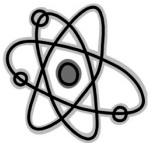
Name: _____ Period: ____ Date: _____

Optional Summer Practice:
LHS AP Chemistry
Mr. Little



Packet Info

The practice problems presented in this packet are **COMPLETELY OPTIONAL** and there is **NOTHING** due on the first day of classes. This packet was created for those students who wish to "stay sharp" over the summer months and be just a little bit more prepared when the new school year begins. You may look at, try, or review as much or as few of the problems as you wish, as nothing is being collected from this packet. The content presented here was taught in Honors Chemistry and will be quickly reviewed in the first few weeks of AP Chemistry. Since the course itself is challenging and fast-paced, you are strongly encouraged to be as ready as possible when the year begins! Some of the problems might be assigned as homework once the course begins… therefore, if you do try any of them, keep your work to save yourself time later on.

Introduction

Welcome to AP Chemistry! I am excited that you have decided to take on the challenge of such a course and look forward to having you in my class. This course is designed to be the equivalent of a first-year general chemistry *college* course. As a result, this course is designed for high school students who are skilled and/or interested in chemistry and are willing to demonstrate very high levels of commitment, motivation, and academic maturity. In order to prepare students for the rigors of the course, some practice problems are presented here to review content that was covered previously in Honors Chemistry.

Enrollment in this course is a commitment to perform at the highest level and to display a positive attitude within the class. Seriousness in maximizing one's problem solving skills is expected. Due to the advanced level of the course, considerable time will be spent on mathematical calculations, both in lab and in class. Students will be expected to devote time in study of new material and in completion of practice problems, as well as developing quality laboratory skills and reporting practices. The College Board makes the following statement in the course description in relation to student commitment: **"IT IS ASSUMED THAT THE STUDENT WILL SPEND AT LEAST FIVE HOURS A WEEK IN UNSUPERVISED INDIVIDUAL STUDY IN ADDITION TO THE TIME REQUIRED TO COMPLETE THE HOMEWORK."** AP Chemistry is hard and cannot by mastered by memorization alone. Chemistry is a thinking discipline, and students must demonstrate the maturity and self-discipline to approach it as such!

IF YOU ARE TAKING THIS COURSE, YOU SHOULD PLAN ON TAKING THE ADVANCED PLACEMENT CHEMISTRY EXAM IN THE SPRING, as the goal of this course is to prepare you for that exam as well as enrollment in a second-year chemistry course in college. Students who enroll in this course without an Honors Chemistry background and/or who have received less than a 90% average in Honors Chemistry may need to work extra hard in order to deal with the volume of work, mathematical computations, and performance level required for above average grades in an accelerated program. You should plan on anywhere from 60-90 minutes of homework per class and are expected to demonstrate a proactive approach to your work.

It is important that you understand that these requirements and time limits are not negotiable simply because this is what is required for success in this course and on the AP Chemistry Exam. If you have concerns, please feel free to contact me using the information listed below. ***BE SURE TO READ ALL OF THE INFORMATION IN THIS PACKET CAREFULLY!***

Teacher Contact / Support
If you need help at any point while working on this packet, you may contact me using the methods below:

Email: MrLittleScience@iCloud.com
Twitter: @MrLittleScience

Textbook / Notes
If you would like to reference the textbook for additional help, it is available online as a PDF. Visit my site at: http://www.mrlittlescience.com/ap-chemistry.html and look for "Textbook Online Access" under Class Documents. This section of the site also contains the notes for the entire course. Unit 1 and parts of Unit 2 contain PowerPoint slides that could also help you as you practice and review.

Important Additional Info (READ ALL OF THIS CAREFULLY!!**)**
Section One of this packet reviews the first half of Honors Chemistry and includes topics from Measurement / Matter, Atomic Structure, Periodic Table, and Nomenclature, while Section Two reviews the second half of the course and includes topics from Bonding, Reactions / Moles / Stoichiometry, Solutions, and Gases. The few problems given in Section Three are a bit more challenging and demonstrate the levels of critical thinking that are needed for AP Chemistry.

Try to visit my teacher website (http://www.mrlittlescience.com) around mid-July for directions on how to sign up for the Remind service, which will provide an additional way for you to contact me directly… do not join the AP group until this time because the previous AP students are not cleared until after the exam results are released in early July. You can also view any other important course files or information for the new year that are posted, which will help you be even more prepared and ready when the year begins!

After the practice problems in this packet, I included the list of Polyatomic Ions and Solubility Rules that you previously learned in Honors Chemistry. You still need to know these for AP Chemistry as well! There is always a quiz on these topics at the end of the first week of classes. They are provided for reference and in case you want to get a head start reviewing them.

Also, the official AP Chemistry Periodic Table that is given on the actual Advanced Placement Exam can be found on the last page of this packet. **It is STRONGLY encouraged that you print and use this Periodic Table when doing any of the problems in this packet.** You must get used to using this table to complete your assignments in AP Chemistry, as it is probably different from the table used in your previous Chemistry class. Since it only has the element symbols with no names, you should also review any common element symbols / names that you might have forgotten for various elements. ***IMPORTANT NOTE:** When finding a molar mass in AP, do NOT round the molar mass of any of the individual elements on this Periodic Table… use the entire number given!

BASD Drop/Add Policy
The following guidelines exist for all other schedule changes requested after August 1st:

1) A schedule change request form must be completed by the student and parent. Forms are available in the Counseling Office or the teacher.

2) Schedule changes will be considered for valid educational reasons only. Schedule changes will not be made to accommodate requests for lateral moves within the same subject area or teacher preference.

3) The counselor and assigned teacher will review the schedule change requests.

4) Quarter courses (half semester courses) will not be dropped after the first 5 days of class.

5) Full semester courses will not be dropped after the first 15 days of class.

6) All students must maintain a full schedule for the entire year.

7) Level changes will not be considered unless the student has a 75% or lower in the course.

Withdrawals from a course will not become part of the student record if the course is dropped within the first 15 days of a semester class and within the first 5 days of a quarter course (half semester course). A "W" (Withdrew) will be recorded after those days but prior to the end of the first quarter. Either a "WP" (Withdraw Passing) or "WF" (Withdraw Failing) will be recorded if the course is dropped after the first marking period, indicating the student's progress at the time of withdrawal.

A course change must be based upon academic considerations and be facilitated by a conference/plan developed by the student, parent, teacher, and counselor/grade level administrator to support student success. This plan will require tutoring, completion of all required work to date, and a sincere demonstration of effort and ability by the student prior to dropping a course or level of course for all classes in English, Social Studies, Math, Science and Foreign Language.

Practice Problems Directions

Since nothing is being collected, if you can get an answer by just reading a question, you do not need to write anything down. During the course and on the AP Exam itself, however, you MUST always show all work for any problems and use appropriate units and Sig Figs in your answers! As explained earlier in this packet, do NOT round the molar mass of any element from the attached Periodic Table when determining a molar mass for these problems… get accustomed to using this official AP Periodic Table as well!!

SECTION ONE

1) Indicate the correct number of significant figures for each of the following.

a. 4900	c. 12.000	e. 450.230	g. 3008
b. 0.00340	d. 20.	f. 1.67×10^{-5}	h. 0.000004

2) Round the following numbers to three significant figures.

a. 2341	c. 9.865	e. 10.156
b. 129,840	d. 0.3427	f. 81820

3) Calculate each of the following with correct significant figures.

a. 45.980 + 0.003458	c. 395.00 / 24
b. 12 – 9.783	d. $(9.00)(8.4 \times 10^{2})$

4) Perform the following conversions using dimensional analysis.

a. 940 km to mm	c. 19.3 mL to L
b. 23.4 g to kg	d. 329.5 mm to ft

5) The volume of a balloon is found to be 250 mL. How many cubic meters (m^3) does the balloon contain?

6) An experiment requires 75.0 g of ethyl alcohol (density = 0.790 g/mL). What volume of the alcohol in liters will be required?

7) Calculate the density (in g/cm^3) of a rectangular solid that has a mass of 0.03416 kg and measures 2.50 cm by 1.80 cm by 3.00 cm.

8) A champion runner is determined to have an average speed of 3.2 m/s. What is his rate of speed in miles per hour?

9) Determine the number of protons, neutrons, and electrons for each of the following.

a. Cl	b. Rn	c. Cu^{2+}	d. P^{3-}

10) Iridium is composed essentially of two isotopes: ^{191}Ir and ^{193}Ir. The average atomic mass of an iridium atom is 192.217 amu. Determine the percent abundance of each of these isotopes in a naturally occurring sample. The mass of a ^{191}Ir atom is 190.961 amu, while the mass of a ^{193}Ir atom is 192.963 amu.

11) Draw the orbital diagram for ground-state Arsenic.

12) Write the electron configuration of each of the following in *spdf* notation.

a. Nickel
b. Tellurium
c. Copper
d. Lead

13) Write the electron configuration of each of the following in Kernel (shorthand) notation.

a. Bromine
b. Iodine
c. Chromium
d. Radon

14) Explain the Periodic Law.

15) List the charge (with number included) that each of the following ions form.

a. Nitrogen
b. Magnesium
c. Potassium
d. Bromine
e. Xenon
f. Aluminum

16) What is ionization energy? Describe the trend that is seen going across a period and down a group. Be sure to explain why this trend occurs for each as well.

17) Which element is the most electronegative? Explain how this plays a role in the compounds that are formed by this element.

18) Write the formula for the following compounds.

a. Barium sulfate
b. Phosphoric acid
c. Magnesium nitride
d. Tin (II) oxide
e. Nitrogen trifluoride
f. Iron (III) hydroxide
g. Lithium oxalate
h. Hydrobromic acid
i. Dichlorine monoxide
j. Ammonium nitrate
k. Chlorous acid
l. Lead (II) carbonate

19) Write the name for the following compounds.

a. P_4O_{10}
b. AgBr
c. $HC_2H_3O_2$
d. Sr_3P_2
e. $Cu(NO_3)_2 \bullet 3H_2O$
f. PbO_2
g. H_3PO_4
h. PCl_5
i. HNO_2
j. NaCN
k. FeI_3
l. HF

SECTION TWO

1) Draw the Electron Dot Structures for each pair and show the transfer of electrons using arrows. Be sure to include the charge on each ion after the transfer and write the formula unit.

   a. Aluminum and Sulfur
   b. Barium and Bromine

2) Differentiate between ionic and covalent compounds. Give TWO properties for each type.

3) Draw molecular dot structures for each of the following.

   a. SCl_6
   b. C_2H_4
   c. HCN
   d. $CH_2CH_2(OH)_2$

4) Give an example of a polar molecule and explain why it exhibits polarity.

5) Write the complete, balanced equation and give the reaction type for each of the following.

   a. $Zn + Cu(NO_3)_2 \rightarrow$
   b. $Ag + Cl_2 \rightarrow$
   c. $Al_2(SO_4)_3 + NaOH \rightarrow$
   d. $C_6H_{14} + O_2 \rightarrow$
   e. Gold (III) oxide →
   f. Sodium + Bromine →
   g. Hydrochloric acid + Tin (IV) hydroxide →
   h. Potassium + Water →

6) Calculate the percent composition of nitrogen in ammonium thiocyanate, NH_4SCN.

7) Determine the number of moles of each of the following.

   a. 324.8 g of $SrCl_2$
   b. 2.4×10^{24} atoms of Mn
   c. 12.50 L of NH_3
   d. 9.52 g of $Ba(NO_3)_2$

8) An unknown compound found in some foods was found to contain 64.7% carbon, 5.9% hydrogen, and 13.7% nitrogen with the rest being oxygen. Find the empirical formula of this compound.

9) Tetrachloroethene (C_2Cl_4), often called perchloroethylene (perc), is a colorless liquid used in dry cleaning. The compound can be formed in several steps from the reaction of dichloroethane, chlorine gas, and oxygen gas as seen below:

$$8\ C_2H_4Cl_2\ (l) + 6\ Cl_2\ (g) + 7\ O_2\ (g) \rightarrow 4\ C_2HCl_3\ (l) + 4\ C_2Cl_4\ (l) + 14\ H_2O\ (l)$$

   a. How many grams of perc will be produced when 25.0 g of dichloroethane, 15.0 g of chlorine gas, and 10.0 g of oxygen gas react?

   b. What is the mass of each excess reagent that remains?

   c. How many kilograms of the other two products are also formed when this reaction is performed?

   d. If only 8.46 g of perc are produced, what is the percent yield of this reaction?

10) The thermite reaction (see below) has been used to weld railroad tracks. How many grams of aluminum would be needed to produce 15.0 grams of iron?

$$Fe_2O_3\ (s) + 2\ Al\ (s) \rightarrow 2\ Fe\ (s) + Al_2O_3\ (s)$$

11) Silver nitrate reacts with iron (III) chloride. In a particular experiment, it was planned to mix a solution containing 25.0 g of silver nitrate with another solution containing 45.0 grams of iron (III) chloride. What is the maximum amount of solid that could be formed?

12) Ammonia gas and hydrogen chloride gas combine to make ammonium chloride. What volume of ammonia is needed to react with 47.7 liters of hydrogen chloride at STP?

13) Sea water contains roughly 28.0 grams of NaCl per liter. What is the molarity of sea water?

14) When a reddish solution of cobalt (II) chloride is added to a white solution of calcium hydroxide, a blue precipitate forms. Write the overall net ionic equation for this reaction and identify any spectator ions.

15) Using the solubility rules, indicate whether each of the following would be soluble or insoluble in water.

a. Barium sulfate
b. Ammonium hydroxide
c. Potassium acetate
d. Magnesium oxide

16) A solution of 235 mL of 0.530 M lead (II) nitrate is mixed with 14.8 g of potassium iodide. Assuming the volume change from adding the solid to the solution is negligible, how many grams of the precipitate will be formed?

17) A sample of deadly chlorine gas has a volume of 80.0 liters and a pressure of 900.0 mm of Hg. Assuming the temperature is 20.0°C, find the number of molecules of gas in this sample.

18) An airtight container with a volume of 4.25×10^4 L, an internal pressure of 1.00 atm, and an internal temperature of 15.00°C is washed off the deck of a ship and sinks to a depth where the pressure is 175 atm and the temperature is 3.00°C. What will the volume of the gas inside be when the container breaks under the pressure at this depth?

SECTION THREE

1) On a cold, snowy February day, Northampton County got 7.460 inches of snow. If the county covers about 370.0 square miles and the average density of the freshly fallen snow was 161 kg/m^3, how many total snowflakes needed to fall in order to generate this much snow across the county? Each snowflake has a mass of 2.97 x 10^3 μg (1 gram = 10^6 micrograms).

2) An element consists of 1.40% of an isotope with a mass of 203.973 amu, 24.10% of an isotope with a mass of 205.9745 amu, 22.10% of an isotope with a mass of 206.9759 amu, and 52.40% of an isotope with a mass of 207.9766 amu. Calculate the average atomic mass and identify the element.

3) Write the complete, balanced equation for each of the following reactions.

   a. Sodium metal is added to water.
   b. A solution of tin (II) chloride is added to a solution of iron (III) sulfate.
   c. Chlorine gas is bubbled into a solution of potassium iodide.
   d. Isopropyl alcohol (C_3H_7OH) is burned

4) The hormone, thyroxine is secreted by the thyroid gland, and has the formula: $C_{15}H_{17}NO_4I_4$. How many milligrams of iodine can be extracted from 15.0 grams of thyroxine?

5) Nitroglycerin, $C_3H_5(ONO_2)_3$, was invented in 1846 by an Italian chemist named Ascanio Sobrero. This compound contains both an oxidant and a fuel. When it detonates, it decomposes to form carbon dioxide, water, nitrogen, and oxygen, all in a gaseous state. If 1.135 kg of nitroglycerin detonates, how many TOTAL liters of gas at STP are produced?

6) The first step in the Ostwald process for manufacturing nitric acid is the reaction of ammonia with oxygen to produce nitrogen monoxide and water. If the reaction consumes 595 g of ammonia, determine each of the following:

   a. What is the minimum amount of oxygen (in liters) needed for this reaction at STP?

   b. Assuming the reaction has a 90.3% yield, how many grams of water will form?

7) On a warm day, an amusement park balloon is filled with 47.8 g He. The temperature is 33.0°C and the pressure in the balloon is 2.25 atm. Calculate the volume of the balloon in milliliters.

THESE ARE INCLUDED FOR YOUR REFERENCE AND IF YOU WANT TO "BRUSH UP" ON THEM, AS THERE IS ALWAYS A QUIZ ON BOTH OF THESE TOPICS AT THE END OF THE FIRST WEEK OF CLASSES!

Polyatomic Ions

NH_4^+	Ammonium	NO_2^-	Nitrite
$C_2H_3O_2^-$	Acetate	MnO_4^-	Permanganate
BrO_3^-	Bromate	SCN^-	Thiocyanate
ClO_4^-	Perchlorate	CO_3^{2-}	Carbonate
ClO_3^-	Chlorate	$Cr_2O_7^{2-}$	Dichromate
ClO_2^-	Chlorite	CrO_4^{2-}	Chromate
ClO^-	Hypochlorite	$C_2O_4^{2-}$	Oxalate
CN^-	Cyanide	SiO_3^{2-}	Silicate
HCO_3^-	Hydrogen carbonate (bicarbonate)	SO_4^{2-}	Sulfate
HSO_4^-	Hydrogen sulfate (bisulfate)	SO_3^{2-}	Sulfite
HSO_3^-	Hydrogen sulfite (bisulfite)	O_2^{2-}	Peroxide
OH^-	Hydroxide	PO_4^{3-}	Phosphate
IO_3^-	Iodate	PO_3^{3-}	Phosphite
NO_3^-	Nitrate		

Solubility Rules

1) Salts of ammonium and alkali metals (column 1A excluding hydrogen) are always **soluble**.

2) All chlorides, bromides, and iodides are **soluble** except when combined with Ag, Hg^{2+}, and Pb which are **insoluble**.

3) Chlorates, acetates, and nitrates (CANs) are **soluble**.

4) Sulfates are **soluble** except with Ca, Sr, Ba, Ag, Hg, and Pb which are **insoluble**.

5) Phosphates, carbonates, and sulfides are **insoluble** except ammonium and alkali metal compounds are **soluble**.

6) All metallic oxides are **insoluble** except ammonium and alkali metal compounds are **soluble**.

7) All hydroxides are **insoluble** except ammonium, alkali metal compounds, and when combined with Ca, Sr, and Ba which are **soluble**.

***REMEMBER: Soluble compounds dissolve in water forming aqueous (*aq*) solutions, while insoluble compounds do NOT dissolve in water and remain solids (*s*).**

PERIODIC TABLE OF THE ELEMENTS

1																	2
H																	**He**
1.008																	4.00
3	4											5	6	7	8	9	10
Li	**Be**											**B**	**C**	**N**	**O**	**F**	**Ne**
6.94	9.01											10.81	12.01	14.01	16.00	19.00	20.18
11	12											13	14	15	16	17	18
Na	**Mg**											**Al**	**Si**	**P**	**S**	**Cl**	**Ar**
22.99	24.30											26.98	28.09	30.97	32.06	35.45	39.95
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
K	**Ca**	**Sc**	**Ti**	**V**	**Cr**	**Mn**	**Fe**	**Co**	**Ni**	**Cu**	**Zn**	**Ga**	**Ge**	**As**	**Se**	**Br**	**Kr**
39.10	40.08	44.96	47.90	50.94	52.00	54.94	55.85	58.93	58.69	63.55	65.39	69.72	72.59	74.92	78.96	79.90	83.80
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Rb	**Sr**	**Y**	**Zr**	**Nb**	**Mo**	**Tc**	**Ru**	**Rh**	**Pd**	**Ag**	**Cd**	**In**	**Sn**	**Sb**	**Te**	**I**	**Xe**
85.47	87.62	88.91	91.22	92.91	95.94	(98)	101.1	102.91	106.42	107.87	112.41	114.82	118.71	121.75	127.60	126.91	131.29
55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Cs	**Ba**	***La**	**Hf**	**Ta**	**W**	**Re**	**Os**	**Ir**	**Pt**	**Au**	**Hg**	**Tl**	**Pb**	**Bi**	**Po**	**At**	**Rn**
132.91	137.33	138.91	178.49	180.95	183.85	186.21	190.2	192.2	195.08	196.97	200.59	204.38	207.2	208.98	(209)	(210)	(222)
87	88	89	104	105	106	107	108	109	110	111							
Fr	**Ra**	**†Ac**	**Rf**	**Db**	**Sg**	**Bh**	**Hs**	**Mt**	**Ds**	**Rg**							
(223)	226.02	227.03	(261)	(262)	(266)	(264)	(277)	(268)	(271)	(272)							

	58	59	60	61	62	63	64	65	66	67	68	69	70	71
*Lanthanide Series	**Ce**	**Pr**	**Nd**	**Pm**	**Sm**	**Eu**	**Gd**	**Tb**	**Dy**	**Ho**	**Er**	**Tm**	**Yb**	**Lu**
	140.12	140.91	144.24	(145)	150.4	151.97	157.25	158.93	162.50	164.93	167.26	168.93	173.04	174.97
	90	91	92	93	94	95	96	97	98	99	100	101	102	103
†Actinide Series	**Th**	**Pa**	**U**	**Np**	**Pu**	**Am**	**Cm**	**Bk**	**Cf**	**Es**	**Fm**	**Md**	**No**	**Lr**
	232.04	231.04	238.03	(237)	(244)	(243)	(247)	(247)	(251)	(252)	(257)	(258)	(259)	(262)