

## AP Chemistry Summer Assignment

The summer assignment for AP Chemistry is 2 parts and is quite simple (but not easy).

**Part 1-** You are expected to review the following. This is first year chemistry basics and we will not cover it although you will be expected to know it. (*no quiz on part 1*)

- Unit conversions
- Temperature Scales
- Significant figures
- Classification of Matter- Elements compounds and mixtures.
- Intensive vs. Extensive Properties

**Part 2-** You need to master the formulas, charges, and names of the common ions. You also need to memorize rules for predicting solubility and memorize the strong acids and bases. *On the first day of the school year, you will be given a quiz on these ions and solubility rules.* You will be asked to:

- write the names of these ions when given the formula and charge
- write the formula and charge when given the names
- Predict solubility of certain compounds

I have included a list of strong acids, bases, solubility rules and common ions. Also included is a copy of the periodic table used in AP Chemistry. Notice that this *is not* the table used in first year chemistry. The AP table is the same that the College Board allows you to use on the AP Chemistry test. Notice that it has the symbols of the elements but *not* the written names. You need to take that fact into consideration when studying for the afore-mentioned quiz!

Doubtless, there will be some students who will procrastinate and try to do all of this studying just before the start of school. Those students may even cram well enough to do well on the initial quiz. However, they will quickly forget the ions, and struggle every time that these formulas are used in lecture, homework, quizzes, tests and labs. All research on human memory shows us that frequent, short periods of study, spread over long periods of time will produce much greater retention than long periods of study of a short period of time.

Use every modality possible as you try to learn these – speak them, write them, visualize them. I look forward to seeing you all at the beginning of the next school year. If you need to contact me during the summer, you can call, email me and I will get back to you quickly. Most of you know that I have a website, <https://sites.google.com/site/jmbmcintosh/>, and there are some review activities in the AP Chemistry section that will give you an idea whether you have adequately mastered the summer assignment.

Best of luck to you all,

Mr. McIntosh

Email: [jdmc410@gmail.com](mailto:jdmc410@gmail.com)

Please note that I rarely check my work email ([jmcintos@wcboc.org](mailto:jmcintos@wcboc.org)) during the summer.

## Common Ions and Their Charges

A mastery of the common ions, their formulas and their charges, is essential to success in AP Chemistry. You are expected to know all of these ions on the first day of class, when I will give you a quiz on them. You will always be allowed a periodic table, which makes indentifying the ions on the left "automatic." For tips on learning these ions, see the opposite side of this page.

<b>From the table:</b>	
<b>Cations</b>	<b>Name</b>
H <sup>+</sup>	Hydrogen
Li <sup>+</sup>	Lithium
Na <sup>+</sup>	Sodium
K <sup>+</sup>	Potassium
Rb <sup>+</sup>	Rubidium
Cs <sup>+</sup>	Cesium
Be <sup>2+</sup>	Beryllium
Mg <sup>2+</sup>	Magnesium
Ca <sup>2+</sup>	Calcium
Ba <sup>2+</sup>	Barium
Sr <sup>2+</sup>	Strontium
Al <sup>3+</sup>	Aluminum
<b>Anions</b>	<b>Name</b>
H <sup>-</sup>	Hydride
F <sup>-</sup>	Fluoride
Cl <sup>-</sup>	Chloride
Br <sup>-</sup>	Bromide
I <sup>-</sup>	Iodide
O <sup>2-</sup>	Oxide
S <sup>2-</sup>	Sulfide
Se <sup>2-</sup>	Selenide
N <sup>3-</sup>	Nitride
P <sup>3-</sup>	Phosphide
As <sup>3-</sup>	Arsenide
<b>Type II Cations</b>	<b>Name</b>
Fe <sup>3+</sup>	Iron(III)
Fe <sup>2+</sup>	Iron(II)
Cu <sup>2+</sup>	Copper(II)
Cu <sup>+</sup>	Copper(I)
Co <sup>3+</sup>	Cobalt(III)
Co <sup>2+</sup>	Cobalt(II)
Sn <sup>4+</sup>	Tin(IV)
Sn <sup>2+</sup>	Tin(II)
Pb <sup>4+</sup>	Lead(IV)
Pb <sup>2+</sup>	Lead(II)
Hg <sup>2+</sup>	Mercury(II)

<b>Ions to Memorize</b>	
<b>Cations</b>	<b>Name</b>
Ag <sup>+</sup>	Silver
Zn <sup>2+</sup>	Zinc
Hg <sub>2</sub> <sup>2+</sup>	Mercury(I)
NH <sub>4</sub> <sup>+</sup>	Ammonium
<b>Anions</b>	<b>Name</b>
NO <sub>2</sub> <sup>-</sup>	Nitrite
NO <sub>3</sub> <sup>-</sup>	Nitrate
SO <sub>3</sub> <sup>2-</sup>	Sulfite
SO <sub>4</sub> <sup>2-</sup>	Sulfate
HSO <sub>4</sub> <sup>-</sup>	Hydrogen sulfate (bisulfate)
OH <sup>-</sup>	Hydroxide
CN <sup>-</sup>	Cyanide
PO <sub>4</sub> <sup>3-</sup>	Phosphate
HPO <sub>4</sub> <sup>2-</sup>	Hydrogen phosphate
H <sub>2</sub> PO <sub>4</sub> <sup>-</sup>	Dihydrogen phosphate
NCS <sup>-</sup>	Thiocyanate
CO <sub>3</sub> <sup>2-</sup>	Carbonate
HCO <sub>3</sub> <sup>-</sup>	Hydrogen carbonate (bicarbonate)
ClO <sup>-</sup>	Hypochlorite
ClO <sub>2</sub> <sup>-</sup>	Chlorite
ClO <sub>3</sub> <sup>-</sup>	Chlorate
ClO <sub>4</sub> <sup>-</sup>	Perchlorate
BrO <sup>-</sup>	Hypobromite
BrO <sub>2</sub> <sup>-</sup>	Bromite
BrO <sub>3</sub> <sup>-</sup>	Bromate
BrO <sub>4</sub> <sup>-</sup>	Perbromate
IO <sup>-</sup>	Hypoiodite
IO <sub>2</sub> <sup>-</sup>	iodite
IO <sub>3</sub> <sup>-</sup>	iodate
IO <sub>4</sub> <sup>-</sup>	Periodate
C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> <sup>-</sup>	Acetate
MnO <sub>4</sub> <sup>-</sup>	Permanganate
Cr <sub>2</sub> O <sub>7</sub> <sup>2-</sup>	Dichromate
CrO <sub>4</sub> <sup>2-</sup>	Chromate
O <sub>2</sub> <sup>2-</sup>	Peroxide
C <sub>2</sub> O <sub>4</sub> <sup>2-</sup>	Oxalate
NH <sub>2</sub> <sup>-</sup>	Amide
BO <sub>3</sub> <sup>3-</sup>	Borate
S <sub>2</sub> O <sub>3</sub> <sup>2-</sup>	Thiosulfate

## Table of Strong acids and bases.

<b>Strong Acids</b>	<b>Strong Bases</b>
Hydrochloric (HCl)	The strong bases are the soluble salts of hydroxide ion: Alkali metals (NaOH, KOH, LiOH etc...) Calcium Strontium Barium
Hydrobromic (HBr)	
Hydroiodic (HI)	
Nitric (HNO <sub>3</sub> )	
Sulfuric (H <sub>2</sub> SO <sub>4</sub> )	
Chloric (HClO <sub>3</sub> )	
Perchloric (HClO <sub>4</sub> )	

## SOLUBILITY GUIDELINES

<b>Soluble Ionic Compounds</b>	<b>Important Exceptions</b>
Compounds containing NO <sub>3</sub> <sup>-</sup>	None
C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> <sup>-</sup>	None
Cl <sup>-</sup>	Compounds of Ag <sup>+</sup> , Hg <sub>2</sub> <sup>2+</sup> , and Pb <sup>2+</sup>
Br <sup>-</sup>	Compounds of Ag <sup>+</sup> , Hg <sub>2</sub> <sup>2+</sup> , and Pb <sup>2+</sup>
I <sup>-</sup>	Compounds of Ag <sup>+</sup> , Hg <sub>2</sub> <sup>2+</sup> , and Pb <sup>2+</sup>
SO <sub>4</sub> <sup>2-</sup>	Compounds of Sr <sup>2+</sup> , Ba <sup>2+</sup> , Hg <sub>2</sub> <sup>2+</sup> , and Pb <sup>2+</sup>
<b>Insoluble Ionic Compounds</b>	<b>Important Exceptions</b>
Compounds containing S <sup>2-</sup>	Compounds of NH <sub>4</sub> <sup>+</sup> , the alkali metal cations, and Ca <sup>2+</sup> , Sr <sup>2+</sup> , and Ba <sup>2+</sup>
CO <sub>3</sub> <sup>2-</sup>	Compounds of NH <sub>4</sub> <sup>+</sup> and the alkali metal cations
PO <sub>4</sub> <sup>3-</sup>	Compounds of NH <sub>4</sub> <sup>+</sup> and the alkali metal cations
OH <sup>-</sup>	Compounds of the alkali metal cations, and NH <sub>4</sub> <sup>+</sup> , Ca <sup>2+</sup> , Sr <sup>2+</sup> , and Ba <sup>2+</sup>

INFORMATION IN THE TABLE BELOW AND IN THE TABLES ON PAGES 3-5 MAY BE USEFUL IN ANSWERING THE QUESTIONS IN THIS SECTION OF THE EXAMINATION.

DO NOT DETACH FROM BOOK.

## PERIODIC TABLE OF THE ELEMENTS

1 <b>H</b> 1.008																	2 <b>He</b> 4.00	
3	4															9	10	
<b>Li</b> 6.94	<b>Be</b> 9.01															<b>F</b> 19.00	<b>Ne</b> 20.18	
11	12															17	18	
<b>Na</b> 22.99	<b>Mg</b> 24.30															<b>Cl</b> 35.45	<b>Ar</b> 39.95	
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
<b>K</b> 39.10	<b>Ca</b> 40.08	<b>Sc</b> 44.96	<b>Ti</b> 47.90	<b>V</b> 50.94	<b>Cr</b> 52.00	<b>Mn</b> 54.94	<b>Fe</b> 55.85	<b>Co</b> 58.93	<b>Ni</b> 58.69	<b>Cu</b> 63.55	<b>Zn</b> 65.39	<b>Ga</b> 69.72	<b>Ge</b> 72.59	<b>As</b> 74.92	<b>Se</b> 78.96	<b>Br</b> 79.90	<b>Kr</b> 83.80	
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
<b>Rb</b> 85.47	<b>Sr</b> 87.62	<b>Y</b> 88.91	<b>Zr</b> 91.22	<b>Nb</b> 92.91	<b>Mo</b> 95.94	<b>Tc</b> (98)	<b>Ru</b> 101.1	<b>Rh</b> 102.91	<b>Pd</b> 106.42	<b>Ag</b> 107.87	<b>Cd</b> 112.41	<b>In</b> 114.82	<b>Sn</b> 118.71	<b>Sb</b> 121.75	<b>Te</b> 127.60	<b>I</b> 126.91	<b>Xe</b> 131.29	
55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	
<b>Cs</b> 132.91	<b>Ba</b> 137.33	<b>*La</b> 138.91	<b>Hf</b> 178.49	<b>Ta</b> 180.95	<b>W</b> 183.85	<b>Re</b> 186.21	<b>Os</b> 190.2	<b>Ir</b> 192.2	<b>Pt</b> 195.08	<b>Au</b> 196.97	<b>Hg</b> 200.59	<b>Tl</b> 204.38	<b>Pb</b> 207.2	<b>Bi</b> 208.98	<b>Po</b> (209)	<b>At</b> (210)	<b>Rn</b> (222)	
87	88	89	104	105	106	107	108	109	110	111								
<b>Fr</b> (223)	<b>Ra</b> 226.02	<b>†Ac</b> 227.03	<b>Rf</b> (261)	<b>Db</b> (262)	<b>Sg</b> (266)	<b>Bh</b> (264)	<b>Hs</b> (277)	<b>Mt</b> (268)	<b>Ds</b> (271)	<b>Rg</b> (272)								
											66	67	68	69	70	71		
											<b>Dy</b> 162.50	<b>Ho</b> 164.93	<b>Er</b> 167.26	<b>Tm</b> 168.93	<b>Yb</b> 173.04	<b>Lu</b> 174.97		
											98	99	100	101	102	103		
											<b>Cf</b> (251)	<b>Es</b> (252)	<b>Fm</b> (257)	<b>Md</b> (258)	<b>No</b> (259)	<b>Lr</b> (262)		

\*Lanthanide Series

†Actinide Series