Dear AP Chemistry Student,

I’m excited that you are thinking about taking AP Chemistry next year with me, and I am so happy that I have an opportunity to teach you next year! This is a difficult class that requires dedication, a fair amount of work and a love for chemistry. I know that with your passion and effort, we’ll have a great time learning this advanced material in chemistry.

AP Chemistry is meant to be a second-year course… that is, there is a lot of new material to cover and add to the foundation topics we studied in Chemistry. However, since Chemistry is comprehensive, we can’t forget about all the concepts learned in this last school year. To that end, I’ve put together this notes and problems packet for you to complete during the summer. It includes problems to practice most of the skills from last year. Each topic is linked to an online textbook, in case you need to some review. The assignment is set up to do one problem a day for most of the summer. My hopes is that these take you about 15 minutes to complete each day. If you can’t do one a day, I would try to complete problems each week.

This summer packet will count as your first grade in AP Chemistry – the easiest A you’ll make and a great start to the year! The packet will be graded on completion, effort, and accuracy (and due during the first full week of school). We will spend the first few days in class reviewing this material and at the end of the first full week of class, I will assess your knowledge in your first exam. While the packet isn’t due on the first day of school, it is to your advantage to follow my schedule, and have it done before school starts since we will be reviewing the first few days. If you make an effort to review these topics, I don’t anticipate you having any difficulty with the summer packet test.

In that spirit, enjoy your summer and I look forward to a new year of AP Chemistry with you! Cheers,

Miss Cote







AP Chemistry Summer Review

A question a day keeps the cobwebs away…

\*\* In AP, do not round the masses from the PT (use the whole number for calculations) \*\*

**Monday June 12th**

**Give the name and symbol of the prefixes used with SI units to indicate multiplication by the following exact quantities. Example: 0.001 🡪 milli**

**(a) 103**

**(b) 10−2**

**(c) 0.1**

**(d) 10−3**

**(e) 10-9**

**Tuesday June 13th**

**Perform the following calculations and report each answer with the correct number of significant figures.**

**(a) 62.8 × 34**

**(b) 0.147 + 0.0066 + 0.012**

**(c) 38 × 95 × 1.792**

**(d) 15 – 0.15 – 0.6155**

**(e) 8.78 × (0.05000478)**

**(f) 140 + 7.68 + 0.014**

**(g) 28.7 – 0.0483**

**(h) (88.5−87.57)45.13**

**Wednesday June 14h**

**Classify the following sets of measurements as accurate, precise, both, or neither.**

1. **Checking for consistency in the weight of chocolate chip cookies: 17.27 g, 13.05 g, 19.46 g, 16.92 g**
2. **Testing the volume of a batch of 25-mL pipettes: 27.02 mL, 26.99 mL, 26.97 mL, 27.01 mL**

 **(c) Determining the purity of gold: 99.9999%, 99.9998%, 99.9998%, 99.9999%**

**Thursday June 15th**

**Classify each of the following as an element, a compound, or a mixture:**

**(a) iron**

**(b) oxygen**

**(c) mercury oxide**

**(d) pancake syrup**

**(e) carbon dioxide**

**(f) a substance composed of molecules each of which contains one hydrogen and one chlorine atom**

**(g) baking soda**

**(h) baking powder**

**Friday June 16th**

**What properties distinguish solids from liquids?**

**Liquids from gases?**

**Solids from gases?**

**Monday June 19th**

**Write conversion factors (as ratios) for the number of: (you can look them up)**

**(a) kilometers in 1 mile**

**(b) liters in 1 cubic foot**

**(c) grams in 1 ounce**

**Tuesday June 20th**

**The distance between the centers of the two oxygen atoms in an oxygen molecule is 1.21 × 10−8 cm.**

 **What is this distance in inches?**

**Wednesday June 21st**

**A long ton is defined as exactly 2240 lb. What is this mass in kilograms?**

**Thursday June 22nd**

**Make the conversion indicated in each of the following (look up any conversion factors necessary):**

1. **the height of Mt. Kilimanjaro, at 19,565 ft, the highest mountain in Africa, to kilometers**
2. **the displacement volume of an automobile engine, 161 in3, to liters**
3. **the estimated mass of the atmosphere, 5.6 × 1015 tons, to kilograms**

**Friday June 23rd**

**Bromine has two isotopes, 79Br and 81Br, whose masses (78.9183 and 80.9163 amu, respectively) and abundances (50.69% and 49.31%, respectively) were determined in earlier experiments. Calculate the average atomic mass of bromine based on these experiments.**

**Monday June 26th**

**Use the periodic table to give the name and symbol for each of the following elements:**

**(a) the halogen in the same period as the alkali metal with 11 protons**

**(b) the alkaline earth metal in the same period with the neutral noble gas with 18 electrons**

**(c) the noble gas in the same row as an isotope with 30 neutrons and 25 protons**

**(d) the noble gas in the same period as gold**

**Tuesday June 27th**

**Using the periodic table, predict whether the following chlorides are ionic or molecular:**

**SiCl4**

**PCl3**

**CaCl2**

**CsCl**

**CuCl2**

**CrCl3.**

**Wednesday June 28th**

**For each of the following compounds, state whether it is ionic or molecular, and if it is ionic, write the symbols for the ions involved:**

**(a) KClO4**

**(b) Mg(C2H3O2)2**

**(c) H2S**

**(d) Ag2S**

**(e) N2Cl4**

**(f) Co(NO3)2**

**Thursday June 29th**

**For each of the following pairs of ions, write the formula of the compound they will form:**

**(a) K+, O2−**

**(b) NH4+, PO43−**

**(c) Al3+, O2−**

**(d) Na+, CO32−**

**(e) Ba2+, PO43−**

**Friday June 30th**

**Name the following compounds:**

**(a) NaF**

**(b) Rb2O**

**(c) BCl3**

**(d) H2Se**

**(e) P4O6**

**(f) ICl3**

**Monday July 3rd**

**Write the formulas of the following compounds:**

**(a) lithium carbonate**

**(b) sodium perchlorate**

**(c) barium hydroxide**

**(d) ammonium carbonate**

**(e) calcium acetate**

**(g) magnesium phosphate**

**(h) sodium sulfite**

**Tuesday July 4th**

**Calculate the molar mass of each of the following: *Don’t round masses from the PT.***

**(a) S8**

**(b) C5H12**

**(c) Sc2(SO4)3**

**(d) CH3COCH3 (acetone)**

**(e) C6H12O6 (glucose)**

**Wednesday July 5th**

**Compare 1 mole of H2, 1 mole of O2, and 1 mole of F2.**

1. **Which has the largest number of molecules? Explain why.**
2. **Which has the greatest mass? Explain why.**

**Thursday July 6th**

**Determine the mass of each of the following:**

**(a) 0.0146 mol KOH**

**(b) 10.2 mol ethane, C2H6**

**(c) 1.6 × 10−3 mol Na2SO4**

**Friday July 7th**

**Determine the number of moles of the compound and determine the number of moles of each type of atom in each of the following:**

1. **2.12 g of potassium bromide, KBr**

**(b) 0.1488 g of phosphoric acid, H3PO4**

**(c) 78.452 g of aluminum sulfate, Al2(SO4)3**

**Monday July 10th**

**Explain what changes and what stays the same when 1.00 L of a solution of NaCl is diluted to 1.80 L.**

**Tuesday July 11th**

**Determine the molarity for each of the following solutions:**

1. **0.444 mol of CoCl2 in 0.654 L of solution**
2. **98.0 g of phosphoric acid, H3PO4, in 1.00 L of solution**

**(c) 0.2074 g of calcium hydroxide, Ca(OH)2, in 40.00 mL of solution**

**Wednesday July 12th**

**Calculate the number of moles and the mass of the solute in each of the following solutions:**

1. **2.00 L of 18.5 M H2SO4, concentrated sulfuric acid**
2. **100.0 mL of 3.8 × 10−6 M NaCN, the minimum lethal concentration of sodium cyanide in blood**

**Thursday July 13th**

**What is the molarity of the diluted solution when each of the following solutions is diluted to the given final volume?**

1. **1.00 L of a 0.250-M solution of Fe(NO3)3 is diluted to a final volume of 2.00 L**

1. **0.5000 L of a 0.1222-M solution of C3H7OH is diluted to a final volume of 1.250 L**

**Friday July 14th**

**Balance the following equations:**

1. **\_\_\_\_\_PCl5(s) + \_\_\_\_\_H2O(l) ⟶\_\_\_\_POCl3(l) + \_\_\_\_\_HCl(aq)**
2. **\_\_\_\_\_Cu(s) + \_\_\_\_\_HNO3(aq)⟶ \_\_\_\_\_Cu(NO3)2(aq) + \_\_\_\_\_H2O(l) + \_\_\_\_\_NO(g)**
3. **\_\_\_\_\_H2(g) + \_\_\_\_\_I2(s)⟶ \_\_\_\_\_HI(s)**
4. **\_\_\_\_\_Fe(s) + \_\_\_\_\_O2(g)⟶ \_\_\_\_\_Fe2O3(s)**
5. **\_\_\_\_\_Na(s) + \_\_\_\_\_H2O(l)⟶ \_\_\_\_\_NaOH(aq) + \_\_\_\_\_H2(g)**
6. **\_\_\_\_\_ (NH4)2Cr2O7(s)⟶ \_\_\_\_\_Cr2O3(s) + \_\_\_\_\_N2(g) + \_\_\_\_\_H2O(g)**
7. **\_\_\_\_\_P4(s) + \_\_\_\_\_Cl2(g)⟶ \_\_\_\_\_PCl3(l)**
8. **\_\_\_\_\_PtCl4(s)🡪 \_\_\_\_\_Pt(s) + \_\_\_\_\_ Cl2(g)**

**Monday July 17th**

**I2 is produced by the reaction of 0.4235 mol of CuCl2 according to the following equation:**

**\_\_\_\_\_CuCl2+\_\_\_\_\_KI⟶\_\_\_\_\_CuI+\_\_\_\_\_KCl+\_\_\_\_\_I2.**

1. **How many molecules of I2 are produced?**
2. **What mass of I2 is produced?**

**Tuesday July 18th …. More on next page**

1. **What is the limiting reactant in a reaction that produces sodium chloride from 8 g of sodium and 8 g of diatomic chlorine? Write equation first.**

**(b) In \_\_\_\_\_ KO2+ \_\_\_\_\_ CO2 → \_\_\_\_\_ K2CO3 + \_\_\_\_\_ O2**

**i) How many grams of CO2 are used when 7.50 g of oxygen are produced?**

**ii) If 4.00 g of carbon dioxide react with 4.00 g of KO2 how much K2CO3 will be produced?**

**Wednesday July 19th**

**Using complete subshell notation (not abbreviations, 1s22s22p6, and so forth), predict the electron configuration of each of the following atoms:**

**(a) C**

**(b) P**

**(c) V**

**(d) Sb**

**(e) Sm**

**Thursday July 20th**

**Predict which of the following compounds are ionic and which are covalent, based on the location of their constituent atoms in the periodic table:**

**(a) Cl2CO**

**(b) MnO**

**(c) NCl3**

**(d) CoBr2**

**(e) K2S**

**(f) CO**

**(g) CaF2**

**(h) HI**

**(i) CaO**

**(j) IBr**

**(k) CO2**

**Friday July 21st …. More on next page**

**Complete the following thermochemistry problems:**

1. **How much energy is lost when a sample of iron with a mass of 25.7 g cools from 75.0°C to 22.0°C? CFe=0.449J/g°C)**
2. **245 mL of water with an initial temperature of 32°C absorbs 17 kJ of heat. What was the final temperature of the water? (Dwater=0.998 g/mL; Cwater=4.148J/g°C**
3. **How much heat is required to vaporize 33.8 g of water at 100.°C? (ΔHvaporization=40.7 kJ/mol)**

**Monday July 24th**

**Periodic Trends (AR, IR, IE) and (EN)**

1. **Order the following elements in order of increasing electronegativity: Ca, S, C, Li, Mg**
2. **Order the following elements in order of increasing atomic radius: Na, Ar, Zn, Se, Sr**
3. **Order the following elements in order of increasing ionization energy: O, Cr, P, Kr, Br**

**(d) Of the following element sets circle which has the higher value for the given trend.**

**Atomic radius: Mg S**

**Ionization energy: Y Co**

**Electronegativity: I Cl**

**Ionic radius: Sr2+ I-**

**Tuesday July 25th**

**Draw the following two graphs and label all of following parts:**

**ΔHrxn (energy of reaction)**

**Ea (activation energy)**

**Reactants**

**Products**

**Label x and y axes**

**Signify if ΔHrxn is positive or negative**

1. **An endothermic reaction diagram**
2. **An exothermic reaction diagram**

**Wednesday July 26th**

**Complete the following gas law problems:**

1. **A bag of chips contains 5.85 mL of air at 25°C and a pressure of 765 mmHg. Assuming the bag does not break, what will its volume be where the pressure is 442 mmHg and the temperature is 5.00°C?**

**(b) Methanol CH3OH can be synthesized by the reaction: \_\_\_\_CO(g) + \_\_\_\_H2(g) → \_\_\_\_CH3OH (g)**

**How many liters of hydrogen gas measured at 0.95 atm and 86°C, are required to synthesize 3.59 g of methanol? How many liters of carbon monoxide gas, measured under the same conditions, are required?**

**(c) How many grams of MgO will form with 14.8 L of oxygen gas, measured at STP, completely reacts with magnesium metal according to the reaction below? 2Mg (s) + O2 (g) → 2MgO (s)**

**Thursday July 27th**

**For the following pH values, calculate both the [H+] and [OH-]:**

1. **8.55**
2. **1.22**
3. **11.23**

**(d) 2.87**

**Friday July 28th**

**For the following, calculate the [OH-], pH and pOH:**

**(a) 1.94 × 10-8 M H2SO4**

**(b) 7.39 × 10-12 M HNO3**

1. **6 × 10-4 M HCl**

**(d) 1.53 × 10-9 M H3PO4**

**Monday July 31st**

[Lab Apparatus Review #1](https://www.google.com/url?q=https://www.google.com/url?q%3Dhttps://www.sciencegeek.net/Chemistry/taters/labequipment.htm%26amp;sa%3DD%26amp;source%3Deditors%26amp;ust%3D1652552917952341%26amp;usg%3DAOvVaw0-cFOZX6FcJLydjnTnIc0s&sa=D&source=docs&ust=1652552918026675&usg=AOvVaw2nBWM7_oR0hBtRk0xUAhSn)

Nothing to turn in, just practice.

**Tuesday August 1st**

[Sig Figs- Counting and Calcs](https://www.google.com/url?q=https://www.google.com/url?q%3Dhttps://www.sciencegeek.net/APchemistry/Quizzes/SigFigs/%26amp;sa%3DD%26amp;source%3Deditors%26amp;ust%3D1652552917953685%26amp;usg%3DAOvVaw07kc8ny6OIq24_dHuEAdcx&sa=D&source=docs&ust=1652552918026887&usg=AOvVaw2_UYeDS8-RLvjOYrocO3e1)

Nothing to turn in, just practice.

**Wednesday August 2nd**

[Scientific Notation](https://www.google.com/url?q=https://www.google.com/url?q%3Dhttps://www.sciencegeek.net/Activities/scientificnotation.html%26amp;sa%3DD%26amp;source%3Deditors%26amp;ust%3D1652552917955073%26amp;usg%3DAOvVaw03RtrVqpyU92rp0LwquOvt&sa=D&source=docs&ust=1652552918027073&usg=AOvVaw319zj0R-VgZCAJkZ7nO3Pl)

Nothing to turn in, just practice.

**Thursday August 3rd**

[Monatomic and PA Ion Practice](https://www.google.com/url?q=https://www.google.com/url?q%3Dhttps://www.sciencegeek.net/APchemistry/Quizzes/Ions/%26amp;sa%3DD%26amp;source%3Deditors%26amp;ust%3D1652552917956546%26amp;usg%3DAOvVaw3cdyJrPn1zvWJ35fbmG-5x&sa=D&source=docs&ust=1652552918027268&usg=AOvVaw3ev4VrbxMOQAD0GUW4JEIb)

Nothing to turn in, just practice.

**Friday August 4th**

[E‑ Configurations Practice](https://www.google.com/url?q=https://www.google.com/url?q%3Dhttps://www.sciencegeek.net/Chemistry/Review/ElectronNotations/%26amp;sa%3DD%26amp;source%3Deditors%26amp;ust%3D1652552917958255%26amp;usg%3DAOvVaw2atTizZ-cXiEC2iDPyfg81&sa=D&source=docs&ust=1652552918027567&usg=AOvVaw0mrObpMGIUU7ilCZJL3zLg)

Nothing to turn in, just practice

**Monday August 7th**

[Gram-Mole Conversions](https://www.google.com/url?q=https://www.google.com/url?q%3Dhttps://www.sciencegeek.net/Chemistry/Review/GramsMoles/%26amp;sa%3DD%26amp;source%3Deditors%26amp;ust%3D1652552917959637%26amp;usg%3DAOvVaw1s8nTn5f0Q148WUkcsx-64&sa=D&source=docs&ust=1652552918027901&usg=AOvVaw2SvKqu_DPGr9Cef8bPCp7z)

Nothing to turn in, just practice.