St. Paul's IB SL Chemistry Summer Work

Welcome to IB Chemistry! In order to review previously learned material and prepare for the start of the school year, you should complete this packet. While it is not required, there will be credit given to those students who complete it and answer the questions correctly. The packet includes a review of writing and balancing various chemical equations and four short answer questions covering material that we covered in your 10th grade science course. Please record all answers on a separate sheet of paper. To best answer the problems in this packet you should use the periodic table that you were given this year.

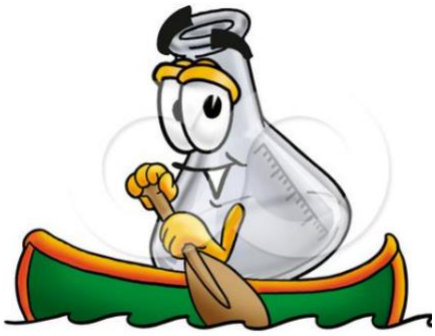
Chemistry deals with the identification of substances from which matter is composed; the investigation of their properties and the ways in which they interact, combine, and change; and the use of these processes to form new substances. Part 1: Balancing Equations and Part 2: Short Answer are included in this packet because they are foundational concepts that we will build upon this year as we dive deeper into the field of chemistry. When working through these questions, if you utilize outside resources to assist you, please cite your sources.

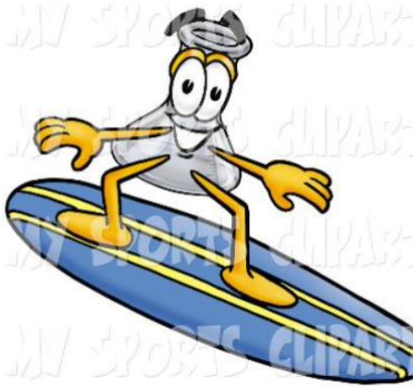
Ms. Radov will be available throughout the summer to review with students, but all appointments must be made via email. Please email me at dhaislup@stpaulsmd.org. I look forward to a great year in IB Chemistry!

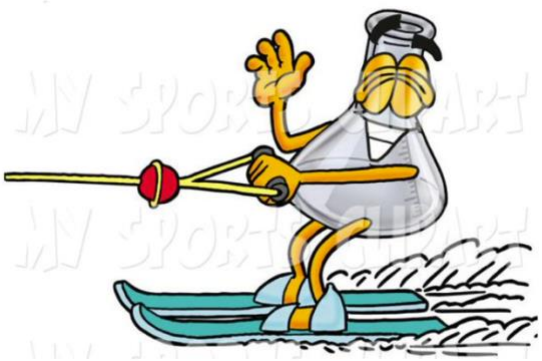
New IB Chemistry Terminology **

The IB does not use mL or L. Instead, they use cm^3 and dm^3, so start to use these values.

1 cm^3 = 1 mL	mol dm^{-3} = Molarity (M)
1 dm^3 = 1 L	Standard Temperature and Pressure (STP): 22.7 dm^3 = 1 mole







Part 1: Chemical Equations

Directions: (1) Write balanced chemical equations for each reaction described. (2) Identify the type of reaction occurring (synthesis, decomposition, single displacement, double displacement, or combustion).

1. A piece of lithium metal is dropped into a container of nitrogen gas forming a binary salt.
2. Dinitrogen pentoxide is bubbled into water forming nitric acid.
3. A sample of metallic magnesium chlorate decomposes into solid magnesium chloride and oxygen gas when heated.
4. Magnesium turnings are added to a solution of iron (II) chloride where a deep gray precipitate settles at the bottom of a clear solution.
5. Chlorine gas is bubbled into a solution of potassium iodide.
6. Hydrogen sulfide gas is bubbled through a saturated solution of potassium hydroxide.
7. A solution of lithium phosphate is reacted with barium hydroxide.
8. Methane gas is completely burned in air.

Part 2: Short Answer questions.

Directions: Answer the following questions on a separate sheet of paper, clearly numbering each question and boxing your final answer. If you utilize outside resources (textbooks or the Internet) to help you answer these questions, please site your sources by identifying the book or link next to that problem.

Answer the following questions that relate to chemical reactions.

1. Lead (IV) oxide can be reduced with carbon monoxide according to the following equation.

$$PbO_2\,(s) + 2CO\,(g) \rightarrow Pb\,(s) + 2CO_2\,(g)$$

a. A 26 gram sample of lead (IV) oxide is reacted with excess carbon monoxide, how many grams of carbon dioxide are produced?

2. In a reaction vessel, 0.500mol of solid barium nitrate and 0.25mol of aqueous phosphoric acid are combined. Solve for the below information:

$$3Ba(NO_3)_2\,(aq) + 2H_3PO_4\,(aq) \rightarrow \text{??}$$

a. Determine the solubility of the products. Is there a solid formed? If so, what is it. Write the full reaction including states of matter below.
b. If the 0.25 mol aqueous HNO_3 is added to 1000 cm^3 of water, what is the pH of the solution? Would you describe this solution as acidic, neutral, or basic. Why?
c. Assuming that the solid completely sublimes into a gas, and the reaction is at STP, solve for the volume of gas produced if 5.05 grams of solid barium nitrate is used in the reaction.

3. To produce 3.00 dm^3 of a 1.90 mol dm^{-3} solution of sodium hydroxide (NaOH), how many grams of sodium hydroxide must be dissolved?

a. Write the balanced chemical reaction.
b. Then solve for grams of sodium hydroxide.

4. While electronegativity is the ability of an atom in a molecule to attract shared electrons to itself, first ionization energy is the energy required to remove an electron from a gaseous atom or ion. Using these concepts, the principles of atomic and molecular structure and the information in the table below, answer the following questions about atomic krypton, chlorine, and sulfur, as well as some of their compounds.

Atom	First Ionization Energy ($kJ\ mol^{-1}$)
Kr	?
Cl	1255
S	1055

1. Write the noble-gas electron configuration for atomic chlorine and sulfur.
2. Draw the orbital filling diagram for atomic chlorine and sulfur.
3. Account for the fact that the first ionization of atomic chlorine is greater than that of atomic sulfur. (You must discuss both atoms in your response.)
4. Predict whether the first ionization energy of atomic krypton is greater than, less than, or equal to the first ionization energy of atomic chlorine. Justify your prediction.
5. Krypton can react with chlorine and sulfur to form compounds such as KrS_3 and $KrCl_4$. Draw the complete Lewis electron-dot diagram for each of these molecules.
6. On the basis of the Lewis electron-dot diagrams you drew for part (f), predict the following:
    i. The geometric shape of the KrS_3 molecule.
    ii. The bond angle for the $KrCl_4$.
7. Predict whether the KrS_3 molecule is polar or nonpolar. Justify your prediction.