

## AP CHEMISTRY SUMMER ASSIGNMENT (2026-2027) and First Day Test Material

*Please Note: This assignment is a requirement and is NOT for extra credit!*

I'm excited that you are thinking about taking AP Chemistry with me and I am so happy that I have an opportunity to teach you! AP Chemistry is a difficult course that requires dedication and a fair amount of work. **Advanced Placement Chemistry is a college level course and is meant to be a second-year course for students who were highly successful in 1<sup>st</sup> year Chemistry, who enjoy science, and who have completed Algebra II. You will need to be dedicated and work very hard if you are to be successful.**

It is not all about memorization. AP Chemistry includes a lot of problem-solving and deep conceptual understanding; however, having the following items memorized is essential for success in learning the concepts covered in the course. Make flashcards, have your friends and family quiz you, take the lists with you on vacation, or do whatever it takes to get this information firmly planted in your head. Do not wait until the night before school begins.

### AP CHEMISTRY FIRST DAY TEST

The first day test will cover six areas of memorization:

1. Polyatomic Ions (including name, symbol and charge)
2. Variable Valences for Transition Metals
3. Rules for Naming Acids
4. Rules for Naming Ionic Compounds
5. The Solubility Rules
6. Determining Oxidation Numbers

**A test on Chapters 1 & 2 from Zumdahl, Chemistry AP Edition, will be given** at the beginning of the second week of school. Topics will include:

- quantitative & qualitative observations
- sci notation w/ sig figs
- accuracy & precision
- uncertainty
- density
- metric conversion
- methods of separating mixtures
- definite & multiple proportions
- Early experiments
- nomenclature
- periodic table basics (including groups, periods, properties of metals & non metals)

## Polyatomic Ions

Name	Symbol
ammonium	$\text{NH}_4^+$
acetate	$\text{C}_2\text{H}_3\text{O}_2^-$
bromate	$\text{BrO}_3^-$
chlorate	$\text{ClO}_3^-$
chlorite	$\text{ClO}_2^-$
cyanide	$\text{CN}^-$
dihydrogen phosphate	$\text{H}_2\text{PO}_4^-$
hypochlorite	$\text{ClO}^-$
hydrogen carbonate (bicarbonate)	$\text{HCO}_3^-$
hydrogen sulfate (bisulfate)	$\text{HSO}_4^-$
hydrogen sulfite (bisulfite)	$\text{HSO}_3^-$
hydroxide	$\text{OH}^-$
iodate	$\text{IO}_3^-$
nitrate	$\text{NO}_3^-$
nitrite	$\text{NO}_2^-$
perchlorate	$\text{ClO}_4^-$
permanganate	$\text{MnO}_4^-$
thiocyanate	$\text{SCN}^-$
carbonate	$\text{CO}_3^{2-}$
chromate	$\text{CrO}_4^{2-}$
dichromate	$\text{Cr}_2\text{O}_7^{2-}$
oxalate	$\text{C}_2\text{O}_4^{2-}$
selenate	$\text{SeO}_4^{2-}$
silicate	$\text{SiO}_3^{2-}$
sulfate	$\text{SO}_4^{2-}$
sulfite	$\text{SO}_3^{2-}$
phosphate	$\text{PO}_4^{3-}$
phosphite	$\text{PO}_3^{3-}$

## Variable Valences for Transition Metals

Name	Symbol	Charge	Stock Name
chromium	Cr	+2	chromium (II)
		+3	chromium (III)
manganese	Mn	+2	manganese (II)
		+3	manganese (III)
iron	Fe	+2	iron (II)
		+3	iron (III)
cobalt	Co	+2	cobalt (II)
		+3	cobalt (III)
copper	Cu	+1	copper (I)
		+2	copper (II)
lead	Pb	+2	lead (II)
		+4	lead (IV)
mercury	Hg	+1	mercury (I)
		+2	mercury (II)
tin	Sn	+2	tin (II)
		+4	tin (IV)
gold	Au	+1	gold (I)
		+3	gold (III)
silver	Ag	+1	silver
		+2 (rarely)	silver (II)
bismuth	Bi	+3	bismuth (III)
		+5	bismuth (V)
antimony	Sb	+3	antimony (III)
		+5	antimony (V)
cadmium	Cd	+2	cadmium
zinc	Zn	+2	zinc

## Rules for Naming Ionic Compounds

1. Balance charges (charges should equal zero)
2. Cation is always written first (in name and in formula)
3. Change the ending to -ide for binary formulas

## Rules for Naming an Acid

1. When the name of the anion ends in -ide, the acid name begins with the prefix hydro-, the stem of the anion has the suffix -ic and is followed by the word acid.

-ide becomes hydro \_\_\_\_\_ ic acid

$\text{Cl}^-$  is the chloride ion, so...  $\text{HCl}$  = hydrochloric acid

2. When the anion name ends in -ite, the acid name is the stem of the anion with the suffix -ous, followed by the word acid.

-ite becomes \_\_\_\_\_ ous acid

$\text{ClO}_2^-$  is the chlorite ion so ...  $\text{HClO}_2$  = chlorous acid

3. When the anion name ends in -ate, the acid name is the stem of the anion with the suffix -ic, followed by the word acid.

-ate becomes \_\_\_\_\_ ic acid

$\text{ClO}_3^-$  is the chlorate ion so...  $\text{HClO}_3$  = chloric acid

## Rules for Determining Oxidation Number

**Oxidation Number:** A number assigned to an atom in a molecular compound or molecular ion that indicates the general distribution of electrons among the bonded atoms.

1. The oxidation number of any uncombined element is 0.
2. The oxidation number of a monatomic ion is equal to the charge of the ion.
3. The more electronegative element in a binary compound is assigned the number equal to the charge it would have if it were an ion.
4. The oxidation of fluorine in a compound is always -1.
5. Oxygen has an oxidation number of -2 unless it is combined with F, when it is +2, or it is in peroxide, when it is -1.
6. The oxidation number of hydrogen in most of its compounds is +1 unless it is combined with a metal, in which case it is -1.
7. In compounds, the elements of groups 1 and 2 as well as aluminum have oxidation numbers of +1, +2, and +3, respectively.
8. The sum of the oxidation numbers of all atoms in a neutral compound is 0.
9. The sum of the oxidation numbers of all atoms in a polyatomic ion equals the charge of the ion.

## Solubility Rules

1. All compounds containing alkali metal cations and the ammonium ion are soluble.
2. All compounds containing  $\text{NO}_3^-$ ,  $\text{ClO}_4^-$ ,  $\text{ClO}_3^-$  and  $\text{C}_2\text{H}_3\text{O}_2^-$  anions are soluble.
3. All chlorides, bromides, and iodides are soluble except those containing  $\text{Ag}^+$ ,  $\text{Pb}^{+2}$ , and  $\text{Hg}^{+2}$ .
4. All sulfates are soluble except those containing  $\text{Hg}_2^{+2}$ ,  $\text{Pb}^{+2}$ ,  $\text{Sr}^{+2}$ ,  $\text{Ca}^{+2}$ ,  $\text{Ba}^{+2}$ .
5. All hydroxides are insoluble except compounds of the alkali metals,  $\text{Ca}^{+2}$ ,  $\text{Sr}^{+2}$ , and  $\text{Ba}^{+2}$ .
6. All compounds containing  $\text{PO}_4^{-3}$ ,  $\text{S}^{-2}$ ,  $\text{CO}_3^{-2}$ , and  $\text{SO}_3^{-2}$  ions are insoluble except those that contain alkali metals or  $\text{NH}_4^+$ .

**You are expected to know and be proficient with the topics from Chemistry I Honors!**

## Practice Problems

### Naming Compounds

1.  $\text{OF}_2$
2.  $\text{Mg}_3\text{P}_2$
3.  $\text{MnCrO}_4$
4.  $\text{Cr}_3(\text{PO}_4)_2$
5.  $\text{H}_2\text{S}$
6.  $\text{SnO}$
7.  $\text{LiOH}$
8.  $\text{KClO}_2$
9.  $\text{Mg}(\text{NO}_3)_2$
10.  $\text{PbS}$
11.  $\text{H}_3\text{PO}_4$
12.  $\text{HNO}_3$
13.  $\text{SO}_2$
14.  $\text{HF}$
15.  $\text{N}_2\text{O}$
16.  $\text{NH}_4\text{Br}$
17.  $\text{H}_2\text{CO}_3$
18.  $\text{Mn}_2(\text{SO}_3)_3$
19.  $\text{HBrO}_4$
20.  $\text{AgNO}_3$
21.  $\text{GaI}_3$
22.  $\text{H}_2\text{ClO}_2$

### Writing Formulas

23. barium iodide
24. diphosphorus pentaiodide
25. hydrophosphoric acid
26. aluminum acetate
27. Sulfuric acid
28. lithium nitride
29. calcium hydroxide
30. acetic acid
31. iron(II) nitrite
32. carbon dioxide
33. dinitrogen monoxide
34. cesium chlorite
35. perchloric acid
36. Hydrochloric acid
37. iron(III) chlorate
38. chloric acid
39. cobalt(II) chloride
40. hydroiodic acid

## Writing Chemical Equations.

### Problems:

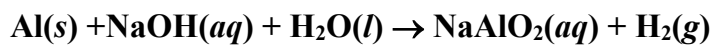
For each set of reactants listed below, identify the type of reaction, predict the products that will be formed, and then write correctly balanced molecular equations. Include states.

1. A piece of aluminum is added to a solution of silver nitrate.
2. Sodium hydroxide is added to a solution of magnesium nitrate.
3. A piece of nickel metal is immersed in a solution of copper (II) sulfate.
4. Liquid bromine is shaken with a sodium iodide solution.
5. Solutions of cobalt (II) nitrate and sodium hydroxide are mixed.
6. Aluminum metal is added to a solution of copper (II) chloride.
7. Manganese (II) nitrate and copper (II) chloride solutions are mixed.
8.  $C_2H_8$  is burned.
9. Sodium solid is mixed with chlorine gas
10. Hydrogen peroxide ( $H_2O_2$ ) decomposes when exposed to sunlight.
11. Write the equation for the dissolution of sodium phosphate (include states).
12. Write the net ionic equation for the reaction that occurs when solutions of lead(II) nitrate and ammonium sulfate are combined (include states).

## Dimensional Analysis - Mole Concept -Stoichiometry

1. The element xenon (what is its symbol?) has an atomic radius of 216 pm. How many meters is this?
2. A proton weighs  $1.6726 \times 10^{-24}$  g. How much does the proton weigh in picograms?

3. An electron weighs 1,837 times lighter than a proton. An electron weighs  $9.11 \times 10^{-31}$  kg. How much does an electron weigh in nanograms?
4. The triple bond between two nitrogen atoms in a nitrogen molecule is one of the strongest bonds known. It requires 941 kJ of energy to break one mole of these bonds. How much energy, in Joules (J), is this?
5. Calculate the molar mass of the following substances.
- NH<sub>3</sub>
  - N<sub>2</sub>H<sub>4</sub>
  - (NH<sub>4</sub>)<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>
6. How many moles of compound are present in 1.00 g of each of the compounds in the problem 5?
7. How many molecules (or formula units) are present in 1.00 g of each of the compounds in problem 5?
8. Aluminum chips are sometimes added to sodium hydroxide-based drain cleaners because they react to generate hydrogen gas which bubbles and helps loosen material in the drain. The unbalanced equation follows.



How many grams of H<sub>2</sub> can be generated from 2.35 g Al and 1.75 g NaOH in excess water?

9. How many grams of SnF<sub>2</sub> are produced from the reaction of 30.00 g HF with Sn?