**Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**IB Chem 2 HL Summer Assignment**

Welcome to IB Chem 2 HL !!!! I am REALLY looking forward to it. I promise to work you hard but the payoff will be sweet when you do well on the IB exam AND are tutoring your fellow college students wherever you go. We are going to also focus on learning strategies that will help you to be very prepared for the rigors of any college course, not just chemistry. As a result, this course will rely heavily on reading the textbook, participating in discussions and study groups, utilizing online practice tools, solving complex problems, and doing higher level lab investigations. I also promise to create a fun learning environment and support you throughout the year. See you in AUGUST ☺

Mrs. M

**Part 1: SCIENCE FAIR PROJECT**

**YOUR ONLY INTERNAL ASSESSMENT** for IB Chemistry HL 2 is your science fair project. Since I am the evaluator, I am not permitted to give you any assistance but you can seek assistance or feedback from outside sources. Please begin researching your topic so that it is at an appropriate level of difficulty. We are calling this research your “presearch”- Before you begin finding specific sources for your IV, DV combination- conduct some “presearch”.  These sources can be wikipedia or any other source that provides you with basic information and helps you focus in on an IV, DV combination . DO NOT include those sources in your Annotated Bibliography.  Use those sources to find good “key words” and ideas to research in scientific journals and other reputable sources. Use these sources to build your background knowledge about your topic. For example, if you are going to study pH, you should know what pH means, what it measures, etc….  Then your sources for your annotated bibliography can focus on what impact/effect  pH may have on your DV based on scientific studies that have already been conducted.

To start your thinking, go to MVHS webpage, select the Library Tab.  Scroll down to Online Databases. Select Gale Databases. The password to get in Gale is “mvhs”.  Scroll down to Science in Context. Click on an advanced search and then select by document type and select Experiment Activity.  Click on Experiments. On the Right Side expand the subjects filter. Choose any topic that peaks your interest. Read the basic information and continue to scroll through the pages, identify words to know, and then toward the bottom, there are SAMPLE experiments as a place to start.  DO NOT USE THESE EXACT Experiments. Use them as a starting point. Each experiment has scientific references to expand your research.

Keep in mind, if your little sister or brother could do the project, it is too simple ☺ Your topic must be a topic related to chemistry, biochemistry, environmental chemistry, materials science, energy, or medicinal chemistry. We will follow the same deadline process as last year, with the first deadline occurring during the second week of school. Each time there is a deadline, if you fail to meet it, you would be required to come to MCMANUS time with me until you complete the task. This is to ensure that your project is TOP QUALITY.

**Part 2: Review of IB Chem 1**

Please complete each section as a review of IB Chemistry 1. Use your old workbook to assist you. The new objectives are in parentheses. There will be an assessment on this content on the third day we meet in the fall. If you find that you need assistance, please email me over the summer or plan to stay after with me any of the first few days of school. Mrs. M

**Topic 11:**

1. **State and explain** how to determine the number of significant digits in an answer to an addition or subtraction problem. Show an example. (11.1)
2. **State and explain** how to determine the number of significant digits in an answer to an multiplication or division problem. Show an example. (11.1)
3. Give the formulas for finding percent error and percent yield. Explain the relationship between percent error and percent yield. (11.1)
4. **Define** systematic error. **Give an example** from a lab you did in IB Chem 1. (11.1)
5. **Define** random error. **Give an example** from a lab you did in IB Chem 1. (11.1)
6. Show the work to convert 145,000 mg to kg.(11.1)
7. **State and explain** how to determine the uncertainty of a measurement of a volume of a graduated cylinder. (11.1)
8. **State and explain** how to determine the uncertainty when two measurements are added or subtracted. (11.1)
9. **State and explain** how to determine the uncertainty when two measurements are multiplied or divided. (11.1)
10. How do you find the slope of a line? (11.1)

**Topic 1**

1. Show the conversion between 1.45 x 1024 atoms of Zn to grams.(1.2)
2. **List the steps** for determining an empirical formula from data. (1.2)
3. **Complete and balance** the following equation (1.3): zinc phosphate + iron(III) nitrate🡪
4. Given : C3H8 + O2 🡪 CO2 + H2O and given 4.56 g of C3H8 and 2.34 g of O2. (1.3)

Determine the following:

1. the limiting reactant
2. the amount of carbon dioxide that can be made
3. the amount of excess reactant left over
4. Solve this gas law problem: A gas occupies a volume of 456 ml at 104.5 kPa and 35°C. What will the volume of the gas be at 102.4 kPa and 45 °C? (1.3)
5. Solve this gas law problem: A sample of nitrogen gas (N2) occupies 45.0 L at 25°C and contains 4.78 grams. What pressure is being exerted? (1.3)
6. Calculate the molarity of a solution made of 75.0 grams of sodium chloride dissolved in 500.0 ml of total solution.(1.3)
7. Calculate the grams of NaCl produced by reaction of 25.0ml of 0.100 M HCl with excess NaOH. (1.3)

**Topic 2**

1. Complete the following table: (2.1)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Symbol | Atomic # | Mass # | Protons | Neutrons | Electrons | Charge | Ox. or Red.  |
| $$1+ |  |  |  |  |  |  |  |
| $$2+ |  |  |  |  |  |  |  |
|  | 35 | 80 |  |  | 36 |  |  |

1. Give the electron configuration of Sulfur. Draw its orbital diagram. (2.2)

**Topic 3**

1. **Describe each trend** below. State what happens as you go across a period and down a family. Give the reason for each trend. (3.2)
	1. Atomic Radius
	2. Ionization Energy
	3. Electronegativity
2. **Describe** how the atomic radius of an atom changes when it becomes a cation or an anion. (3.2)

Topic 4

1. Complete the following table of compounds: (4.1 and 4.2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Formula** | **Type of Bond** | **Special Naming Rule *if necessary*** | **Name** |
|  |  | * Ionic
* Covalent
* Both
 | * Stock system
* Polyatomic ions
* Organic
 |  |
| 1 | CO2 |  |  |  |
| 2 | KOH |  |  |  |
| 3 |  |  |  | lithium oxide |
| 4 | N2O5 |  |  |  |
| 5 |  |  |  | ammonium carbonate |
| 6 |  |  |  | Calcium sulfate |
| 7 | Fe(NO3)3 |  |  |  |
| 8 | C3H8 |  |  |  |

1. Complete the following table below: (4.3)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Lewis dot Structure | # of bonded pairs of e- | # of unshared pairs of e- | Bond Angle | Molecular shape | Polar or nonpolar bonds | Polar or nonpolar molecule |
| BF3 |  |  |  |  |  |  |  |
| NBr3 |  |  |  |  |  |  |  |
| H2O |  |  |  |  |  |  |  |
| CI4 |  |  |  |  |  |  |  |

1. Rank the following compounds from lowest to highest boiling point. Give the reason for each ranking.

water, mercury, calcium chloride, bromine, and dimethyl ethane (CH3OCH3). (4.4)

Topic 5

1. Calculate the heat absorbed by 25.0 grams of water if heated from 14°C to 26°C. (5.1)
2. Calculate H for the reaction 4 NH3 (g) + 5 O2 (g) --> 4 NO (g) + 6 H2O (g), from the following Data: (5.2)

N2(g) + O2(g) 🡪 2NO (g) ΔH=-180.5 kJ

N2(g) + 3H2(g) 🡪 2NH3(g) ΔH=-91.8 kJ

2 H2(g) + O2(g) 🡪 2H2O (g) ΔH= -483.6 kJ

1. Calculate the heat of the reaction for the following reaction using the values provided: (5.3)



2C2H6(g) + 7O2(g) 🡪 4CO2(g) + 6H2O (g)

Topic 6 and 7

1. **Describe both reasons** why increasing the temperature of a reaction increases its rate.(6.1)
2. Given the following hypothetical chemical reaction:(7.1)

 2A(g) + B(g) 4C(g) Δ H= -92 kJ

1. Is this reaction endothermic or exothermic?
2. If we increase the concentration of A, which direction will the reaction shift?

(towards the reactants or towards the products)

1. If we increase the concentration of C, which direction will the reaction shift?
2. If we increase the pressure of the system, which direction will it shift?
3. If we increase the temperature of the system, which direction will it shift?

Topic 8 and 9

1. Define acid and base according to Bronsted- Lowry. (8.1)
2. Describe the difference between the strength of an acid and its concentration. (8.2)
3. Given [H+] = 1 X 10-4, determine the following: (8.3)
	1. pH=
	2. [OH-] =
	3. pOH=
4. Define oxidation and reduction.(9.1)
5. Determine the oxidation number of Cr in Na2Cr2O7. (9.1)

Topic 10

1. Draw the Lewis Structure for propane. (10.2)
2. Draw the Lewis Structure for any alkene. (10.2)
3. Draw the Lewis Structure for any alkyne. (10.2)
4. Draw the Lewis Structure for any Alkanoic Acid. (10.2)