Welcome to AP Chemistry!

High School West Summer Assignment 2018

The enclosed summer assignment provides a review of the Introduction to Chemistry, including topics such as significant digits, density, dimensional analysis and subatomic particles. Additionally, the assignment includes a few charts that need to be memorized. These charts contain information that were part of the Chemistry Reference tables in Honors Chemistry. As an AP Chemistry student you must now commit this information to memory as the charts will not be provided throughout the year. Diligent and comprehensive completion of this assignment will provide a solid foundation for *SUCCESS* in AP Chemistry.

Part I: Chapters 1 and 2

Read chapters 1 and 2 in the textbook. Work through the following exercises using the sample problems in the text as a guide. The answers to these problems are attached to help you monitor your progress. ***Make note of any questions that need clarification and bring these questions to class on the first day of school.***

Chapter 1: pg. 33-39

1, 2, 14, 16, 22, 23, 26, 28, 30, 32, 36, 38, 40, 42, 48, 52, 56, 75, 77, 86

**Practice your dimensional analysis skills. We will be utilizing dimensional analysis throughout the year.

Chapter 2: pg. 73-79

#1, 4, 12, 26, 28, 30, 36, 42, 46, 50, 62, 66, 72, 74, 76, 78, 80, 101, 109

After a brief review, there will be a test on Chapters 1 and 2 and the Summer Packet during the second week of school.

Part II: Important Charts/Information

The information contained in the attached charts will be used throughout AP Chemistry course. It is imperative to have the information set to memory. After memorizing the information, complete the problems on the attached pages to help review the information on the charts. The solutions to these questions are also included so that you can check your responses.

NOTE: You ***do not*** need to memorize the Periodic Table. It is included as a resource. This is the Periodic Table provided by College Board and will be used in AP Chemistry. You should have a working knowledge of the symbols and names of the elements listed.

There will be a QUIZ on the 2nd day of class covering element symbols, polyatomic ions, charges of ions and the solubility rules.

Start developing effective study habits and self-discipline now. A conscientious and diligent work ethic will be essential for success in AP Chemistry.

Have a wonderful summer!

DO NOT DETACH FROM BOOK.

PERIODIC TABLE OF THE ELEMENTS

1 H 1.008																	2 He 4.00
3 Li 6.94	4 Be 9.01											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 24.30											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	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 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.75	52 Te 127.60	53 I 126.91	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57 *La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.21	76 Os 190.2	77 Ir 192.2	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.02	89 †Ac 227.03	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (277)	109 Mt (268)	110 Ds (271)	111 Rg (272)							

*Lanthanide Series	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 151.97	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
†Actinide Series	90 Th 232.04	91 Pa 231.04	92 U 238.03	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 (262)

GO ON TO THE NEXT PAGE.

Simple Rules for Solubility of Salts in Water

1. Salts containing **nitrate** (NO_3^-), acetate ($C_2H_3O_2^-$) and **chlorate** (ClO_3^-) are **soluble**.

2. Salts containing **alkali metals** (Li^+, Na^+, K^+, Cs^+, Rb^+) and the ammonium ion (NH_4^+) are **soluble**.

3. Most salts containing **halides** (Cl^-, Br^-, I^-) are **soluble**.
   Notable exceptions are salts containing the ions Ag^+, Pb^{2+}, Hg_2^{2+}.

4. Most **sulfate** (SO_4^{2-}) salts are **soluble**. *Notable exceptions* contain Ba^{2+}, Sr^{2+}, Pb^{2+}. [Sulfate salts containing Ag^+ and Ca^{2+} are slightly soluble.]

5. Most **hydroxide** salts are **insoluble** *except* for when containing metals of Group 1, NH_4^+, and Ba^{2+} [$Ca(OH)_2$ is slightly soluble]

6. Most **sulfides** (S^{2-}), **carbonates** (CO_3^{2-}), **chromates** (CrO_4^{2-}) and **phosphates** (PO_4^{3-}) are **insoluble** *except* for salts containing metals of Group 1 and NH_4^+.

NOTE: **Insoluble** compounds are considered **precipitates** (See question 8 on attached problems).

Common Polyatomic Ions

Hg_2^{2+}	Mercury (I)	SCN^-	thiocyanate
NH_4^+	ammonium	CO_3^{2-}	carbonate
NO_2^-	nitrite	HCO_3^-	hydrogen carbonate
NO_3^-	nitrate	ClO^-	hypochlorite
SO_3^{2-}	sulfite	ClO_2^-	chlorite
SO_4^{2-}	sulfate	ClO_3^-	chlorate
HSO_4^-	hydrogen sulfate	ClO_4^-	perchlorate
OH^-	hydroxide	$C_2H_3O_2^-$	acetate
CN^-	cyanide	MnO_4^-	permanganate
PO_4^{3-}	phosphate	$Cr_2O_7^{2-}$	dichromate
HPO_4^{2-}	hydrogen phosphate	CrO_4^{2-}	chromate
$H_2PO_4^-$	dihydrogen phosphate	$C_2O_4^{2-}$	oxalate

Element Names and Symbols of Common Elements

Al	Aluminum
Sb	Antimony
Ar	Argon
As	Arsenic
Ba	Barium
Be	Beryllium
B	Boron
Br	Bromine
Cd	Cadmium
Ca	Calcium
C	carbon
Cs	Cesium
Cl	Chlorine
Cr	Chromium
Co	Cobalt
Cu	Copper
F	Fluorine
Fr	Francium
Ge	Germanium

Au	Gold
He	Helium
H	Hydrogen
I	Iodine
Fe	Iron
Kr	Kr
Pb	Lead
Li	Lithium
Mg	magnesium
Mn	Manganese
Hg	Mercury
Ne	Neon
Ni	Nickel
N	Nitrogen
O	Oxygen
Pd	Palladium
P	Phosphorous
Pt	Platinum
Pu	Plutonium

K	Potassium
Ra	Radium
Rn	Radon
Rb	Rubidium
Se	Selenium
Si	Silicon
Ag	Silver
Na	Sodium
Sr	Strontium
S	Sulfur
Te	Tellurium
Th	Thorium
Sn	Tin
W	Tungsten
U	Uranium
Xe	Xenon
Zn	zinc

Common Monatomic Ions

1A	2A	3B	4B	5B	6B	7B	8B			1B	2B	3A	4A	5A	6A	7A	8A
H^+																	
Li^+														N^{3-}	O^{2-}	F^-	
Na^+	Mg^{2+}											Al^{3+}		P^{3-}	S^{2-}	Cl^-	
K^+	Ca^{2+}	Sc^{3+}	Ti^{2+} Ti^{4+}	V^{2+} V^{3+}	Cr^{2+} Cr^{3+}	Mn^{2+} Mn^{4+}	Fe^{2+} Fe^{3+}	Co^{2+} Co^{3+}	Ni^+	Cu^+ Cu^{2+}	Zn^{2+}				Se^{2-}	Br^-	
Rb^+	Sr^{2+}									Ag^+	Cd^{2+}		Sn^{2+}			I^-	
Cs^+	Ba^{2+}									Au^+ Au^{3+}			Pb^{2+}				

PRACTICE PROBLEMS:

Utilize the information from the charts on the previous pages to answer the following questions. Nomenclature and Formula Writing is reviewed in Chapter 2 of the textbook.

1) Name the following binary molecular compounds.

   a. PCl_5 _____

   b. SiO_2 _____

   c. PBr_3 _____

   d. N_2S_5 _____

2) Write the formulas for the following binary compounds of nonmetals

   a. Carbon dioxide _____

   b. Dichlorine monoxide _____

   c. Sulfur trioxide _____

   d. Disulfur decafluoride _____

3) Name the following binary ionic compounds. **Remember: Metals with more than one possible oxidation state require a **roman numeral**.

   a. KI _____

   b. SnI_4 _____

   c. $SrCl_2$ _____

   d. CuBr _____

   e. Al_2O_3 _____

   f. AgBr _____

   g. Fe_2S_3 _____

   h. PbS _____

4) Write the formula for the following binary ionic compounds.

   a. Iron (II) chloride _____

   b. Sodium oxide _____

   c. Bismuth chloride _____

   d. Calcium sulfide _____

   e. Tin (IV) oxide _____

   f. Gold (III) oxide _____

   g. Magnesium nitride _____

   h. Manganese (II) chloride _____

5) Name the following ternary (or higher) ionic compounds. **Remember: Metals with more than one possible oxidation state require a roman numeral. Then predict the solubility.

	Name	Solubility
a. $CuOH$		
b. $KMnO_4$		
c. $SrSO_4$		
d. $FeCO_3$		
e. K_2CO_3		
f. $NaClO$		
g. $CaCrO_4$		

6) Write the chemical formula for the following ternary ionic compounds.

a. Silver phosphate _____

b. Zinc hydrogen carbonate _____

c. Copper (I) sulfite _____

d. Aluminum sulfate _____

e. Cadmium iodate _____

f. Copper (II) perchlorate _____

g. Mercury (II) chlorate _____

h. Calcium hypochlorite _____

7) Write the formula or name for each of the following acids.

a. HBr (aq) _____

b. $HClO_4$ (aq) _____

c. HIO_3 (aq) _____

d. Nitric acid _____

e. Sulfuous acid _____

f. Hydrosulfuric acid _____

8) Complete and balance the following double replacement reactions.
Indicate any precipitate (insoluble product) formed by placing (s) next to the formula.

a. $Ca(OH)_2$ (aq) + $HC_2H_3O_2$ (aq) →

b. $Bi(NO_3)_3$ (aq) + $NaOH$ (aq) →

c. $Pb(C_2H_3O_2)_2$ (aq) + K_2SO_4 (aq) →

d. $CaCO_3$ (aq) + HCl (aq) →

Key

PRACTICE PROBLEMS:

Utilize the information from the charts on the previous pages to answer the following questions. Nomenclature and Formula Writing is reviewed in Chapter 2 of the textbook.

1) Name the following binary molecular compounds.

a. PCl_5 phosphorus pentachloride

b. SiO_2 silicon dioxide

c. PBr_3 phosphorus tribromide

d. N_2S_5 dinitrogen pentasulfide

2) Write the formulas for the following binary compounds of nonmetals

a. Carbon dioxide CO_2

b. Dichlorine monoxide Cl_2O

c. Sulfur trioxide SO_3

d. Disulfur decafluoride S_2F_{10}

3) Name the following binary ionic compounds. **Remember: Metals with more than one possible oxidation state require a **roman numeral**.

a. KI potassium iodide

b. SnI_4 tin (IV) iodide

c. $SrCl_2$ strontium chloride

d. CuBr copper (I) bromide

e. Al_2O_3 aluminum oxide

f. AgBr silver bromide

g. Fe_2S_3 iron (III) sulfide

h. PbS lead (II) sulfide

4) Write the formula for the following binary ionic compounds.

a. Iron (II) chloride $FeCl_2$

b. Sodium oxide Na_2O

c. Bismuth chloride $BiCl_3$

d. Calcium sulfide CaS

e. Tin (IV) oxide SnO_2

f. Gold (III) oxide Au_2O_3

g. Magnesium nitride Mg_3N_2

h. Manganese (II) chloride $MnCl_2$

5) Name the following ternary (or higher) ionic compounds. **Remember: Metals with more than one possible oxidation state require a roman numeral. Then predict the solubility.

	Name	Solubility
a. CuOH	copper (I) hydroxide	insoluble
b. $KMnO_4$	potassium permanganate	soluble
c. $SrSO_4$	strontium sulfate	insoluble
d. $FeCO_3$	iron (II) carbonate	insoluble
e. K_2CO_3	potassium carbonate	soluble
f. NaClO	sodium hypochlorite	soluble
g. $CaCrO_4$	calcium chromate	insoluble

6) Write the chemical formula for the following ternary ionic compounds.

a. Silver phosphate Ag_3PO_4

b. Zinc hydrogen carbonate $Zn(HCO_3)_2$

c. Copper (I) sulfite Cu_2SO_3

d. Aluminum sulfate $Al_2(SO_4)_3$

e. Cadmium iodate $Cd(IO_3)_2$

f. Copper (II) perchlorate $Cu(ClO_4)_2$

g. Mercury (II) chlorate $Hg(ClO_3)_2$

h. Calcium hypochlorite $Ca(ClO)_2$

7) Write the formula or name for each of the following acids.

a. HBr (aq) hydrobromic acid

b. $HClO_4$ (aq) perchloric acid

c. HIO_3 (aq) iodic acid

d. Nitric acid HNO_3

e. Sulfuous acid H_2SO_3

f. Hydrosulfuric acid H_2S

8) Complete and balance the following double replacement reactions. Indicate any precipitate (insoluble product) formed by placing (s) next to the formula.

a. $Ca(OH)_2$ (aq) + $2HC_2H_3O_2$ (aq) → $Ca(C_2H_3O_2)_2$ (aq) + $2H_2O$

b. $Bi(NO_3)_3$ (aq) + $3NaOH$ (aq) → $Bi(OH)_3$ (s) + $3NaNO_3$ (aq)

c. $Pb(C_2H_3O_2)_2$ (aq) + K_2SO_4 (aq) → $PbSO_4$ (s) + $2KC_2H_3O_2$ (aq)

d. $CaCO_3$ (aq) + $2HCl$ (aq) → H_2CO_3 (aq) + $CaCl_2$ (aq)

Chapter 1 pg 33-39

1) (a) pure element = one type of matter (i)
(b) mixture of two elements = two types of atoms not bonded (v) + (vi)

(c) pure compound = one type of particle containing two or more bonded types of atoms (iv)
(d) mixture of an element + compound = (ii) + (iii)

●● = diatomic element

2) The depicted diagram represents a chemical change since new products are formed. This is indicated by the fact that the atoms rearrange.

14) a) homogeneous mixture
b) heterogeneous mixture
c) pure substance
d) heterogeneous mixture

16)

a) carbon	C		f) P	phosphorus
b) nitrogen	N		g) Ca	calcium
c) titanium	Ti		h) He	helium
d) zinc	Zn		i) Pb	lead
e) iron	Fe		j) Ag	silver

22) Physical changes vs. Chemical changes
(b) The metal gets warmer (a) The match burns.
(c) Water condenses on the metal
(d) soot is deposited.

Note: Creating H_2O + soot are chemical changes.

23) a) Add water to dissolve the sugar. Then filter to collect the sand in the filter paper and the sugar solution in the flask. Evaporate the water to recover the sugar.

b) Allow mixture to settle forming two layers. Carefully pour off the oil layer.

26)

a)	.23 nL	e)	15.7 kg
b)	4.7 μg	f)	1.34 mm
c)	1.85 pm	g)	1.84 m
d)	16.7 Ms		

} See last page for set up if needed

26) a) $°C = \frac{5}{9}(81°F - 32) = 31.°C$

b) $K = °C + 273 = 25° + 273 = 298K$
$°F = \frac{9}{5}(°C) + 32 = \frac{9}{5}(25°C) + 32 = 77°F$

c) $°C = (\frac{5}{9})(400°F - 32) = 204°C$
$K = 204°C + 273 = 477\,K$

d) $°C = K - 273 \quad °C = 77K - 273 = -196°C$
$°F = \frac{9}{5}(°C) + 32 = \frac{9}{5}(-196°C) + 32 = -320.8°F$

30) a) $D = \frac{m}{V} \quad D = \frac{m}{l \times w \times h} \quad D = \frac{76.31g}{(1.500cm)^3} = \frac{22.61037}{22.61\,g/cm^3}$

b) $D = \frac{m}{V} \quad m = D \cdot V \quad mL = 125.0mL\left(\frac{4.51g}{1mL}\right) = 563.75$
$\boxed{564g}$

* note $1mL = 1cm^3$

c) $D = \frac{m}{V}$ $m = D \cdot V$ $V = 0.1500\,L$

$$0.1500\,\cancel{L}\left(\frac{1000\,m\cancel{L}}{1\,\cancel{L}}\right)\left(\frac{0.8787\,g}{1\,m\cancel{L}}\right) = 131.805$$

$\boxed{131.8\,g}$

32) a) $D = \frac{m}{V}$ $D = \frac{21.95\,g}{25.0\,mL} = 0.878\,g/mL$

The calculated density is in agreement with the chemistry handbook within 1 of the last digit.

b) $15.0\,g\left(\frac{1.0\,mL}{0.7781\,g}\right) = 19.277727\,mL \Rightarrow \boxed{19.3\,mL}$

(c) $V = (4/3)\pi r^3$ $V = (4/3)\pi\left(\frac{5}{2}cm\right)^3$

$\frac{\text{diameter}}{2} = r$

$D = m/V$ $m = D \cdot V$

$$m = \left(\frac{11.34\,g}{cm^3}\right)\left(4/3\,\pi\left(\frac{5}{2}cm\right)^3\right)$$

$m = 742.20126441$

$\boxed{740\,g}$

36) Exact #s are not measured values

ex. (b) # of students in chemistry class

(e) # of mL in m^3

38) a) 3.774 km 4 s.f. d) 350.00 K 5 s.f.

b) 205 m^2 3 s.f. e) 307.080 g 6 s.f.

c) 1.700 cm 4 s.f. f) 1.3×10^3 m/s 2 s.f.

40) a) 7926.381 mi 7.93×10^3 mi b) 40,008 Km 4.001×10^4 Km

42) (a) $320.5 - (6104.5/2.3)$

$320.5 - 2650 = \boxed{-2330} \rightarrow -2.3 \times 10^3$

(b) $[(285.3 \times 10^5) - (.01200 \times 10^5)] \times 2.8954$

$(285.3 \times 10^5) - (.01200 \times 10^5)] \times 2.8954$

$[285.288 \times 10^5] \times 2.8954 = 826.022875 \times 10^5$

$\boxed{8.260 \times 10^7}$

(c) $(0.0045 \times 20{,}000.0) + (2813 \times 12)$

$90. + 33756 = \boxed{33{,}846} \rightarrow$

3.4×10^4

d) $863 \times [1255 - (3.45 \times 108)]$

$863 \times [1255 - 372.6]$

863×882.4

761511.2 $\boxed{7.62 \times 10^5}$

48) (a) $2.998 \times 10^8 \frac{\cancel{m}}{\cancel{s}}\left(\frac{60\,\cancel{s}}{1\,\cancel{min}}\right)\left(\frac{60\,\cancel{min}}{1\,hr}\right)\left(\frac{1\,\cancel{Km}}{10^3\,\cancel{m}}\right)\left(\frac{1\,mi}{1.6093\,\cancel{Km}}\right) = 6.7065 \times 10^8$

$\boxed{6.707 \times 10^8\ mi/hr}$

(b) $1454\,\cancel{ft}\left(\frac{12\,\cancel{in}}{1\,\cancel{ft}}\right)\left(\frac{2.54\,\cancel{cm}}{1\,\cancel{in}}\right)\left(\frac{1\,m}{100\,\cancel{cm}}\right) = 443.1792$

$\boxed{443.2\,m}$

(c) $3{,}666{,}500\,\cancel{m^3}\left(\frac{10^6\,\cancel{cm^3}}{1\,\cancel{m^3}}\right)\left(\frac{1\,\cancel{mL}}{1\,\cancel{cm^3}}\right)\left(\frac{1\,L}{10^3\,\cancel{mL}}\right) = 3666500000$

$\boxed{3.665 \times 10^9 L}$

d) $5.2\ L\left(\frac{10^3\ mL}{1\ L}\right)\left(\frac{242\ mg}{100\ mL}\right)\left(\frac{1\ g}{10^3\ mg}\right) = 12.584 = \boxed{13g}$

5

a) $0.105\ in\left(\frac{2.54\ cm}{1\ in}\right)\left(\frac{10\ mm}{1\ cm}\right) = 2.667 = \boxed{2.67\ mm}$

b) $0.650\ qt\left(\frac{0.946\ L}{1\ qt}\right)\left(\frac{10^3\ mL}{1\ L}\right) = 614.94\ mL = \boxed{615\ mL}$

c) $8.75\ \frac{\mu m}{s}\left(\frac{1\ m}{10^6\ \mu m}\right)\left(\frac{1\ Km}{10^3\ m}\right)\left(\frac{60\ s}{1\ min}\right)\left(\frac{60\ min}{1\ hr}\right) =$

$\boxed{3.15\times10^{-5}\ Km/hr}$

d) $1.455\ m^3\left(\frac{(1.0936)^3\ yd^3}{1\ m^3}\right) = 2.551695 = \boxed{2.557\ yd^3}$

e) $\frac{\$3.99}{lb}\left(\frac{1\ lb}{453.6g}\right)\left(\frac{10^3 g}{1\ Kg}\right) = 8.796296$ $\boxed{\$8.80/Kg}$

f) $8.75\ \frac{lb}{ft^3}\left(\frac{453.6g}{1\ lb}\right)\left(\frac{1\ ft^3}{1728\ in^3}\right)\left(\frac{1\ in^3}{16.387\ cm^3}\right)\left(\frac{1\ cm^3}{1mL}\right) = \boxed{0.140\ \frac{g}{mL}}$

56) $[CO] = 48\ \mu g/m^3$

apartment: $10.6\ ft \times 14.8\ ft \times 20.5\ f$

$3220\ ft^3\left(\frac{(1\ yd)^3}{(3\ ft)^3}\right)\left(\frac{1\ m^3}{(1.0936\ yd)^3}\right)\left(\frac{48\ \mu g}{1\ m}\right.$

$\boxed{4.4\times10^{-3}\ g\ CO}$

75) The mass of the water will not change change in temperature. However, since of a sample can change w/ a chan temperature the density will chan

@ 25°C

$1.50\ L\ H_2O\left(\frac{10^3\ cm^3}{1\ L}\right)\left(\frac{0.997g\ H_2O}{1\ cm^3}\right)$

@ -10°C

$1.4955\times10^3 g\left(\frac{1\ cm^3}{0.917g}\right)\left(\frac{1\ mL}{1\ cm^3}\right)\left(\frac{1\ L}{10^3 m}\right.$

* The bottle is filled w/ 1.50L and cannot 1.63L of ice. The bottle will crack as the expands.

77) $r = 28.9\ cm$ $\quad D = 19.3\ g/cm^3$

$V = 4/3\ \pi r^3$

$(4/3)\,\pi(28.9\ cm)^3 = 1.0111\times10^5\ cm^3\left(19.3\frac{g}{cr}\right.$

$4302 = 4.3\times10^3$ lbs

*The student cannot carry the sphere.