Pre-AP Chemistry Summer Assignment

This assignment is due the <u>first day</u> you have Pre-AP Chemistry. A quiz over these problems and the polyatomic ions will be given the first week of school. Khanacademy.org is a good reference site if you need help.

1. Answer these questions about the chemical equation shown below.

   $2H_2 + O_2 \rightarrow 2H_2O$

   a. What are the reactants?
   b. What is the product?
   c. Is the reaction balanced?
   d. What are the twos in front of H_2 and H_2O called?
   e. Why does the O_2 not have a number in front of it?
   f. How many hydrogen **atoms** are needed to produce two H_2O **molecules**?
   g. How many oxygen **atoms** are needed to produce two H_2O **molecules**?
   h. How many hydrogen **molecules** are needed to produce two H_2O **molecules**?
   i. How many oxygen **molecules** are needed to produce two H_2O **molecules**?
2. Balance the following chemical equations.
   a. $Fe + O_2 \rightarrow Fe_2O_3$
   b. $H_2 + O_2 \rightarrow H_2O$
   c. $Ag + H_2S \rightarrow Ag_2S + H_2$
   d. $C_2H_6 + O_2 \rightarrow CO_2 + H_2O$
   e. $Co + H_2O \rightarrow Co_2O_3 + H_2$
   f. $Ca(NO_3)_2 + Al_2(SO_4)_3 \rightarrow CaSO_4 + Al(NO_3)_3$
3. How many protons and electrons are in an atom of Ca? How many protons and electrons are in an atom of P?
4. What is a valence electron?
5. Why does calcium have a charge of 2+ when it is an ion? Why does phosphorus have a charge of 3- when it is an ion?
6. How many protons and electrons are in Ca^{2+}? How many protons and electrons are in P^{3-}?
7. What is the formula of a compound formed from Ca^{2+} and P^{3-}?
8. What is the name of the compound in number 7? Is it ionic or molecular (covalent)?
9. Convert 10 centigrams to grams. Show your work!
10. Convert 300.45 milliliters to liters. Show your work!
11. Convert 0.00127 kilometers to millimeters. Show your work!
12. Convert 346 seconds to minutes. Show your work!
13. What is the mass of 4056 milliliters of a substance with density 4.28 g/mL? Show your work!
14. What is the volume of 89 grams of a substance with density 0.0238 g/mL? Show your work!
15. What is the percent by mass of hydrogen in water? Show your work!
16. Write balanced chemical equations for each of the following reactions.
    a. Aluminum metal reacts with copper (II) chloride to produce aluminum chloride and copper metal.
    b. Zinc metal reacts with oxygen gas to produce zinc oxide.
    c. Lead (II) nitrate reacts with sodium bromide to produce lead (II) bromide and sodium nitrate.
    d. Strontium sulfide reacts with lithium to produce…? (complete the reaction)
17. Know the chemical symbols for elements 1-38, 47-56, and 78-82.
18. **<u>Memorize</u> the following polyatomic ions. You must know the names, elements, subscripts, and charges. We will have a quiz over polyatomic ions the first week of school. Strategies to help you memorize are on the back.**

1. **carbonate CO_3^{2-}**
2. **chromate CrO_4^{2-}**
3. **dichromate $Cr_2O_7^{2-}$**
4. **sulfate SO_4^{2-}**
5. **sulfite SO_3^{2-}**
6. **phosphate PO_4^{3-}**
7. **hydrogen sulfate HSO_4^-**
8. **hydrogen phosphate HPO_4^{2-}**
9. **dihydrogen phosphate $H_2PO_4^-$**
10. **peroxide O_2^{2-}**
11. **nitrate NO_3^-**
12. **nitrite NO_2^-**
13. **hydroxide OH^-**
14. **perchlorate ClO_4^-**
15. **chlorate ClO_3^-**
16. **chlorite ClO_2^-**
17. **hypochlorite ClO^-**
18. **cyanide CN^-**
19. **acetate $C_2H_3O_2^-$**
20. **permanganate MnO_4^-**
21. **ammonium NH_4^+**

Strategies to help you memorize the polyatomic ions

All polyatomic ions must be memorized: **both symbol and charge.**

The ones that end with –ate or –ite

ate/ite contains oxygen ex. Sulfate contains sulfur & oxygen
Nitrate contains nitrogen & oxygen

Per___ate contains one more oxygen than the ____ate

____ate MEMORIZE THESE and derive the rest using the relationships between the prefixes & suffixes

___ite contains one less oxygen than ___ate

Hypo___ite contains one less oxygen than ____ite

Polyatomic Ions that start with hydrogen

Ex. Hydrogen carbonate
Hydrogen sulfate
Digydrogen phosphate

You have already memorized ALL of the –ate polyatomic ions, so now, just put an H in front of the symbol and increase the charge by 1+

Carbonate	CO_3^{2-}	Hydrogen carbonate	HCO_3^{1-}
Sulfate	SO_4^{2-}	Hydrogen sulfate	HSO_4^{1-}
Phosphate	PO_4^{3-}	Dihydrogen phospate	$H_2PO_4^{1-}$ (di means 2)

Mercury (there are two of them, and one is really not a polyatomic ion, but go ahead and memorize it)

Mercury (I)	Hg_2^{2+}	(The 2^+ charge is split between the two Hg atoms, so each is assigned a 1+. This is why it is called Mercury (I) even though it has all the twos)
Mercury (II)	Hg^{2+}	technically not a polyatomic ion; try to figure out why.

Weird Ones

There are some on the list that break these common strategies or just don't have one, but we still have the memorize these.

Ammonium	NH_4^{+1}
Hydroxide	OH^{-1}
Cyanide	CN^{1-}

There are many other 'tricks' to help you learn the polyatomic ions, so you may want to Google and find songs or "Nick the Camel" or quizlet games to practice. You're only responsible, and our quiz will only cover, the 21 polyatomic ions listed on the front.