

# AP Chemistry Summer Assignment

Welcome to AP Chemistry! You will quickly notice that things will be different than they were in Honors Chemistry. For one, you must memorize a lot of the information that was given to you on the Chemistry Reference Tables. This assignment will help us with some of the memorization, math skills, and basic topics that you will need so that we can hit the ground running in August.

As you progress through this assignment use the following sources for help;

- I created a playlist of my Honors Chemistry videos on the topics in the summer assignment. You can access the playlist with the url provided here (<http://tinyurl.com/I8qv5f4>) and watch as many videos to help you review as you need. You are welcome to watch others if like you are not limited to mine.
- Read the AP Chemistry Textbook (Chapters 1-3 will be helpful for the summer assignment)
- Helpful links (on my blackboard—more to come throughout the summer stay tuned)
- For the practice problems I will post the answer key; however just copying the answers will not help you prepare!! You need to understand how to solve the problems!
- Email me for help ([jkubacki@wcpss.net](mailto:jkubacki@wcpss.net)) I will check periodically, but not daily!

## Important Dates

- I will be available for help the week of August 1<sup>st</sup> during AP Chemistry Boot Camp from 10am-3pm.
- During AP Chemistry Boot Camp we will review the concepts in the morning and will do lab work in the afternoon. It is completely optional, but many students found it very helpful!
- Due Date: Worksheets 1 & 2 are due the first day of class & there will be a quiz on the elements on the first day, and a quiz on the polyatomic ions on the second day of class.

## What will you hand in?

- Worksheets 1 & 2 (if you need additional space for worksheet 1, you can turn in your own notebook paper, but it must be neat and labeled correctly)

### Task 1: Complete Worksheets 1 & 2 (attached)

### Task 2: Memorize the names of the elements and their corresponding symbols

- You need to know elements 1-56, plus Pt, Au, Hg, Pb, Rn, Fr, Ra, U, Pu
- Many of these elements you will already know
- Making flashcards is helpful!
- It's important to know these elements because the periodic table you are provided has only the symbols and not the names of the elements.

### Task 3: Memorize the ionic charges of the basic ions

- Think about the valence electrons!
- Think about the common elements/ions in that group
  - Group 1 ions = +1
  - Group 2 ions = +2
  - Group 15 (5A) ions (N and P) = -3
  - Group 16 (6A) ions (O and S) = -2
  - Group 17 (7A)/ halogens = -1
  - Zn = +2
  - Ag = +1
  - Cu = +1 or +2
  - Fe = +2 or +3
  - Pb = +2 or +4
  - Sn = +2 or +4

### Task 4: Memorize the names, symbols, and charges of Polyatomic ions below:

- Oxyanions - polyatomics containing oxygen, names end in *-ate* or *-ite*
- *-ate* is used for the most common form
- *-ite* is used for the form with the same charge, but one less oxygen
  - Example:
    - $\text{NO}_3^-$  = nitrate
    - $\text{NO}_2^-$  = nitrite
- Prefixes are also used
  - *Per-* indicates one more oxygen than the *-ate* form (think “perfect = overachieving”, ie = more)
  - *Hypo-* indicates one fewer oxygen than the *-ite* form
  - Example:
    - $\text{ClO}_4^-$  = perchlorate (b/c it has one more O than the *-ate* form)
    - $\text{ClO}_3^-$  = chlorate (b/c it is the most common)
    - $\text{ClO}_2^-$  = chlorite (b/c it has one less oxygen than *-ate* form)
    - $\text{ClO}^-$  = hypochlorite (b/c it has one less oxygen than the *-ite* form)
  - F, Cl, Br, I all behave the same
    - Therefore, if chlorate is  $\text{ClO}_3^-$ , the bromate ion is...
    - $\text{BrO}_3^-$ !!!!
    - Simply substitute one halogen for the other
    - If you learn the chlorate series, you also automatically know the bromate, iodate, and fluorate series
- Hydrogen can be added to -2 or -3 ions to make a “new ion” i.e.  $\text{H}_2\text{PO}_4^-$  is dihydrogen phosphate (note the - charge went up 1 for each  $\text{H}^+$  added)

|  |  |  |
|--|--|--|
| <u>+1</u><br>ammonium, $\text{NH}_4^+$   |  |  |
| <u>-1</u><br>acetate, $\text{C}_2\text{H}_3\text{O}_2^-$ , or $\text{CH}_3\text{COO}^-$<br>bromate, $\text{BrO}_3^-$<br>chlorate, $\text{ClO}_3^-$<br>chlorite, $\text{ClO}_2^-$<br>cyanide, $\text{CN}^-$<br>hydrogen carbonate, $\text{HCO}_3^-$<br>(also called bicarbonate)<br>hydroxide, $\text{OH}^-$<br>hypochlorite, $\text{ClO}^-$<br>iodate, $\text{IO}_3^-$<br>nitrate, $\text{NO}_3^-$<br>nitrite, $\text{NO}_2^-$<br>permanganate, $\text{MnO}_4^-$<br>perchlorate, $\text{ClO}_4^-$<br>thiocyanate, $\text{SCN}^-$ | <u>-2</u><br>carbonate, $\text{CO}_3^{-2}$<br>chromate, $\text{CrO}_4^{-2}$<br>dichromate, $\text{Cr}_2\text{O}_7^{-2}$<br>oxalate, $\text{C}_2\text{O}_4^{-2}$<br>peroxide, $\text{O}_2^{-2}$<br>sulfate, $\text{SO}_4^{-2}$<br>sulfite, $\text{SO}_3^{-2}$ | <u>-3</u><br>phosphate, $\text{PO}_4^{-3}$<br>phosphite, $\text{PO}_3^{-3}$<br>arsenate, $\text{AsO}_4^{-3}$ |

**Be able to name polyatomic ions using the rules above such as these below:**

$\text{HPO}_4^{-2}$  \_\_\_\_\_

$\text{HSO}_3^{-1}$  \_\_\_\_\_

$\text{FO}_3^{-1}$  \_\_\_\_\_

$\text{HCO}_3^{-1}$  \_\_\_\_\_

**Be able to write formulas for polyatomic ions using the rules above such as these below:**

Bromite \_\_\_\_\_

periodate \_\_\_\_\_

Dihydrogen phosphite \_\_\_\_\_

hydrogen chromate \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

AP Chemistry Summer Assignment

Worksheet #1 - Math Skills

**Significant Figures (Sig Figs)**

1. How many sig figs are in the following numbers?

a) 0.0450 \_\_\_\_\_

b) 790 \_\_\_\_\_

c) 32.10 \_\_\_\_\_

2. Solve the following problems. Round your answer to the correct number of sig figs (and use the correct unit on your answer).

a) 825 cm x 32 cm x 0.248 cm \_\_\_\_\_

b)  $\frac{15.68 \text{ g}}{2.885 \text{ mL}}$  \_\_\_\_\_

**Density** (round your answers to correct number of sig figs and show all work with units)

3. A cube of ruthenium metal 1.5 cm on a side has a mass of 42.0 g. What is the density in  $\text{g/cm}^3$ ? Will ruthenium metal float on water?

4. The density of bismuth metal is  $9.8 \text{ g/cm}^3$ . What is the mass of a sample of bismuth that displaces 65.8 mL of water?

**Conversions** (round answers correctly and show work with units)

5. Make the following conversions:

a) 16.2 m to km

b) 5.44 nL to mL

c) 45.7 mL/s to kL/hr

**Reactions**

6. Balance the following and equations and tell what type of reaction it is (synthesis, decomposition, single replacement, double replacement, or combustion)

a)  $\text{___ KNO}_3 \rightarrow \text{___ KNO}_2 + \text{___ O}_2$  Type: \_\_\_\_\_

b)  $\text{___ AgNO}_3 + \text{___ K}_2\text{SO}_4 \rightarrow \text{___ Ag}_2\text{SO}_4 + \text{___ KNO}_3$  Type: \_\_\_\_\_

c)  $\text{___ CH}_3\text{NH}_2 + \text{___ O}_2 \rightarrow \text{___ CO}_2 + \text{___ H}_2\text{O} + \text{___ N}_2$  Type: \_\_\_\_\_

d)  $\text{___ N}_2\text{O}_5 + \text{___ H}_2\text{O} \rightarrow \text{___ HNO}_3$  Type: \_\_\_\_\_

e)  $\text{___ Na} + \text{___ Zn(NO}_3)_2 \rightarrow \text{___ Zn} + \text{___ NaNO}_3$  Type: \_\_\_\_\_

7. What are diatomic molecules? List the 7.

### Average Atomic Mass

8. Magnesium consists of 3 naturally occurring isotopes with the masses 23.98504, 24.98584, and 25.98259 amu. The relative abundances of these three isotopes are 78.70%, 10.13 %, and 11.17% respectively. Calculate the average atomic mass.

### Percent Composition

9. Calculate the percent composition of  $C_{12}H_{22}O_{11}$  (sugar). (Give Percent of each element.) Show all work.

### Moles

10. Calculate the number of moles of the following: (SHOW WORK)

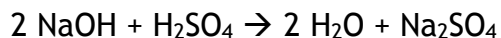
a) 42.8 g of  $KNO_3$

b) 155.7 L of  $CO_2$  at STP

c)  $9.25 \times 10^{26}$  molecules of  $CaCl_2$

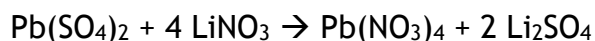
## Stoichiometry

11. Using the following equation:



How many grams of sodium sulfate will be formed if you start with 200 grams of sodium hydroxide and you have an excess of sulfuric acid?

12. Using the following equation:



How many grams of lithium nitrate will be needed to make 250 grams of lithium sulfate, assuming that you have an adequate amount of lead (IV) sulfate to do the reaction?

13. Using the following equation:  $\text{Fe}_2\text{O}_3 + 3 \text{H}_2 \rightarrow 2 \text{Fe} + 3 \text{H}_2\text{O}$

Calculate how many grams of iron can be made from 16.5 grams of  $\text{Fe}_2\text{O}_3$ .





## Worksheet #2: Practice Naming Compounds

1. Provide names for the following ionic compounds:

- a.  $\text{AlF}_3$  \_\_\_\_\_
- b.  $\text{Fe}(\text{OH})_2$  \_\_\_\_\_
- c.  $\text{Cu}(\text{NO}_3)_2$  \_\_\_\_\_
- d.  $\text{Ba}(\text{ClO}_4)_2$  \_\_\_\_\_
- e.  $\text{Li}_3\text{PO}_4$  \_\_\_\_\_
- f.  $\text{Hg}_2\text{S}$  \_\_\_\_\_
- g.  $\text{Cr}_2(\text{CO}_3)_3$  \_\_\_\_\_
- h.  $(\text{NH}_4)_2\text{SO}_4$  \_\_\_\_\_

2. Write the chemical formulas for the following compounds:

- a. Copper(I) oxide \_\_\_\_\_
- b. Potassium peroxide \_\_\_\_\_
- c. Iron(III) carbonate \_\_\_\_\_
- d. Zinc nitrate \_\_\_\_\_
- e. Sodium hypobromite \_\_\_\_\_
- f. Aluminum hydroxide \_\_\_\_\_

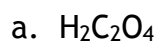
3. Give the name or chemical formula for each of the following molecular substances:

- a.  $\text{SF}_6$  \_\_\_\_\_
- b.  $\text{XeO}_3$  \_\_\_\_\_
- c. Dinitrogen tetroxide \_\_\_\_\_
- d. Hydrogen cyanide \_\_\_\_\_
- e.  $\text{IF}_5$  \_\_\_\_\_
- f. Dihydrogen monoxide \_\_\_\_\_
- g. Tetraphosphorous hexasulfide \_\_\_\_\_

4. Give the name or chemical formula for the following compounds:

- a. Ammonium oxalate \_\_\_\_\_
- b. Manganese(III) dichromate \_\_\_\_\_
- c.  $\text{Ti}(\text{OH})_4$  \_\_\_\_\_
- d.  $\text{Ni}(\text{ClO}_2)_3$  \_\_\_\_\_
- e. Dinitrogen pentoxide \_\_\_\_\_
- f. Aluminum oxide \_\_\_\_\_
- g.  $\text{Fe}_2\text{S}_3$  \_\_\_\_\_

5. Name the following acids



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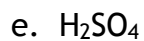
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6. Write formulas for the following acids.

a. hydrochloric acid

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b. sulfuric acid

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c. nitric acid

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d. phosphoric acid

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e. carbonic acid

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f. acetic acid

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