**Pre IB Chemistry Summer Review Packet - 2015**

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I am so looking forward to having you in IB chem with me in the Fall, please know it will be in-depth, fast paced and rigorous …but most of all it will be fun!! This course will challenge you to not only advance your (already superb) chemistry knowledge, but also to develop your critical thinking problem solving and inquiry skills. I believe that learning to think and learn is much more important than learning facts (though we will need to hit those as well). So please come into my class prepared to take responsibility for your own learning. I can provide resources, opportunities, advise, insight and support (moral and otherwise), but the only person who can help you to truly succeed and thrive in this class is yourself.

**Completion of this packet is required, and will be due the first day of school. The packet is graded and will count for 50% of your first test score** (First Test will be the third day of class and will cover foundational material that you already know from STEM chem – the contents of this packet). Use the check sheet at the end of the packet to be sure you have completed all the necessary work and use that sheet as the cover page for the work you will be turning in.

**Packet Contents:**

* **REFERENCE** (you should read and be familiar with all of the content in these reference pages)
	+ Underlying Philosophy of the course
	+ Obtaining a High Final Grade
* **REVIEW** (this is the content you need to complete and turn in on the first day of school)
	+ Things you should know (annoying but useful memorization)
	+ Vocabulary
	+ Basic Review Problems (these are examples of things you should know how to do)
		- Lab Safety
		- Topic 1: Stoichiometric Relationships
		- Concept Review
			* Topic 2: Atomic Structure
			* Topic 3: Periodicity
			* Topic 4: Chemical Bonding & Structure
			* Topic 5: Energetics and Thermodynamics
			* Topic 6: Chemical Kinetics
			* Topic 7: Equilibrium
	+ Challenge Problems

**Separate packet – Topic 1 Text** – We will not be directly covering topic 1 in class so be sure you know this material (it should all be review). Do the problems from this chapter (key included).

**Internet Resources:** Khan Academy Chemistry, Chemguide – UK, Also my website has links to many useful resources.

\*\***I will try to email you all to let you know when the key is posted about 2 weeks before school.**

**THINGS YOU SHOULD KNOW**

**Polyatomic ions & Acids and Bases assignment:** Create a set of flash cards and memorize the polyatomic ions and the strong acids and bases listed above. Bring the flash cards to turn in on the first day of school.

**Some Common Polyatomic Ions**

You need to know the names and formulas (including charge) of the following polyatomic ions.

Ammonium ion, NH4+

Hydroxide ion, OH-

Nitrate ion, NO3-

Hydrogencarbonate ion, HCO3-

Carbonate ion, CO32-

Sulfate ion, SO42-

Phosphate ion, PO42-

### Some Common Strong Acids and Bases

You need to know the names and formulas of the following strong acids and bases.

**Strong Acids**

Hydrochloric acid, HCl

Nitric acid, HNO3

Sulfuric Acid, H2SO4

**Strong Bases**

Lithium hydroxide, LiOH

Sodium hydroxide, NaOH

Potassium hydroxide, KOH

Barium hydroxide, Ba(OH)2

**SI Units and Conversions**

You need to know all of the SI units below and how to convert between magnitudes.

|  |  |  |
| --- | --- | --- |
| **Property** | **Unit** | **Symbol** |
| **Mass** | **gram** | **g** |
| **Time** | **second** | **s** |
| **Temperature** | **Kelvin** | **K** |
| **Volume** | **cubic meter** | **m3** |
| **Pressure** | **Pascal** | **Pa** |
| **Energy** | **Joule** | **J** |



**Vocabulary**

**Vocabulary Assignment:** Use a trusted source on the Internet and/or your STEM chem notes/knowledge to define the following terms in your own words. Create a project of your choice (foldable, comic, story, list, flash cards …) that shows understanding of all of the below terms to turn in.

Stoichimoetry

Mole ratio

Avogadro’s constant (number)

Molecular formula

Empirical formula

Element

Atom

Compound

Proton

Neutron

Electron

Isotope

Ion

Relative atomic mass

Period (on the PT)

Group (on the PT)

Transition elements

Alkali metals

Alkaline earth metals

Halogens

Noble gases

Ionization energy

Atomic radius

Electronegativity

Physical property

Physical change

Chemical property

Chemical change

Melting point

Boiling point

Ionic bond

Covalent bond

Cation

Anion

Conductivity

Sublimation

Reactants

Products

Solute

Solvent

Solution

Precipitate

Molarity

Aqueous

Saturated

Unsaturated

STP

Kinetic Molecular Theory

Catalyst

Chemical reaction

**Lab Safety**

**Lab Safety Assignment:** Complete the activities listed below.

1. Watch a couple chemistry lab safety videos on YouTube and compile one page of notes that summarize everything you should know about lab safety.
2. Choose two accident scenarios from the list below and demonstrate (with a paragraph, comic, flow chart, etc …) that you know how to respond to the situation.
	1. A stock bottle of a chemical tips over and breaks.
	2. A Bunsen burner catches some papers on fire at your lab station
	3. A students sleeve catches fire
	4. Some chemical splashes and gets on your face and clothes
	5. You knock over your beaker full of boiling water and it breaks
3. On a separate sheet of paper, identify the following lab equipment and give an example of what it might be used for.

a.  b.  c.d. e.  f.  g.  h.

**TOPIC 1: STOICHIOMETRIC RELATIONSHIPS**

**Topic 1 Assignment:** On a separate sheet of paper, solve the following problems **in addition to all of the problems from the end of the Topic 1 text included in this packet**, showing all of your work. Include units and the appropriate number of significant figures in your answers. If you are struggling, use the Internet sources provided above and the chapter included in this packet to review (remember we will not be covering this topic in class and it will be the primary content on the first exam).

**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. dm3 to liters.

**5)** How many significant figures are in the number 4.0070 x 1012?

**6)** An object has a mass of 40.1g and occupies a volume of 8.20 cm3. What is the density of the object?

**7)** Calculate the percent yield if 28.0g of MgCl2 is produced, but 32.0g of MgCl2 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, C2H5OH?

**12)** What is the empirical formula of glucose, C6H12O6?

**13)** A compound with an empirical formula of CH2 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, NH3, 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)** What volume of 18.0M sulfuric acid is required to prepare 16.5dm3 of 0.126M sulfuric acid?

**CONCEPT REVIEW**

**Concept Review Assignment:** On a separate sheet of paper, 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. 127I

**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 electron configurations for Na, Al, and Cl1-

**9)** Draw dot diagrams for Nitrogen and Fluorine.

**10)** Draw the Lewis structures for NH3 and CO2.

**11)** Discuss how intermolecular forces determine the physical properties of a substance.

**12)** Write and balance chemical equations for:

a. The combustion of methane

b. The single replacement reaction of zinc and hydrochloric acid

c. The double replacement reaction of sodium hydroxide and barium nitrate.

d. The decomposition of dinitrogen pentoxide.

**13)** Compare and contrast endothermic and exothermic reactions

**14)** Why are aqueous solutions of ionic compounds considered electrolytes?

**15)** Define collision theory and identify the factors that effect the rate of a reaction.

**16)** Consider the following reaction: N2(g) + 3H2(g)  2NH3(g) ∆H = -93 kJ/mol

a. How would increasing the volume of the container affect the equilibrium? the value of Kc?

b. How would increasing the temperature affect the equilibrium? the value of Kc?

c. How would removing NH3 affect the equilibrium? the value of Kc?

**Challenge Problems**

**Challenge Problem Assignment:** On a separate sheet of paper, solve the following problems. These “challenge” problems are designed to make you use all of your chemistry knowledge to solve an integrated problem. I would follow the following procedure when approaching these problems:

1. Dissect the problem
	1. Identify the question being asked
	2. Identify what information the problem is giving you
2. Make a plan to solve
	1. Determine what information you need to answer the question
	2. Determine what you need to do the get the information from step 3
3. Solve the problem
	1. Do the work identified in step 4
	2. Answer the question (Using the information from the above steps)
4. Check to be sure your answer makes sense.
5. The white limestone cliffs of Dover, England contain a large percentage of calcium carbonate. A sample of limestone with a mass of 84.4g reacts with an excess of hydrochloric acid to form calcium chloride water and carbon dioxide gas. The mass of calcium chloride formed from this reaction is 81.8g, what is the percentage of calcium carbonate in the limestone?
6. Two elements are to be combined to form a balanced compound. The first element, M (fictitious), has two valence electrons. The second (fictitious) element, X, has five valence electrons. Show, using Bohr models and describe using words how many M’s and how many X’s will come together to form a balanced ionic compound.
7. The following information concerns six consecutive elements in the periodic table. Study the information carefully and then identify each element.

**Element A** is a diatomic gas at room temperature. It combines with element B to form a compound B2A.

**Element B** reacts with water to produce heat and causes rapid movement across the surface of the water. Element B reacts with element F to form the compound BF.

**Element C** is a diatomic gas at room temperature. 22.4 liters of the gas at 0°C and a pressure of 1.0 atm weighs 28.0g.

**Element D** is a gas that does not form compounds with anything.

**Element E** is a non-metal solid that in some forms can conduct electricity moderately. It combines with element A to form common compounds EA and EA2.

**Element F** exists as a diatomic gas at room temperature. It is the most reactive nonmetal of all the elements in this question.

1. A fundamental feature of stoichiometric calculations and using dimensional analysis is the canceling of units. Using the following equation and constant prove that the units do in fact cancel.

**R = 8.31 J K-1 mol-1 , pressure in Pa, temperature in K, n in mols, volume in m3**

The ideal gas law states that PV=nRT, solve for R and prove that the units are equal on both sides of the equation. (some research into units may be needed here, the Internet will help)

**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_per\_\_\_\_\_date\_\_\_\_\_\_\_\_**

**Pre IB Chemistry Summer Review Packet - 2015 Check Sheet**

**Completed Review Work is Due on the First Day of Class.**

**To be considered complete all problems must be attempted with all work shown.**

(Please check off each item when you have it completed, leave the points section for me.)

* Polyatomic ions & Acids and Bases assignment /5pts
* Vocabulary Assignment /5pts
* Lab Safety Assignment /5pts
* Topic 1 Assignment /10pts

 (Including Topic 1 Practice Problems pg. 52-55)

* Concept Review Assignment /5pts
* Challenge Problem Assignment /10pts

Total /40pts

**Turn this page in stapled to the top of your packet of review work.**