

Welcome to AP Chemistry 2017 - 2018

Dear AP Chemistry Student:

We hope you are ready for a fun, yet challenging year. AP Chemistry involves really understanding chemistry concepts and being able to apply them to all sorts of different problems.

Students who finish AP Chemistry come out with a much better understanding of the world around them as well as a great sense of accomplishment. AP Chemistry is a difficult class, but with motivation and effort, you will definitely succeed.

- This document contains the **Required AP Chemistry Summer Assignment**. The work for this assignment is **due the first day of class and will count as a homework assignment**.
- Separate documents contain **Summaries of Review Topics** and **Optional Practice Problems and Answers** that you may find useful to try.
- We will spend the first week of school reviewing Writing Formulas, Naming Compounds, Balancing Equations, Dimensional Analysis, Mole Conversions, Stoichiometry, Molarity, and Significant Figures. There will be quizzes on the material reviewed previous days.

We encourage you to form a study group and begin by working on the summer assignment together. The course is much easier if you have a support system.

If you are having problems on the assignment, please feel free to contact Dr. Farrar at mfarrar@cpsd.us.

Have a great summer! Can't wait to work with you next year!

The CRLS AP Chemistry Teacher,

Dr. Farrar

Summer Assignment:

- Where there are **blank spots**, you should take notes on that particular topic. Use the **Summaries of Review Topics**, your notes from CP or HN Chemistry, books, or look around online.

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- I would like to recommend you the following websites: these materials and videos also can help you to be prepared for the next year.
 - College Board websites:
 - http://apcentral.collegeboard.com/apc/public/exam/exam_information/221837.html
 - <https://secure-media.collegeboard.org/digitalServices/pdf/ap/ap-chemistry-course-and-exam-escrption.pdf>
- Bozeman Chemistry Videos (or similar topics on Khan Academy Chemistry website)
- <http://www.bozemanscience.com/factor-label-method> 10 min
 - <http://www.bozemanscience.com/significant-digits> 11 min
 - <http://www.bozemanscience.com/history-of-the-atom> 10 min
 - <http://www.bozemanscience.com/atoms-the-periodic-table> 9 min
 - <http://www.bozemanscience.com/chemical-bonds-covalent-vs-ionic> 9 min
 - <http://www.bozemanscience.com/beginners-guide-balancing-equations> 11 min
 - <http://www.bozemanscience.com/mole-conversions> 12 min
 - <http://www.bozemanscience.com/physical-chemical-changes> 12 min
 - <http://www.bozemanscience.com/naming-compounds-part-1> 11 min
 - <http://www.bozemanscience.com/naming-compounds-part-2> 6 min
 - <http://www.bozemanscience.com/ap-chem-028-stoichiometry> 10 min

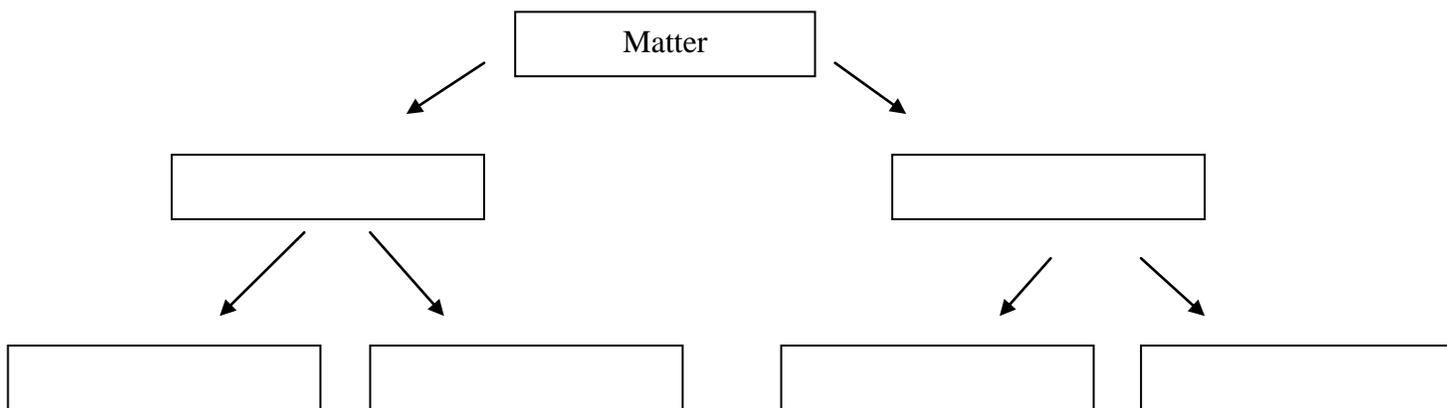
Review of Chemistry Topics

AP Chemistry

Dr. Farrar

Classification of Matter Basics

Use the Summary Packet/other resources to help you fill in these notes/questions.



1. Classify the following as an element, compound, heterogeneous mixture, or homogeneous mixture.

_____ a. Mud

_____ e. CO

_____ b. Carbon

_____ f. Sugar water

_____ c. NaCl (aq)

_____ g. Air

_____ d. H₂

_____ h. Carbon dioxide

2. Describe how each type of matter can be separated/broken down.

Element:

Compound:

Heterogeneous Mixtures:

Homogeneous Mixtures:

3. Which technique would you use to separate a suspended solid from a liquid?

a. Distillation

b. Chromatography

c. Filtration

4. Determine if the following if a chemical change or a physical change?

_____ a. Melting Ice

_____ e. Dissolving

_____ b. Burning Wood

_____ f. Combustion

_____ c. Cutting Paper

_____ g. Freezing water

_____ d. Boiling water

_____ h. Evaporating perfume

Periodic Table Basics

Use the Summary Packet/other resources to help you with this section.

1. What are the rows called in the periodic table: _____

2. What are the columns called in the periodic table: _____

3. How is the periodic table organized? _____

	Name	# Valence electrons	Charge of an Ion
Group 1A			
Group 2A			
Group 3A	N/A		
Group 4A	N/A		
Group 5A	N/A		
Group 6A	N/A		
<i>Example: Group 7A</i>	<i>halogens</i>	<i>7</i>	<i>-1, +7, +5, +3, +1</i>
Group 8A			

Memorizing Formulas: Polyatomic Ions and Some Acids.

Memorizing the polyatomic ions and some acids are VERY important for you to quickly write and name formulas. You are expected to know them all year. For each ion or acid listed below, you will make an index card. On one side of the card, write the name of the ion, on the other side write the formula and charge. Whenever you get a free moment, look at one side of the card and guess the other side. Keep doing this for one week and you should have them memorized. **Formulas of ions and acids that we will use more often, are represented in bold.**

Selected Polyatomic Ions-----

H₃O⁺	hydronium	OH⁻	hydroxide
NH₄⁺	ammonium	ClO₃⁻	chlorate
CO₃²⁻	carbonate	CrO₄²⁻	chromate
HCO₃⁻	hydrogen carbonate or bicarbonate	Cr₂O₇²⁻	dichromate
PO₄³⁻	phosphate	MnO₄⁻	permanganate
NO₂⁻	nitrite	SO₃²⁻	sulfite
NO₃⁻	nitrate	SO₄²⁻	sulfate

- You should know both forms of acetate
- You need to be able to go from the name to the ion (with the correct charges) and from the ion to the name.
- Sometimes grouping them by charge helps. Create your own practice quiz where you actually have to write your answers. This is much different than just flipping over flash cards.

Names and Formulas of Acids

Chemical formula	Name of the acid
H₂S	Hydrosulfuric acid
HF/ HCl /HBr / HI	Hydrofluoric acid/ Hydrochloric acid/ Hydrobromic acid/ Hydroiodic acid
H₂CO₃/ H₂SiO₃	Carbonic acid/ Silicic acid
HNO₃ / HNO₂	Nitric acid / Nitrous acid
H₃PO₄	Phosphoric acid
H₂SO₄ / H₂SO₃	Sulfuric acid / Sulfurous acid

Review Writing Formulas from Names of Ionic Compounds

Write Notes from the Summary Packet of writing formulas for ionic compounds:

- | | | | |
|------------------------|-------|----------------------------|-------|
| 1. ammonium phosphate | _____ | 9. iron (II) oxide | _____ |
| 2. iron (III) oxide | _____ | 10. lead (II) nitrate | _____ |
| 3. calcium chloride | _____ | 11. potassium nitrite | _____ |
| 4. magnesium hydroxide | _____ | 12. aluminum sulfate | _____ |
| 5. copper (II) sulfate | _____ | 13. lead (IV) chromate | _____ |
| 6. copper (I) sulfate | _____ | 14. potassium permanganate | _____ |
| 7. sodium bicarbonate | _____ | 15. zinc nitrate | _____ |
| 8. aluminum sulfite | _____ | 16. sodium thiocyanate | _____ |

Review Naming Ionic Compounds

Write Notes from the summary packet here on naming:

Zinc²⁺ and Silver⁺ do not need Roman Numerals

- | | | | |
|---|-------|-------------------------|-------|
| 1. FeSO ₄ | _____ | 9. FeCl ₃ | _____ |
| 2. CuC ₂ H ₃ O ₂ | _____ | 10. PbSO ₄ | _____ |
| 3. Fe ₂ O ₃ | _____ | 11. NaHSO ₄ | _____ |
| 4. Ag ₂ SO ₄ | _____ | 12. NiBr ₃ | _____ |
| 5. ZnCO ₃ | _____ | 13. Al(OH) ₃ | _____ |

Review Writing Formulas of Covalent Compounds

Write Notes from the Summary Packet here on writing formulas for covalent compounds:

- | | | | |
|-------------------------|-------|-------------------------|-------|
| 1. carbon monoxide | _____ | 4. dinitrogen pentoxide | _____ |
| 2. carbon tetrachloride | _____ | 5. hydrochloric acid | _____ |
| 3. sulfur trioxide | _____ | 6. nitric acid | _____ |

Review Naming Covalent Compounds

Write Notes from the Summary Packet here on naming covalent compounds and acids:

- | | | | |
|----------------------------------|-------|-----------------------------------|-------|
| 1. CO ₂ | _____ | 4. HBr | _____ |
| 2. N ₂ O ₄ | _____ | 5. H ₂ SO ₄ | _____ |
| 3. CBr ₄ | _____ | 6. H ₂ SO ₃ | _____ |

Review Balancing and Classifying Equations

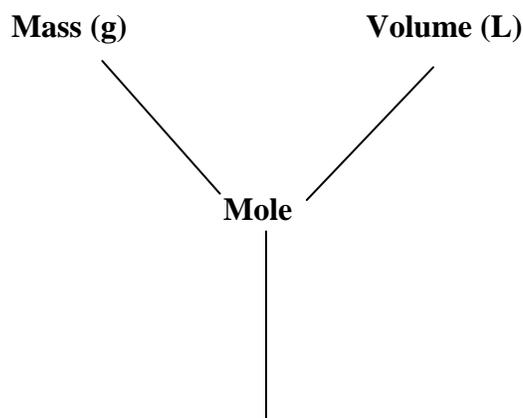
(1) Classify the following Equations as **Synthesis, Decomposition, Single Replacement, Double Replacement, and Combustion.**

(2) Balance these Equations.



Review Mole Conversions

Write the conversion factors on each line:



Particles (atoms, molecules, formula units)

Do the following conversions. Show your work!!!

1. What is the molar mass of K₂SO₄? _____

2. What is the molar mass of Ca₃(PO₄)₂? _____

3. 0.5 moles of $C_6H_{12}O_6$ to grams _____

4. 100 g of $KMnO_4$ to moles _____

5. How many grams are there in 1.5×10^{25} molecules of CO_2 ? _____

6. How many grams are in a sample of NH_3 gas occupies 75.0 liters at STP? _____

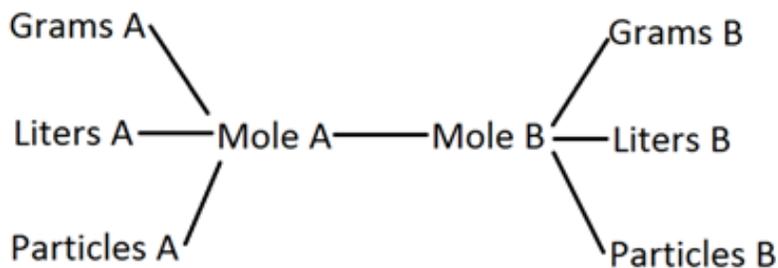
7. How many atoms are there in 1.3×10^{22} molecules of NO_2 ? _____

8. A 5.0 gram sample of O_2 is in a container at STP. What volume is the container? _____

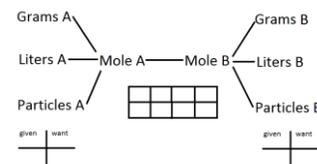
9. a. How many molecules of O_2 are in the container in Problem 6? _____

b. How many oxygen atoms are there? _____

Review Stoichiometry



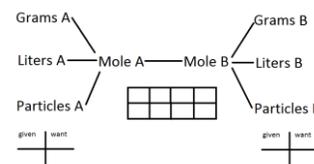
Use the equation below for questions 1-4.



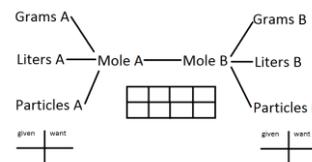
1. What is the number of moles of butane (C_4H_{10}) needed for producing 3.0 moles of CO_2 ?



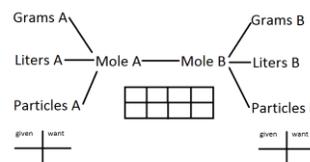
2. How many grams of water will be produced if 10.0 g of butane were reacted with excess oxygen?



3. What volume of butane at STP is needed to produce 20.0 g of CO_2 ?



4. How many molecule of carbon dioxide are produced from 3.0 moles of butane?



Concentration- Molarity Basics

Formula for Molarity:

1. How many moles of NaCl are dissolved in a 0.2 M solution of 500 ml?

2. How many liters of solution yields a 0.5 M solution made of 3.5 moles of NaOH?

3. A 1500 ml solution with 100. g of KOH completely dissolved, calculate the molarity.

4. Calculate the molarity of a 750. ml solution with 54 g of HCl completely dissolved.

5. Calculate the molarity of a 1.0 L solution with 94.5 g of HNO₃ completely dissolved.

Formula for a Dilution:

1. How much concentrated 18 M sulfuric acid is needed to prepare 250. ml of a 6.0 M solution?

2. How much concentrated 12 M HCl is needed to prepare 100. ml of a 2.0 M solution?

3. How much concentrated 6 M acid is needed to prepare 500. ml of a 3 M solution?

Review Atomic Structure

(1) Use the summary packet to fill in the information below:

Subatomic Particle	Symbol	Location	Mass	Charge
Proton				
Neutron				
Electron				

(2) How to determine # protons _____

(3) How to determine # electrons in a neutral atom _____

(4) Mass # is equal to _____

(5) How to determine # neutrons _____

(6) In which of the calcium isotopes is the number of neutrons the same as the number of protons?

(A) ${}_{20}^{40}\text{Ca}$ (B) ${}_{20}^{42}\text{Ca}$ (C) ${}_{20}^{41}\text{Ca}$

(7) What is the composition of an atom of fluorine- 22?

(A) 22 protons, 22 neutrons, 22 electrons (B) 22 protons, 22 neutrons, 13 electrons

(C) 9 protons, 9 neutrons, 9 electrons (D) 9 protons, 13 neutrons, 9 electrons

(8) Fill in the Table below:

Element Name	Atomic Symbol	Atomic Number	Mass Number	Number of Protons	Number of Electrons	Number of Neutrons
Sodium						
Hydrogen						
Oxygen						
Chlorine						
Argon						

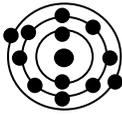
(9) Underline valence electrons of each element and identify these elements.

	Electron configurations	Period	Group	Element
1	$1s^1$			
2	$1s^2 2s^2 2p^6 3s^2 3p^4$			
3	$1s^2 2s^2 2p^3$			
4 Example	$1s^2 2s^2 2p^6 \underline{3s^2 3p^1}$	3	2 + 1 = 3 <u>3A</u>	Al
5	$1s^2 2s^2 2p^6 3s^2 3p^3$			
6	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$			

(10) Underline valence electrons of each element and identify these elements.

	Electron configurations	Period	Group	Element
1	[He] $2s^2 2p^5$			
2	[Ne] $3s^2 3p^1$			
3 Example	[Ar] $4s^2$	Period 4	Group 2A	Ca
4	[Kr] $5s^1$			

(11) Fill in the table below:

Element's symbol	Total # of electrons = atomic number	# of valence electrons = number of a group	Bohr diagram	<u>Electron configuration and nobel-gas notation</u>
Ne				
Mg Example	12	2		$1s^2 2s^2 2p^6 3s^2$ or [Ne] $3s^2$
S				

(12) Fill in the table below:

Element #, symbol, # of protons and electrons	Bohr diagram	Electron configuration, Nobel-gas notation, Orbital diagram
17, Cl		
19, K		

Review Significant Figures

Write notes in the empty spaces using information from the summary packet:

General Information for Finding Significant Figures of a Number

Rules for Calculations Using Significant Figures

When multiplying and dividing:

When adding and subtracting:

Perform the following calculations using the rules for significant figures. On the first line, write the unrounded calculation and on the second line, write the rounded calculation.

1. $1.35 \text{ m} \times 2.467 \text{ m} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

2. $1035 \text{ m}^2 \div 42 \text{ m} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

3. $12.01 \text{ mL} + 35.2 \text{ mL} + 6 \text{ mL} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

4. $55.46 \text{ g} - 28.9 \text{ g} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

5. $0.021 \text{ cm} \times 3.2 \text{ cm} \times 100.1 \text{ cm} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

6. $0.15 \text{ cm} + 1.15 \text{ cm} + 2.051 \text{ cm} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

7. $150 \text{ m}^3 \div 4 \text{ m} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

8. $505 \text{ kg} - 450.25 \text{ kg} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

9. $1.252 \text{ mm} \times 0.115 \text{ mm} \times 0.012 \text{ mm} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

10. $1.278 \times 10^3 \text{ m}^2 \div 1.4267 \times 10^2 \text{ m} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

Review Metric prefixes and conversions

Complete conversions. Show work below and answers on the line.

1. Convert 125 mL to L _____

5. Convert 36.5 g to kg _____

2. Convert 734 nm to m _____

6. Convert 9.8 mg to kg _____

3. Convert 0.047 mg to μg _____

7. Convert 87 mL to cm^3 _____

4. Convert 1.6 mg to g _____

8. Convert 0.75 L to cm^3 _____

Temperature Conversion

Use summary packet to fill in this information:

To Kelvin from Celsius: _____ To Celsius from Kelvin: _____

1. Convert 86°C to K: _____

1. Convert 300 K to $^\circ\text{C}$: _____

2. Convert 21°C to K: _____

2. Convert 352 K to $^\circ\text{C}$: _____

****End of Summer Assignment****
