

08/09/2014



Chem 30 Review: Pre-requisites

Name: Key!

Date: Sept 8 2014

These are the concepts that we will rely on quite heavily during this course. It is imperative that you begin the course with a very good understanding of each of the following. If you feel weak in any of these areas, please ask for assistance immediately.

- Nomenclature (you must be able to confidently name both ionic and molecular compounds)
- Dissociation**
- Writing and balancing chemical reactions (combustion reactions in particular)
- STOICHIOMETRY** (gravimetric and solution in particular)
- pH calculations

Chemistry 30 also contains a strong **math** component that shows up in **every unit**. Weak math skills will be difficult to overcome. If you struggle with mathematics (algebra in particular), please come in for help. Try the basic problems below. These are the minimum you should be able to do.

1. Solve for the variable

a) $-12x = 3(x - 3)$

$-12x = 3x - 9$
 $-15x = -9$
 $x = \frac{9}{15} = \frac{3}{5}$

c) $6(5x - 16) = -30x + 84$

b) $6(-16x - 8) = 24x - 120$

$-96x - 48 = 24x - 120$
 $-122x = -72$
 $x = \frac{36}{61}$

d) $3(16x - 9) = 39$

e) $3(5x - 5) = 60$

f) $2x(3x) = 18$

g) $-36 = (3y)(6y)$

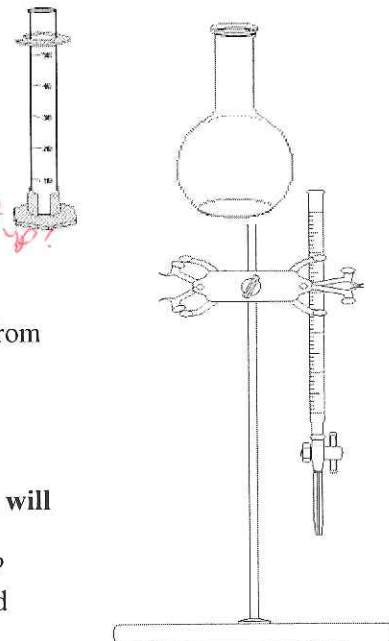
h) $5(4 + 15x) = 5x - 60$

i) $21y = 2(7 - 7y)$

j) $(3x)(2)(5x) = 45$

2. Laboratory Safety Review Sheet

- Are contact lenses allowed in the lab? NO
 Are prescription glasses allowed in the lab? Not as goggles.
 Are sunglasses or colored lenses allowed in the lab? " " "
 How about hats? OK
 Gum? NO
 Purses? NO
 Whiners? NO
- When do you have to wear safety goggles? Always!
- Hair must be tied back.
- If a spill occurs, what should you do? tell me.
- Oops, you accidentally broke some glassware. What happens now? clean it up?
- What is spill mix? Why is it useful? _____
- Is food or drink allowed in the lab? _____
- You get thirsty during an experiment. You decide it's okay to drink from the distilled water bottle. How smart was that? Why?
- How do you properly smell a chemical?
- When adding acids or bases to water, what procedure do you follow?
- If you spill an acid or base on your hands, you should...
- If you get chemicals in your eyes (**which you shouldn't because you will always be wearing safety goggles**), what should you do?
- What type of fire extinguisher do we have in the labs? How is it used?
- Your lab partner cuts his hand on a piece of broken glass. How should he be treated?
- When we are walking to a lab, why is it important to be very, very quiet?
- Briefly describe the fire escape routes from the lab and the classroom.
- Why must proper footwear be worn in the laboratory?
- What do the following stand for: a) WHMIS b) MSDS
- Label the random pieces of lab equipment on this page.



WHMIS Symbols

Symbol	Name and brief description	Example
	<u>Compressed gas</u>	CO _{2(g)} canister Butane torch
	<u>flammable</u>	Wood, paper, ethanol, butane
	<u>oxidizing</u>	Gasoline, ethanol, permanganate ion
	<u>toxic, immediate effects</u>	Draino, acids, bases
	<u>toxic, non-immediate</u>	Cigarettes, benzene, organic solvents
	<u>biohazardous</u>	Used needles, band-aids, e-coli
	<u>corrosive</u>	Acids (especially strong acids) and bases
	<u>dangerous</u> <u>reactive.</u>	Alkali metals (sodium, potassium), NI _{3(s)}

3. Writing Chemical Reactions

1. aluminum plus hydrochloric acid



2. propane(C_3H_8) burns



3. calcium hydroxide plus nitric acid



4. magnesium plus zinc nitrate



5. A nickel (assume pure nickel) is placed in a copper (II) sulfate solution.



6. Sodium bicarbonate is used to neutralize sulfuric acid.



7. Methanol burns



4. Write dissociation equations for the following substances.

1. nitric acid - $\text{HNO}_3(aq) \rightarrow \text{H}^+(aq) + \text{NO}_3^-(aq)$

2. sodium phosphate $\text{Na}_3\text{PO}_4(aq) \rightarrow 3\text{Na}^+(aq) + \text{PO}_4^{3-}(aq)$

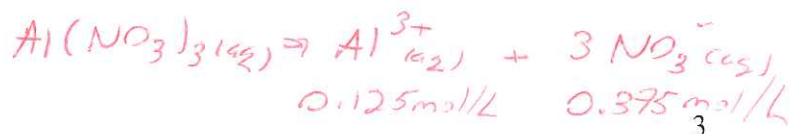
3. potassium permanganate $\text{KMnO}_4(aq) \rightarrow \text{K}^+(aq) + \text{MnO}_4^-(aq)$

4. hydrogen peroxide $\text{H}_2\text{O}_2(aq) \rightarrow 2\text{H}^+(aq) + \text{O}_2^{2-}(aq)$

5. Find the ion concentration for the following

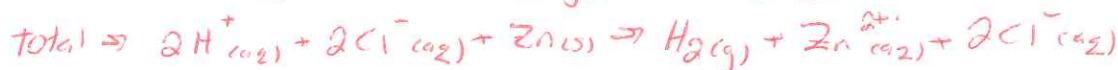
- a. 2.5 mol/L of potassium sulfate $\text{K}_2\text{SO}_4(aq) \rightarrow 2\text{K}^+(aq) + \text{SO}_4^{2-}(aq)$
5.0 mol/L 2.5 mol/L

- b. 0.125 mol/L of aluminum nitrate



6. Write the non, total and net ionic equations for the following.

a) Hydrochloric acid is poured over zinc metal.

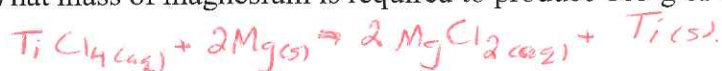


b) Hydrogen gas is bubbled through a potassium iodide solution.



7. Stoichiometry:

a) Large amounts of the important metal titanium, $\text{Ti}_{(s)}$, are made by reacting titanium(IV) chloride with magnesium metal. Titanium metal and magnesium chloride are produced. What mass of magnesium is required to produce 105 g of titanium?



$$\frac{105g}{1} \times \frac{1\text{mol}}{47.87g} \times \frac{2}{1} \times \frac{24.31g}{1\text{mol}} = \underline{\underline{107g}}$$

b) What mass of solid sodium hydroxide must be added to completely react with 2.00 L of 1.25 mol/L boric acid?



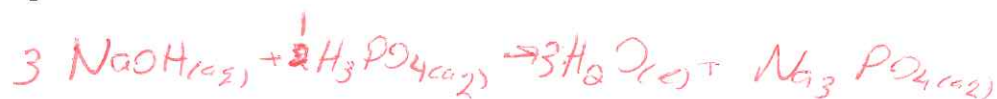
$$\frac{1.25\text{mol}}{1\text{L}} \times \frac{2\text{L}}{1} \times \frac{3}{1} \times \frac{40.00g}{1\text{mol}} = \underline{\underline{300g}}$$

c) What volume of 0.100 mol/L copper (II) sulphate must be added to completely react with 20.5 g of solid iron?



$$\frac{20.5g}{1} \times \frac{1\text{mol}}{55.85g} \times \frac{3}{2} \times \frac{1\text{L}}{0.100\text{mol}} = \underline{\underline{5.51\text{L}}}$$

d) What volume of 0.100 mol/L sodium hydroxide must be added to 150 mL of 2.00 mol/L phosphoric acid?



$$\frac{0.15\text{L}}{1} \times \frac{2\text{mol}}{1\text{L}} \times \frac{3}{1} \times \frac{1\text{L}}{0.1\text{mol}} = \underline{\underline{9.00\text{L}}}$$

e) What volume of water vapour at STP is produced when 9.6 kg of oxygen gas reacts with sufficient hydrogen gas?



$$n = \frac{9600g}{32g/mol} = 300mol \times \frac{2}{1} = 600mol$$

$$PV = nRT$$

273.15K
 (101.325 kPa) $V = (600mol)(8.314 \frac{LkPa}{molK})$

$$V = 1.3 \times 10^4 L$$

8. pH

a) Fill in the chart... watch sig digs

$[H_3O^+_{(aq)}]$ mol/L	$[OH^-_{(aq)}]$ mol/L	pH	pOH
1.10×10^{-3}	9.10×10^{-12}	2.959	11.041
4.5×10^{-6} 2.2×10^{-6}	4.5×10^{-9}	5.65	8.35
1.6×10^{-9}	6.2×10^{-6}	8.79	5.21
2.317×10^{-10}	4.32×10^{-3}	11.635	2.365
1.486	6.73×10^{-11}	3.828	10.172
2.00×10^{-10}	5.000×10^{-5}	9.699	4.301

b) As the pH of a solution increases, a solution becomes more (acidic or basic).

c) If the pH goes down by one (from 6 to 5), the $[H_3O^+_{(aq)}]$ goes up by 10 times.

d) What is the difference between a strong and weak acid?

\leftarrow dissociates > 90% \downarrow dissociates < 50%

e) Write reactions to show how the following solutions are acidic or basic

a. $HCO_3^-_{(aq)}$ forms an acidic solution



b. $HCO_3^-_{(aq)}$ forms a basic solution



