

IB Chemistry SL – Summer Assignment – 2016-2017 School Year

Welcome to the IB Program and IB Chemistry SL! This summer assignment is designed as a review of the major concepts from Honors Chemistry that will be developed further in IB Chemistry SL. In addition to developing your knowledge of advanced chemical concepts, you will also explore chemical relationships through designing and performing labs. You will not be required to turn in this assignment; however, you will take a formative quiz over these review topics during the second week of school. During the first two weeks of class, we will briefly review this material and cover IB specific changes to your chemistry knowledge. All of the material below was covered in Honors Chemistry and is the foundation we will use to master IB Chemistry SL. Please take the time to carefully go through these topics, review the concepts, and memorize the necessary material, or you will not be prepared for this course. IB Chemistry SL is designed to prepare you for the IB Chemistry SL Exam in May 2016 – this course will not adequately prepare you to take the AP Chemistry Exam. A list of internet sites has been provided below to help guide your review.

Supply List: Please purchase the following supplies prior to the first day of class.

- Graphing calculator
- Ruler
- 1.5 inch three-ring binder
- 13 dividers
- Notebook paper
- Blue or black pens
- Pencils
- I also strongly encourage you to purchase a study book for the IB Chemistry Exam. I recommend (however, you may purchase a different one): IB Chemistry: Study Guide: Oxford IB Diploma Program, 2014 edition (Paperback), by Geoffrey Neuss, Publication Date: October 29, 2014, ISBN-10: 0198393539, ISBN-13: 978-0198393535 **Be sure to get the 2014 edition (first examinations 2016)-the older version is VERY different!**

Internet Sources:

Khan Academy Chemistry: <https://www.khanacademy.org/science/chemistry>

ChemGuide – UK (very helpful throughout the year, as it is specific to IB Chemistry): <http://www.chemguide.co.uk/>

Chemistry Lectures: <http://www.chemtopics.com/lectures.htm>

Content to Memorize: This information was all required in Honors Chemistry – make sure you still know it.

- Elements: memorize the names & symbols for elements with the following atomic #'s (1-38),(45-57),(78-89), 92
- Polyatomic Ions: You must know the formula and charge for each

-1		-2	
Acetate	$\text{CH}_3\text{COO}^{-1}$ or $\text{C}_2\text{H}_3\text{O}_2^{-1}$	Carbonate	CO_3^{-2}
Bromate	BrO_3^{-1}	Chromate	CrO_4^{-2}
Chlorate	ClO_3^{-1}	Oxalate	$\text{C}_2\text{O}_4^{-2}$
Chlorite	ClO_2^{-1}	Peroxide	O_2^{-2}
Cyanide	CN^{-1}	Sulfate	SO_4^{-2}
Hydrogen carbonate or Bicarbonate	HCO_3^{-1}	Sulfite	SO_3^{-2}
Hydroxide	OH^{-1}	-3	
Hypochlorite	ClO^{-1}	Borate	BO_3^{-3}
Iodate	IO_3^{-1}	Citrate	$\text{C}_6\text{H}_6\text{O}_7^{-3}$
Nitrate	NO_3^{-1}	Phosphate	PO_4^{-3}
Nitrite	NO_2^{-1}	Phosphite	PO_3^{-3}
Perchlorate	ClO_4^{-1}	+1	
Permanganate	MnO_4^{-1}	Ammonium	NH_4^{+1}

- Charges of Groups 1, 2, 3, 5, 6, and 7 on the periodic table
- Strong Acids (as required for IB): HCl, HNO₃, H₂SO₄
- Strong Bases (as required for IB): NaOH, KOH, RbOH, Ba(OH)₂
- SI Units:

Property	Unit	Symbol
Mass	kilogram	kg
Time	second	s
Temperature	Kelvin	K
Volume	cubic meter	m ³
Pressure	Pascal	Pa

Vocabulary: Use a trusted source on the internet and/or your Honors Chemistry notebook to define the following terms in your own words, and give examples as appropriate. Create a note card for each term.

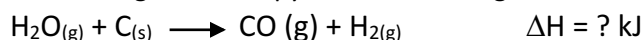
- 1) Element
- 2) Atom
- 3) Compound
- 4) Proton
- 5) Neutron
- 6) Electron
- 7) Isotope
- 8) Ion
- 9) Half-life
- 10) Relative atomic mass
- 11) Period (as on the periodic table)
- 12) Group (as on the periodic table)
- 13) Transition elements
- 14) Alkali metals
- 15) Alkaline earth metals
- 16) Halogens
- 17) Noble gases
- 18) Ionization energy
- 19) Atomic radius
- 20) Electronegativity
- 21) Melting point
- 22) Boiling point
- 23) Ionic bond
- 24) Covalent bond
- 25) Cation
- 26) Anion
- 27) Conductivity
- 28) Avogadro's constant (number)
- 29) Molecular Formula
- 30) Empirical Formula
- 31) Sublimation
- 32) Reactants
- 33) Products
- 34) Solute
- 35) Solvent
- 36) Solution
- 37) Precipitate (as in chemistry)
- 38) Molarity
- 39) Aqueous
- 40) Saturated
- 41) Unsaturated
- 42) STP
- 43) Enthalpy
- 44) Exothermic reaction
- 45) Endothermic reaction
- 46) Hess's Law
- 47) Kinetic Molecular Theory
- 48) Catalyst
- 49) Equilibrium
- 50) Le Chatelier's Principle
- 51) Titration
- 52) Strong Acid
- 53) Weak Acid
- 54) Conjugate Acid
- 55) Conjugate Base
- 56) Bronsted-Lowry Acid
- 57) Bronsted-Lowry Base
- 58) Lewis Acid
- 59) Lewis Base
- 60) pH
- 61) Amphoteric
- 62) Neutralization reaction

Quantitative Chemistry: Solve the following problems, showing all of your work. Include units and the appropriate number of significant figures in your answers. If you are struggling, refer to your honors chemistry notebook and use the internet sources provided above to review.

- 1) Convert 4,672,000,000 into scientific notation.
- 2) Convert 0.000005210 into scientific notation.
- 3) Convert 50.0 g to milligrams.
- 4) Convert 150. mL to liters.
- 5) How many significant figures are in the number 4.0070×10^{12} ?
- 6) An object has a mass of 40.1g and occupies a volume of 8.20 mL. What is the density of the object?
- 7) Calculate the percent yield if 28.0g of MgCl_2 is produced, but 32.0g of MgCl_2 should have been produced.
- 8) How many atoms are in 52.4g of nickel?
- 9) 6.00g of water contains how many moles of water?
- 10) What is the molar mass of methane?
- 11) How many hydrogen atoms are in 3.0 moles of ethanol, $\text{C}_2\text{H}_5\text{OH}$?
- 12) What is the empirical formula of glucose, $\text{C}_6\text{H}_{12}\text{O}_6$?

- 13) A compound with an empirical formula of CH_2 has a molecular mass of 42.09. What is its molecular formula?
- 14) A compound of nickel has a mass composition of 37.9% nickel, 20.7% sulfur, and 41.4% oxygen. What is its empirical formula?
- 15) Aluminum and iron(III) oxide react to form iron and aluminum oxide. What mass of iron is produced from the reaction of 21.4g of aluminum and 91.3g of iron(III) oxide? What is the limiting reactant? What is the excess reactant?
- 16) What volume of nitrogen forms when 100. g of ammonia, NH_3 , decomposes completely into its elements at STP?
- 17) A helium party balloon has a volume of 12.0L. At room temperature (25°C) the internal pressure is 1.05atm. Calculate the number of moles of helium in the balloon.
- 18) The gas left in a used aerosol can is at a pressure of 1.00atm at 27.0°C . If this can is thrown into a fire, what is the pressure of the gas when its temperature reaches 927°C ?
- 19) The volume of a gas is 20.0L at 275K and 92.1kPa. Find its volume at STP.
- 20) A solution is made by dissolving 17.0g of lithium iodide in enough water to make 387mL of solution. What is the molarity of the solution?
- 21) What volume of 18.0M sulfuric acid is required to prepare 16.5L of 0.126M sulfuric acid?
- 22) Calculate the $[\text{OH}^-]$ in a solution that has a pH of 3.70.
- 23) A solution has a pH of 4.37. What is the $[\text{H}^+]$ in the solution?
- 24) A 100.0g sample of N-16 decays to 12.5g in 30.0 seconds. What is the half-life of N-16?
- 25) A 15.6g sample of ethanol absorbs 868J of heat. If the initial temperature of the ethanol was 21.5°C , what is the final temperature of the ethanol?
- 26) Given the following two reactions and corresponding enthalpy changes,
 - I. $2\text{C}_{(s)} + \text{O}_2(g) \longrightarrow 2\text{CO}_{(g)} \quad \Delta H = - 221.0 \text{ kJ}$
 - II. $2\text{H}_2(g) + \text{O}_2(g) \longrightarrow 2\text{H}_2\text{O}_{(g)} \quad \Delta H = - 483.6 \text{ kJ}$

Compute the change in enthalpy for the following reaction.



Concept Review: Answer the conceptual questions below. If you don't remember a topic, use the internet sources provided above to review.

- 1) Determine the number of protons, neutrons, and electrons for each:
 - a. Sulfur
 - b. Chloride
 - c. Calcium ion
 - d. ^{127}I
- 2) Which is larger? Ca or Ca^{+2} Why?
- 3) Which is larger? F or F^{-1} Why?
- 4) Why is sodium larger than chlorine?
- 5) Why is fluorine smaller than iodine?
- 6) Why does it take less energy to remove an electron from Potassium than from Bromine?
- 7) List the following elements in order from smallest to largest electronegativity: Magnesium, Sulfur, Francium
- 8) Write full length electron configurations for Na, Al, and Cl^{-1}
- 9) Draw dot diagrams for Nitrogen and Fluorine.
- 10) Draw the Lewis structures for NH_3 and CO_2 .
- 11) Write and balance chemical equations for:
 - a. The combustion of methane
 - b. The single replacement reaction of zinc and hydrochloric acid
 - c. The neutralization reaction of sulfuric acid and sodium hydroxide
 - d. The decomposition of dinitrogen pentoxide.
- 12) Endothermic reactions have a (negative/positive) ΔH , and the products are (more/less) stable than the reactants.

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- 14) Why are aqueous solutions of ionic compounds considered electrolytes?
- 15) Consider the following reaction: $N_{2(g)} + 3H_{2(g)} \leftrightarrow 2NH_{3(g)}$ $\Delta H = -93 \text{ kJ/mol}$
- How would increasing the volume of the container affect the equilibrium? the value of K_{eq} ?
 - How would increasing the temperature affect the equilibrium? the value of K_{eq} ?
 - How would removing NH_3 affect the equilibrium? the value of K_{eq} ?
- 16) Determine the conjugate acid-base pairs: $H_2SO_3 + H_2O \leftrightarrow HSO_3^{-1} + H_3O^{+1}$
- 17) Label each as a Lewis acid or Lewis base: BF_3, NH_3

**I will be checking email periodically (not daily) throughout the summer if you have questions –
cphilpot@forsyth.k12.ga.us Have a wonderful, safe summer! Mrs. Philpot**