isotopes of masses 68.93 amu (⁶⁹Ga) and 70.92 amu (⁷¹Ga).

What are the relative abundances of the two isotopes?

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

Isotope	Mass (amu)	Abundance (%)
⁴⁶ X	45.95269	8.0%
⁴⁷ X	46.951764	7.3%
⁴⁸ X	47.947947	73.8%
⁴⁹ X	48.947841	5.5%
⁵⁰ X	49.944792	5.4%

Section 3.3: 5. How many moles & how many grams does 300 atoms of nitrogen compose?

6. How many atoms of gold does it take to make 1 gram of gold?

7. Give the number of moles of each element present in 1.0 mole of each of the following substances:
 a. Hg₂I₂ b. PbCO₃ c. RbOH·2H₂O d. Ba₃(AsO₄)₂

Section 3.4: 8. Calculate molar mass:
 a. Cu(NH₃)₄·8H₂O b. Zn(CN)₄ c. Cr₄(P₂O₇)₃ d. Zr(SeO₃)₂ e. Ca₂Fe(CN)₆·12H₂O

9. Bauxite, the principle ore used in the production of aluminum cans, has a molecular formula of Al₂O₃·2H₂O.

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 x 10²⁴ formula units of bauxite?

Section 3.6: 10. Calculate the mass percent of Cl in each of the following compounds:
 a. ClF b. CuCl₂ c. HClO₂ d. PuOCl

11. Calculate the mass percent of each element in:
 a. K₃Fe(CN)₆ b. KAlSi₂O₆ c. C₁₀H₁₄N₂

Section 3.7: 12. Which of the following formulas are empirical?
 a. CH₄ b. CH₂ c. KMnO₄ d. N₂O₅ e. B₂H₆ f. Sb₂S₃ g. N₂O₄

13. Determine the empirical and molecular formulas using the information given about the compounds.

a. C = 49.67%; Cl = 48.92%; H = 1.39% Molecular Mass = 289.9 g/mol

b. C = 63.18%, H = 5.26%, O = 31.56% Molecular Mass = 152.08 g/mol

14. Calculate the empirical formulas for:
 a. an oxide of copper, one gram of which contains 0.7989 g of copper

b. an oxide of nitrogen, a sample of which contains 6.35 g of nitrogen and 3.65 g of oxygen

Section 3.8: 15. 3H₂ + N₂ → 2NH₃ 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?

c. How many grams of ammonia, NH₃, will be formed?

Section 3.9: 16. Balance the following equations:
 a. (NH₄)₂Cr₂O₇ → Cr₂O₃ + N₂ + H₂O b. Na₃PO₄ + HCl → NaCl + H₃PO₄

c. TiCl₄ + H₂O → TiO₂ + HCl d. Ba₃N₂ + H₂O → Ba(OH)₂ + NH₃ e. HNO₂ → HNO₃ + NO + H₂O

Section 3.10 (Assume all equations to be unbalanced)

17. How many grams of sodium hydroxide are needed to make 51.63 g Pb(OH)₂? Pb(NO₃)₂ + NaOH → Pb(OH)₂ + NaNO₃

18. 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? C₆H₁₂O₆ → 2C₂H₆O + 2CO₂

Section 3.11 (Assume all equations to be unbalanced)

19. For: Pb(NO₃)₂ + NaOH → Pb(OH)₂ + NaNO₃; 133.484g Pb(NO₃)₂ reacts with 45.010g NaOH

a. How much Pb(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 Pb(OH)₂, what was the percent yield?

20. For: AgNO₃ + KBr → AgBr + KNO₃; 64.81g AgNO₃ reacts with 92.67g KBr

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 AgBr, what was the percent yield?

21. For: KClO₃(s) + P₄(s) → P₄O₁₀(s) + KCl(s); 94.6g KClO₃ reacts with 65.3g P₄

a. How much KCl is formed?

b. Which reactant is limiting? Which is in excess (How much left?)

c. If the actual yield was 21.0 g KCl, what was the percent yield?

22. DDT, a harmful insecticide, is produced: 2C₆H₅Cl + C₂HOC₂Cl₃ → C₁₄H₉Cl₅ + H₂ 1142g C₆H₅Cl reacted with 485g C₂HOC₂Cl₃

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?

CHAPTER 4: Section 4.1

- Write dissociation equations for the following when they are dissolved in water:
a. $\text{MgBr}_2(s)$ b. $\text{NH}_4\text{Cl}(s)$ c. $\text{Al}_2(\text{SO}_4)_3(s)$ d. $\text{KOH}(s)$ e. $\text{Ba}(\text{OH})_2(s)$ f. $\text{Na}_2\text{CrO}_4(s)$
- For the following pairs of substances, determine which are miscible, and Explain why or why not?
a. $\text{CH}_3\text{CH}_2\text{OH} / \text{H}_2\text{O}$ b. $\text{C}_6\text{H}_6 / \text{C}_6\text{H}_{12}$ c. $\text{C}_6\text{H}_6 / \text{H}_2\text{O}$ d. $\text{LiBr} / \text{H}_2\text{O}$

Section 4.2: 3. Classify the following as strong, weak, or nonelectrolyte.

- a. $\text{CH}_3\text{CH}_2\text{OH}$ b. NH_3 c. CaF_2 d. $\text{C}_6\text{H}_{12}\text{O}_6$ e. C_6H_{12} f. Na_2S g. HCl h. HF

Section 4.3: 4. Calculate the molarity of the following solutions prepared by dissolving the solute in enough water to get the final volume of solution. a. 49.73g H_2SO_4 in 500 mL b. 5.035g FeCl_3 in 250 mL c. 5.761g of KOH in 350 mL

- Calculate the concentrations of each of the ions in the following solutions:
a. 0.25 M Na_3PO_4 b. 0.15 M $\text{Al}_2(\text{SO}_4)_3$ c. 0.87 M Na_2CO_3 d. 0.35 M NaOH
- How many grams of the solute would you need to prepare the following solutions:
a. 100. mL of 1.00 M NaCl b. 250. mL of 1.00 M Na_2SO_4 c. 1.50 L of 0.500 M $\text{K}_2\text{Cr}_2\text{O}_7$
- Determine what volume of the given stock solution is needed to prepare the following solutions via a dilution.
a. 500 mL-1.0M from 17.8M b. 1.5 L--0.25M from 1.0M c. 100 mL--0.01M from 0.5M d. 250 mL--0.1 M from 12.5M
- a. A stock solution of sodium hydroxide is prepared by dissolving 120.0 g of NaOH in 500.0 mL of water. What is the molarity of the stock solution?
b. A stock solution of KNO_3 is prepared by dissolving 329.3 grams of the salt in enough water to make a final volume of 2.000 L. What is the molarity of the stock solution?
- a. A solution of ammonium acetate ($\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$) was made by dissolving 3.85 g of ammonium acetate in enough water to make 500 mL of solution. Calculate the solution concentration.
b. How many moles of ammonium acetate are contained in 17 mL of this solution?
- a. For, $2\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$; How many milliliters of 0.136 M NaOH are required to react with the H_2SO_4 in 10 mL of a 0.202 M solution?
b. For, $2\text{HCl} + \text{Ca}(\text{OH})_2 \rightarrow \text{CaCl}_2 + 2\text{H}_2\text{O}$; How many milliliters of 0.50 M $\text{Ca}(\text{OH})_2$ are required to react with the HCl in 30 mL of a 0.12 M solution?

Section 4.5: 11. Complete and balance the following reactions, then write the net ionic equations

- a. $\text{NaCl}(aq) + \text{Hg}_2(\text{NO}_3)_2(aq) \rightarrow$ b. $\text{Ca}(\text{OH})_2(aq) + \text{Na}_2\text{CO}_3(aq) \rightarrow$ c. $\text{Na}_2\text{S}(aq) + \text{FeCl}_3(aq) \rightarrow$

12. A solution contains Ag^+ , Pb^{2+} , and Fe^{3+} . If you want to precipitate the Pb^{2+} selectively, what anion would you choose?

Section 4.6: 13. Write the net ionic equations for the following reactions.

- a. $\text{Mg}(\text{NO}_3)_2(aq) + 2\text{NaOH}(aq) \rightarrow \text{Mg}(\text{OH})_2(s) + 2\text{NaNO}_3(aq)$ b. $\text{H}_2\text{SO}_4(aq) + \text{BaCl}_2(aq) \rightarrow \text{BaSO}_4(s) + 2\text{HCl}(aq)$
c. $\text{Na}_2\text{CO}_3(aq) + \text{CaF}_2(aq) \rightarrow \text{CaCO}_3(s) + 2\text{NaF}(aq)$ d. $\text{AgNO}_3(aq) + \text{NaCl}(aq) \rightarrow \text{AgCl}(s) + 2\text{NaNO}_3(aq)$

Section 4.7: 14. Calculate the mass of the precipitates for the following scenarios, using the equations from #13.

- Mass of $\text{Mg}(\text{OH})_2$ made when 100. mL of 0.42 M $\text{Mg}(\text{NO}_3)_2$ is added to an excess NaOH solution?
 - Mass of BaSO_4 made when 15.0 mL of 3.00 M H_2SO_4 is added to 20.0 mL of 0.100 M BaCl_2 ?
 - Mass of CaCO_3 made when 250 mL of 6.0 M Na_2CO_3 is added to 750 mL of 1.0 M CaF_2 ?
15. A 50.00-mL sample containing chloride ions, Cl^- , is combined with 125.0 mL of a 0.02157 M AgNO_3 solution. The resulting precipitate weighs 0.2116 g. What was the concentration of the chloride ion in the original sample?

Section 4.8: 16. For the following, determine the volume of titrant needed to reach the equivalence point.

- Volume of 0.1379 M HCl required to neutralize 10.0 mL of 0.2789 M NaOH ?
 - Volume of 1.50 M NaOH required to neutralize 275 mL of 0.5 M H_2SO_4 ?
 - Volume of 2.30 M HNO_3 required to neutralize 0.920 L of 0.5 M $\text{Ba}(\text{OH})_2$?
17. For the following, determine the unknown concentrations when volume and concentration of titrant required to reach equivalence point in titrations is given.
- Molarity of 10.0 mL of HCl solution with 29.31 mL of 0.0923 M NaOH titrant?
 - Molarity of 25.00 mL unknown base (1:1 stoichiometry) with 18.34 mL of 0.100 M HCl titrant?
 - Molarity of 20.0 mL unknown acid (1:1 stoichiometry) with 33.4 mL of 0.250 M KOH titrant?
18. A titration is done using 0.1302 M NaOH to determine the molar mass of an acid. The acid contains one acidic hydrogen per molecule. If 1.863 g of the acid require 70.11 mL of the NaOH solution, what is the molar mass of the acid?
19. A 2.000-g sample of silver alloy was dissolved in nitric acid and then precipitated as AgBr . After drying, the sample of silver bromide weighed 2.000 g. Calculate the percentage of silver in the alloy.
20. Complete and balance each acid-base equation (assume complete neutralization):
a. $\text{H}_2\text{SO}_4 + \text{NaOH} \rightarrow$ b. $\text{H}_3\text{PO}_4 + \text{Mg}(\text{OH})_2 \rightarrow$ c. $\text{H}_2\text{SO}_3 + \text{NaOH} \rightarrow$ d. $\text{HC}_2\text{H}_3\text{O}_2 + \text{Ba}(\text{OH})_2 \rightarrow$
21. Pennies made after 1982 contain about 97% zinc by mass. A student wants to prove this by filing the copper outside of a penny until he sees zinc and then putting the penny in a 1.00 M HCl solution. The zinc will be oxidized, and the H^+ (from HCl) will be reduced: $\text{Zn} + 2\text{H}^+ \rightarrow \text{Zn}^{2+} + \text{H}_2$ If the entire penny has a mass of 2.80 grams, how many mL of 1.00 M HCl are required to just react with all the zinc? (You would, in reality, add much more to completely surround the penny.)

Section 4.9: 22. Determine the oxidation number for each element in the following:

- a. KMnO_4 b. MnO_2 c. Mn_2O_7 d. LiMnO_2 e. K_2MnCl_4 f. H_3O^+ g. S_8
h. NH_4ClO_4 i. P_4O_{10} j. MgBr_2 k. $\text{Cr}_2\text{O}_7^{2-}$ l. NaClF_4 m. Na_2SO_4 n. HNO_3