HOMEWORK FROM CHEMISTRY

YEAR 4

1. a) Explain **how to prepare** 25 liters of a 0.10 M $BaCl_2$ solution, starting with solid $BaCl_2$.(multistep work)

b) **Specify the volume** of the solution in (a) needed to get 0.020 mol of $BaCl_2$.

2. **The simplest formula for vitamin C is $C_3H_4O_3$. Experimental data indicates that the molecular mass of vitamin C is about 180. What is the molecular formula of vitamin C? .(multistep work)**

3. **Balance the following equations. Give the names of the reactants and the products: (two steps work)**

a. $LiOH\ (s) + H_2SO_4\ (aq) \rightarrow H_2O\ (l) + Li_2SO_4\ (aq)$
b. $Mg(OH)_2\ (aq) + H_3PO_4\ (l) \rightarrow Mg_3(PO_4)_2\ (aq) + H_2O\ (l)$
c. $CH_4\ (g) + O_2\ (g) \rightarrow CO_2\ (g) + H_2O\ (g)$
d. $C_8H_{18}\ (l) + O_2\ (g) \rightarrow CO_2\ (g) + H_2O\ (g)$
e. $NaCl\ (aq) + AgNO_3\ (aq) \rightarrow AgCl\ (s) + NaNO_3\ (aq)$
f. $CH_3COOH\ (aq) + NaHCO_3\ (s) \rightarrow CO_2\ (g) + H_2O\ (l) + NaCH_3COO\ (aq)$

Balance the following equations. Determine the molecular formula and the molecular weight of each species. (two steps work)

4.

a. Nitrogen monoxide reacts with ozone (trioxide) to produce nitrogen dioxide and oxygen molecules.
b. Iron (III) oxide reacts with zinc metal to produce iron metal and zinc (II) oxide.
c. Hydrobromic acid reacts with aluminum metal to produce hydrogen gas and aluminum bromide.

5. Balance the following redox reactions and name the product of each of them using IUPAC

a. 5. $SO_2\,(g) + HNO_2\,(aq) \rightarrow H_2SO_4\,(aq) + NO\,(g)$
b. $Al\,(s) + H_2SO_4\,(aq) \rightarrow Al_2(SO_4)_3\,(aq) + H_2\,(g)$
c. $Au^{3+}\,(aq) + I^-\,(aq) \rightarrow Au\,(s) + I_2\,(s)$
d. $S^{2-}\,(aq) + I_2\,(s) \rightarrow SO_4^{2-}\,(aq) + I^-\,(aq)$
e. $H_2O_2\,(aq) + ClO_4^-\,(aq) \rightarrow O_2\,(g) + ClO_2^-\,(aq)$
f. $Br_2\,(aq) + OH^-\,(aq) \rightarrow Br^-\,(aq) + BrO_3^-\,(aq)$
g. $Mn\,(s) + HNO_3\,(aq) \rightarrow Mn^{2+}\,(aq) + NO_2\,(g)$
h. $I_2\,(s) + OCl^-\,(aq) \rightarrow IO_3^-\,(aq) + Cl^-\,(aq)$
i. $Cr_2O_7^{2-}\,(aq) + HNO_2\,(aq) \rightarrow Cr^{3+}\,(aq) + NO_3^-\,(aq)$

j. $CrO_4^{2-}(aq) + S^{2-}(aq) \rightarrow Cr(OH)_3(s) + S(s)$

6.

For the each word reaction,

a) **write the chemical equation without balancing it,**
b) **write the oxidation state of each element above that element,**
c) **write the two half reactions, labeling which is oxidation and which is reduction.**
remark: *You can check your work by balancing the complete reaction using the numbers from the half reaction addition.*

1. Lead metal and lead IV oxide in sulfuric acid produce lead II sulfate and water. This is the reaction in a common lead-acid car battery.
2. Methane gas burns in oxygen to make water vapor and carbon dioxide.
3. Octane burns with oxygen to make carbon dioxide and water
4. Concentrated nitric acid is put on copper wire. Water and copper II nitrate in the water solution is produced, along with a brownish gas, nitrogen monoxide or nitric oxide, NO.
5. Potassium dichromate and hydrochloric acid in solution will make chlorine gas, water, chromium III chloride and potassium chloride. (The soluble salts, of course, remain in the water solution.)

7. $C_7H_6O_3$ + $C_4H_6O_3$ -- à $C_9H_8O_4$ + $C_2H_4O_2$

What is the theoretical yield (in grams) of aspirin, $C_9H_8O_4$**, when 2.00 g of $C_7H_6O_3$ is heated with 4.00 g of $C_4H_6O_3$? If the actual yield of aspirin is 2.21g,** what is the percentage yield? (Multisteps work)

8. On the line to the right of the number, indicate if the substance is Covalent [C] or Ionic [I]. On the line to the right of the formula, write the proper name (English and Slovak) of the formula. (Two steps work)

1. _____ Br_3O_8 _____
2. _____ Mg_3N_2 _____
3. _____ CrSe _____
4. _____ $Fe(OH)_3$ _____
5. _____ B_3Si _____

6. _____ Ag_3PO_4 _____

7. _____ $NiBr_2$ _____

8. _____ P_4S_{10} _____

9. _____ $Sr(NO_2)_2$ _____

10. _____ Cu_3N _____

9. **State what type of reaction the following are**:
1) Splitting of water into hydrogen and oxygen.
2) Burning of hydrogen in air.
3) Action of iron with copper sulphate solution.
4) Action of heat on calcium carbonate.
5) Treating silver nitrate with hydrochloric acid. **Give equations with your answer (Two steps work).**

10. Given the following two half-reactions:

(i) $\mathbf{MnO_4^-_{(aq)} + 8H^+_{(aq)} + 5e^- ==> Mn^{2+}_{(aq)} + 4H_2O_{(l)}}$

and (ii) $\mathbf{Fe^{3+}_{(aq)} + e^- ==> Fe^{2+}_{(aq)}}$

(a) Construct the **fully balanced redox ionic equation** for the manganate(VII) ion oxidising the iron(II) ion

(b) **24.3** cm^3 of **0.02** mol dm^{-3} $KMnO_4$ reacted with **20.0** cm^3 of an iron(II) solution.

(i) Calculate the molarity of the iron(II) ion. (ii) How do recognise the end-point in the titration?