

AP Chemistry Summer Assignment Summer of 2022 (SY 2022-2023)

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First off, let me be very clear about the purpose of the AP Chemistry Summer Assignment. It is to make as sure as possible that you are prepared for Chemistry II Honors/AP Chemistry next year as fully as I can manage. Most of you know that by general principle, I dislike making you do a ton of work outside of class. It pains me even more to do this during the summer, but past experience teaching this class has taught me the error of not doing so. So the three-fold purpose is to:

- Make sure that you walk in on day 1 with everything you are expected to know *coming into* the class securely in your brain!
- Make sure you are interested/want/need the class enough to put in a lot of effort even outside of the classroom. If this relatively small amount of work (maybe 2 hours a week tops) is too much, you probably should reconsider taking the class altogether.
- Broaden your thinking about Chemistry and learning in general a bit. While I would love for all of you to make 5s on the AP test, that isn't really our goal. Our goal is that you learn a lot of Chemistry, and despite it's difficult nature, maybe even come to enjoy it!

You might need a refresher on topics, if so, head to my YouTube channel at <https://www.youtube.com/channel/UCCiV0aywNQKfYXpgiCZPQug>

- If you can't find a video for what you are looking for, shoot me an email and I'll point you in the right direction.
- I will help in August of course, have no fear of that, but as students preparing for what is probably the hardest class of high school, you must do your best to learn what you can before we begin.

This work is all due the first day of class in August. Late work will not be accepted and incomplete work will be marked down. This will be the first assignment of the year in each of the two classes, counting for 100 points. I take this seriously and so should you.

If you are not signed up to learn Chemistry, and learn it at the college level, then you should probably speak to your guidance counselor about other course options. In this work, as in most work this year, you should be much more concerned with actually knowing, learning, and being able to apply these concepts and calculations than you are with getting the points for them. The grades will come if you know the material and can use it well.

Some of you are students who will look at places like the AP student sites for information about the class. I encourage that on a frequent basis. This will cause some of you to note that we are doing some things that are no longer technically on

the new AP Chemistry exam, like memorizing solubility rules, ions, and a few other things. This is true, and again, I'm not always the biggest fan of memorizing things, except when I believe solid knowledge of something enhances your critical thinking ability about problems related to it. Such is the case here. Additionally, many of you all will go on to further classes in Chemistry at the college level where you will be expected to have learned these things in first year Chemistry. I'm preparing you for that as well.

Should you have major issues at any point and have made a good faith effort to do the problems and activities on your own, please feel free to email me during the summer, I will more than likely reply within a day or two. Once you are done you can upload your work to this [GDrive folder](#). *Do not tamper with or look at anyone else's work. I take academic integrity very seriously and I am one of the sponsors of the L&N Chapter of NHS.*

DO NOT attempt to cram all of this in the last week or the last night before classes start in August. I built this assignment intentionally so that you could work a couple hours a week steadily. I understand that vacations, camps, and just general summer relaxation occurs and I want you to do that as well. But be steady and intentional about your progress through the summer. When you have completed it and uploaded your work, email me and I will send you the key so that you can check your work (it must be uploaded first!).

Additionally, please make sure your parents have read through this with you. They need to know what you are getting into as much as you do!

Credit for the work has been collated from various sources and I'd like to thank Ms. Sayers and Mr. Lin in particular for their contributions.

Summer Assignment

Part 1

Read **at least** 4 chapters out of one of the following books. Write a short summary of the work itself, as well as your impressions/insights gained after your reading. (4-5 paragraphs). You will be in groups discussing this at the beginning of the year, so you might want to find a buddy reading the same thing.

The following list offers students **suggested** texts to offer deeper insights into Chemistry topics. Hopefully, you will find the summer readings enjoyable as well as thought provoking. Many of these texts are not found on the pre-approved list for Knox County. **Please take care to preview texts by utilizing book reviews. While no student will be penalized for reading/not reading a certain text is your responsibility to make informed decisions about your reading/viewing. *If you would like to choose another book, that is acceptable if you ensure that it is tied into Chemistry issues, but have it approved by me first.***

Parental note: please understand that while these books are non-fiction, they may contain some topics that are controversial to some, such as discussion of the effects of illicit drugs. These are suggested titles due to chemistry themes, students are invited to research with their parents to find alternates with similar Chemistry connections that are acceptable for your family.

A good source for reviews are the website of www.Amazon.com, www.barnesandnoble.com.

- *Stuff Matters* by Mark Niodownik
- *Molecules at an Exhibition* by John Emsley
- *Napoleon's Buttons* by Penny Le Couteur & Jay Burreson
- *Creations of Fire* by Cathy Cobb & Harold Goldwhite
- *Making of the Atomic Bomb* by Richard Rhodes
- *The Poisoner's Handbook* by Deborah Blum
- *The Alchemy of Air* by Thomas Hager
- *Rust: The Longest War* by Jonathan Waldman

Any of these books are easily found on Amazon and probably at some local booksellers and libraries as well. If you are really having problems finding or acquiring them, let me know and I will try to find some way to loan out my copy.

Part 2

Work the following Chemistry I type problems. A good pace of 8-12 problems a week should get you done on time with minimal stress.

These are on the attached sheet(s) at the end of this form.

Part 3

Memorize the ions, solubility rules, and strong acids/bases on the following pages. There will be quizzes throughout the year on these, you are expected to know them at any point. The solubility rules will be used in predicting products type problems. If you use online quizlets and such for these (which is great) then be sure it includes the things I have listed. If you make one, share it!

Part 4

Write a paragraph (or more) on each of the following topics (diagrams and artwork with labels are acceptable as well):

- How to determine both polarity and molecular geometry for covalent compounds. Include at least 2 diagrams as examples.
- How to determine the intermolecular forces a compound is subject to
- Groups and areas of the periodic table (diagram here obviously)
- Historical development of atomic model, including quantum model

PART 2 Problems (Working 8-12 or so a week will get you finished appropriately)

1. Write the formula for the following compounds

- Phosphorus pentabromide
- Mercury (I) bicarbonate
- Mercurous bisulfite
- Sodium acetate
- Zinc sulfite
- Silver sulfide
- Potassium iodide

2. Write the name of the following compounds:

- SiF_4
 - Sb_2O_5
 - LiH
 - KOH
 - K_2O
 - H_2SO_3
 - SF_6
3. Write the electron configuration (long way) for sodium.
4. Write the orbital notation (boxes) for fluorine.
5. Write the electron configuration using the Noble Gas core method for gold.

6. Write a balanced equation and indicate the reaction type (single or double replacement, decomposition, or composition/synthesis) for each of the following:
- Ammonium nitrite (s) → nitrogen (g) + water (l)
 - Ammonia (g) + oxygen (g) → nitrogen (II) oxide (g) + water (l)
 - Barium chloride (aq) + sodium sulfate (aq) → sodium chloride (aq) + barium sulfate (s)
 - Iron (III) oxide (s) + carbon monoxide (g) → iron (s) + carbon dioxide (g)
 - Magnesium hydroxide (aq) + ammonium phosphate (aq) → magnesium phosphate (s) + ammonia (g) + water (l)
 - Magnesium hydroxide (aq) + phosphoric acid (aq) → magnesium phosphate (s) + water (l)
7. Calcium dihydrogen phosphate is an important fertilizer. What is the percent phosphorus in $\text{Ca}(\text{H}_2\text{PO}_4)_2$?
8. How much boron can be obtained from 10.00 grams of diboron trioxide? How much magnesium?
9. The sugar substitute sodium benzosulfimide (sodium saccharin) has a sweetness of about 500 times that of regular sugar. Calculate the percentage of sodium and carbon in the sweetener if its formula is $\text{C}_7\text{H}_4\text{O}_3\text{SNNa}$.
10. SnO_2 is reduced by carbon according to this reaction: $\text{SnO}_2 + \text{C} \rightarrow \text{Sn} + \text{CO}_2$.
- How many liters of CO_2 are produced if 300.0 grams of tin are produced at STP?
 - How many grams of SnO_2 are required to produce 1800.0 grams of tin?
 - How much tin is produced per 100.0 grams of carbon used?
11. If 50.0 dm^3 of methane, CH_4 , react with 10.0 dm^3 of air, calculate the grams of water produced.
- $$\text{CH}_4 (\text{g}) + 2 \text{O}_2 (\text{g}) \rightarrow \text{CO}_2 (\text{g}) + 2 \text{H}_2\text{O} (\text{l})$$
12. Determine the number of moles of solute needed to prepare these solutions:
- 2.35 L of a 2.00 M $\text{Cu}(\text{NO}_3)_2$ solution.
 - 16.00 mL of a 0.415 M $\text{Pb}(\text{NO}_3)_2$ solution.
 - 3.00 L of a 0.500 M MgCO_3 solution.
13. White lead contains 80.1% lead, 16.5% oxygen, 3.10% carbon, and 0.260% hydrogen. What is the formula of this compound?
14. Express the following numbers with the indicated number of significant figures.
- 1000 (2 sig figs)
 - 43,927 (3 sig figs)
 - 0.000286 (3 sig figs)
15. Make the following conversions:
- 2.77 kg to mg
 - 2.90 cm to millimeters
 - 45.6 liters to kiloliters
 - 1.08 kg to cg
16. Calculate the number of cubic centimeters (cm^3) in 16 cubic meters (m^3).
17. 28.5 grams of iron shot is added to a graduated cylinder containing 45.5 mL of water. The water level rises to the 49.1 mL mark. From this information, calculate the density of iron.
18. Write the formula for the following compounds:

- | | |
|------------------------|------------------------|
| a. Sodium phosphate | j. Aluminum acetate |
| b. Silver hypochlorite | k. Barium chromate |
| c. Ammonium phosphate | l. Cobaltic chloride |
| d. Ferrous chlorite | m. Sulfurous acid |
| e. Potassium sulfide | n. Potassium hydroxide |
| f. Tin (IV) bromide | o. Zinc bisulfite |
| g. Lithium chromate | p. Sodium sulfite |
| h. Magnesium bisulfate | q. Cobaltous sulfate |
| i. Ferrous phosphate | |

19. Write the names of the following compounds:

- | | |
|---------------------------------|---------------------------------|
| a. FePO_4 | f. N_2O |
| b. Hg_2SO_4 | g. $\text{Fe}(\text{NO}_3)_2$ |
| c. KH | h. $\text{Sn}_3(\text{PO}_4)_2$ |
| d. $\text{Co}_2(\text{SO}_3)_3$ | i. H_2O_2 |
| e. N_2O_3 | j. $\text{Be}(\text{OH})_2$ |

20. Write the electron configuration (long way) for yttrium.

21. Write the orbital notation (boxes) for zinc.

22. Write the electron configuration using the Noble Gas core method for mendelevium.

23. Write a balanced equation for the following double and single replacement reactions:

- Sulfuric acid (aq) + potassium hydroxide (aq)
- Mercury (II) sulfate (aq) + ammonium nitrate (aq)
- Iron (s) + copper (II) sulfate (aq)
- Zinc (s) + sulfuric acid (aq)

24. $6 \text{NaOH} + 2 \text{Al} \rightarrow 2 \text{Na}_3\text{AlO}_3 + 3 \text{H}_2$

- How much aluminum is required to produce 17.5 grams of hydrogen?
- How many moles of NaOH are required to produce 3.0 grams of hydrogen?
- How many moles of hydrogen can be prepared from 1.0 grams of aluminum?

25. A rigid container holds a gas at a pressure of 0.55 atm at -100°C . What will the pressure be when the temperature is increased to 200°C ?

26. What weight (in grams) of NaCl would be contained in 100.0 mL of a 0.20 M NaCl solution?

27. What weight in grams of H_2SO_4 would be needed to make 750.0 mL of a 2.00 M solution?

28. Calculate the empirical formulas for a compound containing 77% Fe and 22.3 % O.

29. Metals _____ electrons. (Gain or lose)

30. Nonmetals _____ electrons. (Gain or lose)

31. How many cm^3 are there in $4.261 \times 10^4 \text{ dm}^3$?

32. A rubber balloon weighing 144.85 grams is filed with carbon dioxide gas and reweighed. The weight of the balloon plus gas is 153.77 grams. The volume of the balloon filled with carbon dioxide is 4.55 L. What is the density of carbon dioxide?

33. Calculate the density of sulfuric acid if 35.4 mL of the acid weighs 65.14 grams.

34. Write the formulas for the following compounds:

- | | |
|-------------------------|-------------------------|
| a. sodium nitrite | j. ammonium hydroxide |
| b. silver oxide | k. cobalt (II) iodide |
| c. nickel (II) bromide | l. sodium hydroxide |
| d. magnesium oxide | m. silver nitrate |
| e. mercuric perchlorate | n. mercury (II) nitrate |
| f. lithium hypochlorite | o. hydrochloric acid |
| g. oxygen difluoride | |
| h. acetic acid | |
| i. barium hypobromite | |

35. Write the name of the following compounds:

- | | |
|--------------|--------------|
| a. N_2O_5 | f. CuS |
| b. $SnCrO_4$ | g. MgI_2 |
| c. Al_2O_3 | h. $CoCl_3$ |
| d. $CuCO_3$ | i. NaCN |
| e. ClO_2 | j. Hg_3N_2 |

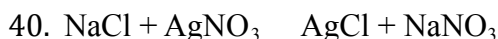
36. Write the electron configuration (long way) for francium.

37. Write the orbital notation (boxes) for cadmium.

38. Write the electron configuration using the Noble Gas core method for lead.

39. Write a balanced equation for the following double replacement reactions:

- cobalt (III) hydroxide (aq) + nitric acid (aq)
- bromine (l) + sodium iodide (aq)
- sodium hydroxide (aq) + phosphoric acid (aq)
- ammonium sulfate (aq) + calcium hydroxide (aq)



If you have 78.00 grams of NaCl, how many grams of AgCl should be produced?

41. If 20.0 dm³ of methane, CH₄, react with 20.0 dm³ of air at STP, calculate the dm³ of carbon dioxide gas produced.



42. A mass of air occupies a volume of 5.7 L at a pressure of 0.52 atm. What is the new pressure if the same mass of air at the same temperature is transferred to a 2.0 L container?

43. What weight in grams of KCl is there in 2.50 L of a 0.50 M KCl solution?

44. What is the molarity of a solution containing 12.0 grams of NaOH in 250.0 mL of solution?

45. Round off the following to three significant figures.

- 4.76200
- 0.0299817

c. 506789.2

46. Make the following conversions:

a. 3.44×10^{-6} cm to hm

d. 458 cg to mg

b. 10.00 kg to mg

c. 0.6321 kg to g

47. How many dm^3 are there in 6.245101 cm^3 ?

48. Calculate the number of L in $8,062.95 \text{ cm}^3$.

49. What is the weight of ethyl alcohol that exactly fills a 200.0 mL container? The density of ethyl alcohol is 0.789 g/mL.

50. Calculate the density of helium in g/L if a balloon with a capacity of 5.00 L holds 0.890 grams.

51. Write the formulas for the following compounds:

a. aluminum hydroxide

k. iron (II) chromate

b. cobaltous oxide

l. ferric bromide

c. ferric permanganate

m. zinc sulfate

d. ammonium chromate

n. boron phosphide

e. nitrogen triiodide

o. ferric carbonate

f. ammonium dichromate

p. cupric bisulfate

g. iron (III) bicarbonate

q. ammonia

h. ammonium perchlorate

r. barium bisulfite

i. cobaltic acetate

s. nitric acid

j. cobalt (II) hydroxide

52. Write the name of the following compounds:

a. NaOH

b. NI_3

c. ClF_3

d. P_3H_5

e. UF_6

f. NBr_3

g. Cl_2O_3

53. Perform the indicated operations and round off your answers to the proper number of significant figures. Assume that all numbers were obtained from measurements.

a. $8.649 - 2.8964$

b. 0.06936×0.384

c. $4567/2.53$

54. Make the following conversions:

a. .002023 mg to kg

c. 0.00031 grams to dg

b. 89.00 grams to cg

d. 62,000 mg to dkg

55. A book is found to have a mass of 0.6321 kg. Calculate its mass in grams and its density if its volume is 12 cm^3 .

56. Calculate the number of dm^3 in 1000 cm^3 .

57. Sugar is used to fill a box that has a volume of 200 cm^3 . The sugar weighs 316 grams. What is the density of sugar? (Ignore the space between the sugar crystals.)

58. Mercury metal is poured into a graduated cylinder that holds exactly 22.5 mL. The mercury used to fill the cylinder weighs 306.0 grams. From this information, calculate the density of the mercury.

59. Write the names for the following compounds:

- | | |
|--------------------------|---------------------------------------|
| a. KHCO_3 | m. As_4O_6 |
| b. SbCl_5 | n. BN |
| c. CO_2 | o. CoS |
| d. HgO | p. N_2O_4 |
| e. PCl_3 | q. H_3BO_3 |
| f. PBr_5 | r. I_2O_5 |
| g. IF_7 | s. PbO |
| h. Cl_2O | t. NaBr |
| i. CCl_4 | u. $\text{Li}_2\text{Cr}_2\text{O}_4$ |
| j. NO | v. SO_3 |
| k. XeF_4 | |
| l. CaH_2 | |

60. Write the formulas for the following:

- | | |
|-------------------------|------------------------|
| a. Calcium sulfide | k. Aluminum oxide |
| b. Copper (I) bisulfate | l. Cobaltous bisulfate |
| c. Zinc permanganate | m. Barium carbonate |
| d. Ferric carbonate | n. Mercuric chloride |
| e. Hydrobromic acid | o. Ferrous chromate |
| f. Hydrocyanic acid | p. Cupric hydroxide |
| g. Hydrogen cyanide | q. Perchloric acid |
| h. Sulfuric acid | r. Ferric phosphate |
| i. Copper (I) sulfate | s. Lead (II) oxide |
| j. Chromium (III) oxide | t. Cobaltic chlorate |

61. Write the orbital notation (boxes) for chlorine.

62. Write the electron configuration using the Noble Gas core method for cesium.

63. Write a balanced equation and indicate the reaction type (single or double replacement, decomposition, or composition/synthesis) for each of the following:

- Iron (III) bromide (aq) + ammonium sulfide (aq) → iron (III) sulfide (s) + ammonium bromide (aq)
- Calcium oxide (s) + diphosphorus pentoxide (s) → calcium phosphate (s)
- Magnesium chloride (aq) + silver nitrate (aq) → magnesium nitrate (aq) + silver chloride (s)

- d. Sodium carbonate (aq) + sulfuric acid (aq) → sodium sulfate (aq) + carbon dioxide (g) + water (l)
- e. Iron (II) sulfide (s) + hydrochloric acid (aq) → iron (II) chloride (aq) + hydrogen sulfide (g)

64. The sugar substitute sodium benzenesulfonate (sodium saccharin) has a sweetness of about 500 times that of regular sugar. Calculate the percentage of sodium and carbon in the sweetener if its formula is $C_7H_4O_3SNa$.

65. SnO_2 is reduced by carbon according to this reaction: $SnO_2 + C \rightarrow Sn + CO_2$.

- d. How many liters of CO_2 are produced if 300.0 grams of tin are produced at STP?
- e. How many grams of SnO_2 are required to produce 1800.0 grams of tin?
- f. How much tin is produced per 100.0 grams of carbon used?

66. If 50.0 dm³ of methane, CH_4 , react with 10.0 dm³ of air, calculate the grams of water produced.



67. Determine the number of moles of solute needed to prepare these solutions:

- d. 2.35 L of a 2.00 M $Cu(NO_3)_2$ solution.
- e. 16.00 mL of a 0.415 M $Pb(NO_3)_2$ solution.
- f. 3.00 L of a 0.500 M $MgCO_3$ solution.

68. White lead contains 80.1% lead, 16.5% oxygen, 3.10% carbon, and 0.260% hydrogen. What is the formula of this compound?

69. The helium gas stored inside a large weather balloon weighs 13.558 grams. What is the volume of this balloon if the density of helium is 0.1786 g/L?

70. A rectangular block of copper metal weighs 1896 grams. The dimensions of the block are 8.4 cm by 5.5 cm by 4.6 cm. From this data, what is the density of copper?

71. Write the formula for the following compounds:

- | | |
|---------------------------|----------------------------|
| a. ammonium sulfide | l. silver cyanide |
| b. sodium nitrate | m. ammonium sulfite |
| c. cupric bromide | n. zinc sulfate |
| d. aluminum sulfate | o. tin (II) chloride |
| e. potassium nitrate | p. antimony (III) chloride |
| f. ferrous carbonate | q. silver sulfide |
| g. lead (II) phosphate | r. magnesium hydroxide |
| h. diphosphorus pentoxide | s. ammonium carbonate |
| i. cupric hydroxide | t. nickel (II) acetate |
| j. calcium fluoride | |
| k. nickel (II) nitrate | |

72. Write the name of the following compounds:

- | | |
|-----------------|---------------|
| a. KF | |
| b. $CaSO_4$ | g. NH_4NO_3 |
| c. HCl | h. IF_5 |
| d. $SbCl_3$ | i. $NaHCO_3$ |
| e. As_4O_{10} | j. $Ba(OH)_2$ |
| f. NH_4Cl | |

73. Write the electron configuration (long way) for sulfur.

74. Write the orbital notation (boxes) for magnesium.
75. Write the electron configuration using the Noble Gas core method for radium.
76. Write a balanced equation and indicate the reaction type (single or double replacement, decomposition, or composition/synthesis) for each of the following:
- Sodium hydroxide (aq) + sulfuric acid (aq) → sodium sulfate (aq) + water (l)
 - Magnesium (s) + oxygen (g) → magnesium oxide (s)
 - Ammonium phosphate (aq) + barium hydroxide (aq)
77. Calculate the percentage composition of the following compounds:
- Ferric oxide
 - Silver oxide
78. $4 \text{FeCr}_2\text{O}_7 + 8 \text{K}_2\text{CO}_3 + \text{O}_2 \rightarrow 2 \text{Fe}_2\text{O}_3 + 8 \text{K}_2\text{CrO}_4 + 8 \text{CO}_2$
- How many grams of iron (II) dichromate are required to produce 44.0 grams of carbon dioxide?
 - How many grams of oxygen gas are required to produce 100.0 grams of ferric oxide?
 - If 300.0 grams of iron (II) dichromate react, how many grams of oxygen gas will be consumed?
 - How many grams of iron (III) oxide will be produced from 300.0 grams of ferrous dichromate?
79. What is the volume of a sample of oxygen gas that has a mass of 50.0 grams and is under a pressure of 1.20 atm at 27.0°C?
80. What is the molarity of 245.0 grams of H_2SO_4 dissolved in 1.00 L of solution?
81. What is the molarity of 5.30 grams of Na_2CO_3 dissolved in 400.0 mL solution?
82. Calculate the empirical formula of a compound which has the following percentage composition: 40.2 % K, 26.9% Cr, and 32.9% O.
83. In what order are the elements listed on the PRESENT periodic table?
84. What name is given to the elements in a vertical column on the periodic table?
85. What name is given to the elements in a horizontal row on the periodic table?

PART 3- Memorization

Polyatomics

NH_4^+	ammonium	H_2PO_4^-	dihydrogen phosphate
NO_2^-	nitrite	CO_3^{2-}	carbonate
NO_3^-	nitrate	SO_3^{2-}	sulfite
OH^-	hydroxide	SO_4^{2-}	sulfate
CN^-	cyanide	$\text{S}_2\text{O}_3^{2-}$	thiosulfate
MnO_4^-	permanganate	O_2^{2-}	peroxide
HCO_3^-	hydrogen carbonate (bicarbonate)	CrO_4^{2-}	chromate
ClO^-	hypochlorite	$\text{Cr}_2\text{O}_7^{2-}$	dichromate
ClO_2^-	chlorite	HPO_4^{2-}	hydrogen phosphate
ClO_3^-	chlorate	PO_4^{3-}	phosphate
ClO_4^-	perchlorate	AsO_4^{3-}	arsenate
BrO_3^-	bromate	HSO_4^-	hydrogen sulfate
IO_3^-	iodate	$\text{C}_2\text{O}_4^{2-}$	oxalate
IO_4^-	periodate	$\text{C}_6\text{H}_5\text{O}_7^{3-}$	citrate
$\text{C}_2\text{H}_3\text{O}_2^-$	acetate		

Monatomics

Cesium	Cs^+	
Gold		Au^+
Silver		Ag^+
Copper (I)		
Cuprous	Cu^+	
Copper (II)		
Cupric	Cu^{2+}	
Cobalt (II)		
Cobaltous	Co^{2+}	
Cobalt (III)		
Cobaltic	Co^{3+}	
Chromium (II)		
Chromous	Cr^{2+}	
Chromium (III)		
Chromic	Cr^{3+}	
Iron (II)		
Ferrous	Fe^{2+}	
Iron (III)		
Ferric	Fe^{3+}	
Tin (II)		
Stannous	Sn^{2+}	
Tin (IV)		
Stannic	Sn^{4+}	

Lead (II)

 Plumbous Pb^{2+}

Lead (IV)

 Plumbic Pb^{4+}

Manganese (II) Mn^{2+}

Manganese (IV) Mn^{4+}

Zinc Zn^{2+}

Nickel (II) Ni^{2+}

Nickel (III) Ni^{3+}

Strong Acids

HCl- hydrochloric acid

HNO_3 - nitric acid

HClO_4 - perchloric acid

H_2SO_4 - sulfuric acid

HI- hydroiodic acid

HBr- hydrobromic acid

HClO_3 - chloric acid

Strong Bases

LiOH-

NaOH

KOH

RbOH

CsOH

Ca(OH) ₂		
Sr(OH) ₂		
Ba(OH) ₂		
Mercury (I)		
Mercurous		Hg ₂ ²⁺
Mercury (II)		
Mercuric		Hg ²⁺

Solubility Rules

Solubility is of course a lot more complicated than this, once we cover equilibrium, you will know K_{sp} values that make all of this a bit more clear.

1. All compounds of Group 1 (IA) elements (alkali metals) are soluble.
2. All ammonium (NH₄) salts are soluble.
3. All nitrate (NO₃⁻), chlorate (ClO₃⁻), perchlorate (ClO₄⁻), and acetate (CH₃COO⁻) salts are soluble
4. All chloride (Cl⁻), bromide (Br⁻) and iodide (I⁻) salts are soluble EXCEPT for those of Ag⁺, Pb²⁺, and Hg₂²⁺
5. All sulfate (SO₄²⁻) compounds are soluble EXCEPT Hg²⁺, Ca²⁺, and Ag⁺, which are only moderately soluble.
6. All hydroxide (OH⁻) compounds are insoluble except those of alkali metals and Ba²⁺, Ca²⁺, and Sr²⁺
7. All sulfide (S²⁻) compounds are insoluble except those of alkali and alkali earth metals
8. All sulfites (SO₃²⁻), carbonates (CO₃²⁻), chromates (CrO₄²⁻), and phosphates (PO₄³⁻) are insoluble except those of NH₄⁺ and alkali metals

A quick and easy way that many use to remember some of this this is NaClNOSO...google this online to see flash card sets for this!