Welcome to AP Chemistry!

Students enrolled in AP chemistry will be asked to reinforce skills and knowledge accumulated in the first year chemistry class (Honors Chemistry) during the summer before the beginning of the AP course. This will allow us to focus our attention on the advanced chemistry topics and 16 suggested labs that will be tested on the AP exam in May 2025.

Your summer assignment consists of the following:

1. **Review the objectives** taught in Chemistry Honors for the Atomic Structure & Periodicity, Stoichiometry and Chemical Reactions units. **A diagnostic exam to test your readiness for AP Chemistry will be given the second day the class meets.**

2. Review the Solubility Rules, Polyatomic Ions, Strong Acids and Bases, and General Rules for Completing Chemical Equations (all attached). All these will be tested in the diagnostic test.

3. **Lab preparation.** Go to the website below and read all the Glassware and Techniques. This is important as some questions on the AP test require knowledge of these. Your knowledge of these glassware and techniques will be also tested in the diagnostic test. https://www.michigan.gov/documents/deq/wrd-ot-lab-glassware_445272_7.ppt

4. Answer ALL questions on the assignment included in this document (pages 4 through 10) in the space provided. Assignment is **due on the first day of school.**

Please take the assignment seriously and start in early August—there's a lot to do and you won't be able to complete it all on the night before it's due.
If at any time you would like to ask me a question, please email me at agarciaminsal@dadeschools.net.
Have a great summer. I look forward to beginning our journey together in August.

Mrs. Minsal ☺

Polyatomic Ion Names

Must be memorized by the first day of school!

1+

ammonium, NH_4^+
hydronium, H_3O^+

1-

acetate, $C_2H_3O_2^-$, or CH_3COO^-
perchlorate, ClO_4^-
chlorate, ClO_3^-
chlorite, ClO_2^-
hypochlorite, ClO^-
cyanide, CN^-
hydrogen carbonate, HCO_3^- (also called bicarbonate)
hydrogen sulfate, HSO_4^- (also called bisulfate)
hydroxide, OH^-
nitrate, NO_3^-
nitrite, NO_2^-
permanganate, MnO_4^-
thiocyanate, SCN^-

2-

carbonate, CO_3^{2-}
chromate, CrO_4^{2-}
dichromate, $Cr_2O_7^{2-}$
oxalate, $C_2O_4^{2-}$
peroxide, O_2^{2-}
sulfate, SO_4^{2-}
sulfite, SO_3^{2-}
thiosulfate, $S_2O_3^{2-}$

3-

phosphate, PO_4^{3-}
phosphite, PO_3^{3-}
arsenate, AsO_4^{3-}

Strong Acids

HCl
HBr
HI
H_2SO_4
HNO_3
$HClO_4$
$HClO_3$

Strong Bases.

Group I hydroxides (LiOH, NaOH, KOH, etc)
$Ca(OH)_2$
$Sr(OH)_2$
$Ba(OH)_2$

Solubility Rules (P A G A N)

1. All compounds that contain a Group I element (alkali metal) are soluble.
2. All compounds that contain an Ammonium ion (NH_4^+) are soluble.
3. All compounds that contain a Nitrate ion (NO_3^-), Acetate ion ($C_2H_3O_2^-$), and Perchlorate ion (ClO_4^-) are soluble.
4. All other compounds are INSOLUBLE, unless otherwise noted.

Name: _____ Date: _____

AP Chemistry Ms. Minsal

Directions: Answer the following questions in the space provided.

1) Write the electron configuration for the following atoms/ions.

   a) Cl :

   b) Ti^{2+} :

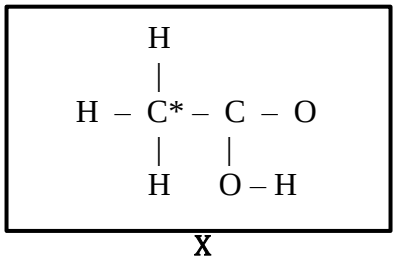
   c) Al :

   d) S^{2-} :

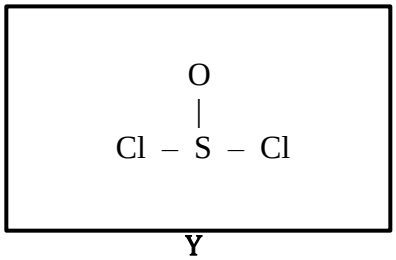
   e) Fe^{3+} :

2) Explain, in terms of atomic structure and forces of attraction, why the ionic radius of Al^{3+} ion is smaller than that of Al atom.

3) The incomplete Lewis structures of two molecules are given below. Complete the structures by entering bonds and/or lone pairs where necessary. Don't forget the Octet Rule.



X



Y

   a) Enter the shape and the bond angle around the C* : _____.

   b) Enter the molecular shape and the bond angle around the S atom in the $SOCl_2$ molecule: _____.

4) A 1.50 g sample of the acidic compound **X** (above) (MM: 60.052g/mol) was dissolved in enough water to make 25.00 mL of solution and then titrated with 0.150 M NaOH(aq). Calculate:

   a) The moles of the acid **X**.

   b) The molarity of the acid **X**.

c) The balanced equation for the reaction between compound **X** and NaOH is given below. Calculate the volume of NaOH required to react with the acid.

$$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$$

$$\_\_\_\_\_\ Fe(s) + \_\_\_\_\_\ O_2(g) \rightarrow \_\_\_\_\_\ Fe_2O_3(s)$$

5) Iron reacts with oxygen to produce iron(III) oxide, as represented by the equation above. A 60.0 g sample of Fe(s) is mixed with 20.0 L of $O_2(g)$ at 25.0°C and 1.02 atm.

a) Balance the equation.
b) Calculate the number of moles of each reactant before the reaction begins.

c) Calculate the number of moles of Fe_2O_3 (s) produced when the reaction proceeds to completion and identify the limiting reactant.

6) Answer the following questions about $MgSO_4$(s) and its hydrate.

When heated to 310.°C, $MgSO_4 \cdot X\ H_2O$ (s) dehydrates completely as represented below.

$$MgSO_4 \cdot X\ H_2O\ (s) \rightarrow MgSO_4\ (s) + X\ H_2O(g)$$

A student weighs an empty clean and dried crucible, adds some of the hydrate to the crucible and weighs the crucible again. Then the student heats up the crucible at 310.°C for 10 minutes, lets the crucible + residue cool down and weighs again. The student repeats this last step. The table below contains data collected by the student during the experiment.

Mass of empty crucible	6.849 g
Mass of crucible and $MgSO_4 \cdot X\ H_2O$	12.330 g
Mass of crucible and $MgSO_4$ after first heating	10.279 g
Mass of crucible and $MgSO_4$ after second heating	10.277 g

Calculate

a) The mass of $MgSO_4$ (s) formed.

b) The mass of water contained in the hydrate.

c) The volume of the $H_2O(g)$ released, measured at STP conditions.

d) The empirical formula of the hydrate, $MgSO_4 \cdot X\ H_2O$

7) Aqueous solutions of Na_3AsO_4 and $AgNO_3$ react to form Ag_3AsO_4 and $NaNO_3$. One of the products is a precipitate.
   a) Identify the precipitate. _____
   b) Write the balanced net ionic equation for the reaction, including the state symbols.

Excess of aqueous Na_3AsO_4 is added to 41.00 mL of a 0.2500 M solution of $AgNO_3$ to force all the insoluble product to precipitate. After the precipitate was filtered, rinsed with distilled water and dried, the mass of the precipitate formed is 1.362 g.

c) Calculate the moles of Ag^+ ions consumed in the reaction.

d) Calculate the theoretical yield of the reaction.

e) Calculate the percent yield of the reaction.