

## AP Chemistry Summer Assignment

Welcome to AP Chemistry! This summer packet is designed to prepare you for the beginning of AP Chemistry! The topics covered in this packet are topics that were taught in Chemistry 1 that are imperative to the AP Chemistry course. This packet is simply a tool to help you to review. Please email me for any help!

Email: [talexander1@pasadenaisd.org](mailto:talexander1@pasadenaisd.org)

### Topics in this packet:

- Polyatomic ions (must memorize)
- Significant figures
- Dimensional analysis
- Stoichiometry
- Naming/formula writing

A periodic table is attached as reference for the problems in this packet.

**Polyatomic Ions:** These will not be given on the back of the periodic table like they were in Chemistry 1. Please familiarize yourself with these; you should know the name of each, its formula, and its charge.

Name	Symbol
Ammonium	$\text{NH}_4^{+1}$
Nitrite	$\text{NO}_2^{-1}$
Nitrate	$\text{NO}_3^{-1}$
Sulfite	$\text{SO}_3^{2-}$
Sulfate	$\text{SO}_4^{-2}$
Hydroxide	$\text{OH}^{-1}$
Cyanide	$\text{CN}^{-1}$
Phosphate	$\text{PO}_4^{-3}$
Hydrogen Phosphate	$\text{HPO}_4^{-2}$
Dihydrogen Phosphate	$\text{H}_2\text{PO}_4^{-1}$
Phosphite	$\text{PO}_3^{-3}$
Carbonate	$\text{CO}_3^{-2}$
Hydrogen Carbonate	$\text{HCO}_3^{-1}$
Hypochlorite	$\text{ClO}^{-1}$
Chlorite	$\text{ClO}_2^{-1}$
Chlorate	$\text{ClO}_3^{-1}$
Perchlorate	$\text{ClO}_4^{-1}$
Hypoiodite	$\text{IO}^{-1}$
Iodite	$\text{IO}_2^{-1}$
Iodate	$\text{IO}_3^{-1}$
Periodate	$\text{IO}_4^{-1}$
Hypobromite	$\text{BrO}^{-1}$
Bromite	$\text{BrO}_2^{-1}$
Bromate	$\text{BrO}_3^{-1}$
Perbromate	$\text{BrO}_4^{-1}$
Acetate	$\text{C}_2\text{H}_3\text{O}_2^{-1}$
Permanganate	$\text{MnO}_4^{-1}$
Dichromate	$\text{Cr}_2\text{O}_7^{-2}$
Chromate	$\text{CrO}_4^{-2}$
Oxalate	$\text{C}_2\text{O}_4^{-2}$

**Significant Figures:** Be able to determine how many significant figures a number has.

Rules:

1. Non-zero digits and zeros between non-zero digits are always significant.
2. Leading zeros are not significant.
3. Zeros to the right of all non-zero digits are only significant if a decimal point is shown.
4. For values written in scientific notation, the digits in the coefficient are significant.

**Dimensional Analysis:** Remember, units must cancel top to bottom diagonally!

Example 1: What is  $7.86 \times 10^{-2}$  kL in mL?

\*\*Must know metric conversions (King Henry Died By Drinking Chocolate Milk)

Example 2: If you are going 50 miles per hour, how many feet per second are you traveling?

$$\frac{1 \text{ mile}}{5280 \text{ ft}} \cdot \frac{5280 \text{ ft}}{1 \text{ mile}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} \cdot \frac{1 \text{ min}}{60 \text{ sec}} \cdot \frac{60 \text{ sec}}{1 \text{ min}}$$
  
$$\frac{50 \text{ miles}}{1 \text{ hour}} \cdot \frac{5280 \text{ ft}}{1 \text{ mile}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} \cdot \frac{1 \text{ min}}{60 \text{ sec}} = 73.3 \frac{\text{ft}}{\text{sec}}$$

Example 3: Calculate the mass, in grams of 0.370 moles of boron.

Example 4: What is the volume of 0.960 mol CH<sub>4</sub>?

Example 5: How many atoms are in 1.14 moles of sulfur?

\*\*Formula units are used for ions and ionic compounds.

\*\*Atoms will be used for elements (Na, Al)

\*\*Molecules will be used for covalent compounds (CO<sub>2</sub>).

Example 6: How many moles are in  $1.25 \times 10^{23}$  molecules of SO<sub>3</sub>?

Example 7: How many grams are in  $8.97 \times 10^{22}$  molecules of SiCl<sub>4</sub>?

Practice Problems:

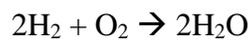
1. Convert 56 mg to grams.
2. Convert 124 miles to cm (1 mile = 5280 ft) (1 inch = 2.54 cm)
3. Calculate the mass, in grams, of 2.00 mol of  $\text{CaCl}_2$ .
4. Calculate the number of moles of 67.2 L of  $\text{SO}_2$ .
5. How many moles are in  $2.17 \times 10^{23}$  atoms of barium?
6. How many formula units are in 5.7 moles of  $\text{Na}^+$ ?

7. Calculate the number of atoms in 4.58 grams of CO<sub>2</sub>.

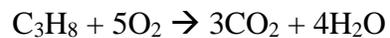
8. Convert 25.6 L of MgBr<sub>2</sub> to grams.

**Stoichiometry:**

Example 1: How many moles of water will be produced if 19.4 moles of O<sub>2</sub> react?

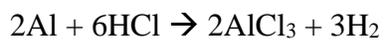


Example 2: How many liters of O<sub>2</sub> gas are required to produce 140 grams of water?



Practice Problems:

1. How many moles of HCl are required to produce 78.4 moles of AlCl<sub>3</sub>?



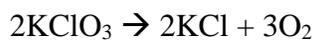
2. How many grams of H<sub>2</sub> are produced when 7.0 moles of Zn react?



3. How many grams of CaCl<sub>2</sub> are produced if 84.7 grams of KCl react?



4. How many molecules of oxygen are produced by the decomposition of 6.54 grams of KClO<sub>3</sub>?



## Naming & Formula Writing:

Ionic Compounds: metal and a nonmetal/cation and anion/positive charge with a negative charge

--To write formulas: Criss-cross charges to make compound neutral

\*Roman numeral will give you the charge on a transition metal

--To name: If binary (2 elements)→ make sure it ends in -ide

If it contains a polyatomic ion (refer to chart in packet), do not change ending

+1						+4				-1 0					
IA		+2				+3	-4	-3	-2	VIIA	VIIIA				
1	H	2	He					5	6	7	8	9	10		
3	Li	4	Be					B	C	N	O	F	Ne		
11	Na	12	Mg					13	14	15	16	17	18		
								Al	Si	P	S	Cl	Ar		
19	K	20	Ca	21	Sc	22	Ti	29	30	31	32	33	34	35	36
								Cu	Zn	Ga	Ge	As	Se	Br	Kr
37	Rb	38	Sr	39	Y	40	Zr	47	48	49	50	51	52	53	54
								Ag	Cd	In	Sn	Sb	Te	I	Xe
55	Cs	56	Ba	57	La	72	Hf	79	80	81	82	83	84	85	86
								Au	Hg	Tl	Pb	Bi	Po	At	Rn
87	Fr	88	Ra	89	Ac	104	Rf	111	112		114		116		118

Examples:

Write formulas for these:

- Mg and O
- Li and S
- Cu<sup>+2</sup> and Cl
- Sodium and sulfate
- Iron (III) and nitrate

Name these:

- a.  $\text{CaCO}_3$
- b.  $\text{K}_3\text{N}$
- c.  $\text{CoF}_3$
- d.  $\text{Be}_3(\text{PO}_4)_2$

Covalent Compounds: two nonmetals/two anions/two negative charges

\*\*Use prefixes to name and write formulas; ends in -ide

\*Exception: Don't put mono- on first element

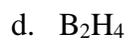
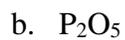
#	Prefix	#	Prefix
1	Mono	6	Hexa
2	Di	7	Hepta
3	Tri	8	Octa
4	Tetra	9	Nona
5	Penta	10	Deca

Examples:

- a.  $\text{CO}_2$
- b.  $\text{SiF}_4$
- c.  $\text{N}_3\text{P}_5$
- d. Carbon monoxide
- e. Dihydrogen monoxide
- f. Carbon tetrachloride

Mixed Practice: Ionic and Covalent mixed together!

Name these:



Write formulas for these:

a. Dinitrogen trioxide

b. Lithium acetate

c. Zinc (II) sulfide

d. Aluminum hydroxide

e. Silicon tetrafluoride

## Answers to practice problems:

### Dimensional Analysis:

1. 0.056 grams
2.  $2.00 \times 10^7$  cm
3. 222g
4. 3.00 mol
5. 0.360 mol
6.  $3.4 \times 10^{24}$  formula units
7.  $1.88 \times 10^{23}$  atoms
8. 210. g

### Stoichiometry:

1. 235 mol HCl
2. 14 g H<sub>2</sub>
3. 63.0 g CaCl<sub>2</sub>
4.  $4.82 \times 10^{22}$  molecules O<sub>2</sub>

### Naming and Formula Writing:

1. Naming
  - a. Sodium carbonate
  - b. Diphosphorus pentoxide
  - c. Iron (II) sulfate
  - d. Diboron tetrahydride
  - e. Magnesium phosphide
2. Formulas
  - a. N<sub>2</sub>O<sub>3</sub>
  - b. LiC<sub>2</sub>H<sub>3</sub>O<sub>2</sub>
  - c. ZnS
  - d. Al(OH)<sub>3</sub>
  - e. SiF<sub>4</sub>

## Periodic Table of the Elements

1 H 1.008																	2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57-71*	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (210)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89-103‡	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 Ds (271)	Numbers in parentheses are atomic mass numbers of radioactive isotopes.							

*lanthanide series	57 La 138.9	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
‡actinide series	89 Ac (227)	90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)