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Lawrence High School's AP Chemistry 2022 Summer Jumpstart

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To incoming AP Chemistry Students:

Hello! I am excited that you signed up to take AP Chemistry this school year! This summer assignment is designed to help you start AP Chemistry with your best foot forward, and prepare you for the challenging work that begins very early in the school year.

To be most successful, you need to have mastered the content covered in the Chemistry or Honors Chemistry course. Students who have taken CP Chemistry prior to enrolling into AP Chemistry may not have experienced the same rigor and/or content. Typically, the Honors classes cover additional skills, concepts and topics. As a result, you may find some of the AP information new to you rather than an extension of Honors Chemistry, which are foundational to the AP Chemistry program. Regardless of your prior Chemistry class, this course will require you to dedicate more time to studying, but with hard work all students have the potential to be successful in AP Chemistry.

This material needs to be fresh and current when school starts. We recommend that you begin and work on this Summer JumpStart assignment throughout the month of August and establish consistent study habits to be fluent with the content included in this assignment. If you complete the assignment before August, you should revisit the material and assignment before school begins.

You need to enter AP Chemistry prepared. This assignment is designed to review and reinforce essential skills/concepts from Chemistry Honors, and prepare you for a review assessment which will be given within the first few weeks of school. While I know that sounds stressful to have a test in the beginning weeks of school, but the purpose of the assessment is to ensure you fully understand the foundational Chemistry concepts that we will build upon for the rest of the school year. This assignment will be due no later than midnight September 25, 2022. Your instructor will clarify the due date for you in class.

To get started, please do the following:

Join our Remind:

1) Text 81010 with the message @apchemzuc

Join our Google Classroom:

1) Sign up for AP Chemistry google classroom, by using class code: “rebd7q3”
2) Additional resources will be posted sporadically throughout the summer but we will use Google Classroom as our central hub for information/assignments.

Review assignment

1) Read and familiarize yourself with Chapters 1-3 of the textbook, posted in Google Classroom
2) Complete the assignment provided.

Scoring/Grading

- Show work for all calculations, as partial credit may be awarded for correct work with an incorrect answer.
- Your grade will be based on completeness and accuracy.

RECOMMENDED Resource:
Viziscience offers a ***FREE*** summer prep course for any student taking AP Chemistry. While this is not being checked or graded, it goes through all the necessary material to 1) complete this packet 2) prepare for AP Chemistry. The course is flexible so you can work at your own pace. To enroll, go to https://course.viziscience.com/ and sign up with your school gmail account. You can enroll in AP Chem Summer Prep Course 2022 with code "jzuczek_22D". If you have any issues, please send me an email.

Additional Resources

- chemmybear.com
- khanacademy.org
- chemtutor.com
- Crash Course channel on youtube.com
- Tyler Dewitt channel on youtube.com

Task 1:

Master the names of the elements and their corresponding symbols

- You need to know elements 1-56, plus Pt, Au, Hg, Pb, Rn, Fr, Ra, U, Pu
- Many of these elements you will already know
- Making flashcards is helpful!
- It's important to know these elements because the periodic table you are provided has only the symbols and not the names of the elements. *Note: The AP Periodic Table & Reference sheets are posted to our Google Classroom -> Classwork -> 0 H. Chem. Review Resources -> R1 Periodic Table (AP Version)*

Task 2:

Master the ionic charges of the basic ions

- Think about valence electrons
- Think about the common elements/ions in that group
    - Group 1 ions = +1
    - Group 2 ions = +2
    - Group 15 (5A) ions (N and P) = -3
    - Group 16 (6A) ions (O and S) = -2
    - Group 17 (7A)/Halogens = -1
    - Zn = +2
    - Ag = +1
    - Cu = +1 or +2
    - Fe = +2 or +3
    - Pb = +2 or +4
    - Sn = +2 or +4
- *See also our Google Classroom -> Classwork -> 0 Review for H. Chem Resources -> R12 Ion Periodic Table*

Task 3:

Master the names, symbols, and charges of the Polyatomic ions below:

- Oxyanions – polyatomic containing oxygen, names end in –ate or-ite
- - ate is used for the most common form
- - ite is used for the form with the same charge, but one less oxygen
    - Example:
        - NO_3^- = nitrate
        - NO_2^- = nitrite
- Prefixes are also used
    - Per – indicates one more oxygen than the –ate form
    - Hypo – indicates one fewer oxygen than the –ite form
    - Example:
        - ClO_4^- perchlorate (b/c it has one more O than the –ate form)
        - ClO_3^- chlorate (b/c it is the most common)
        - ClO_2^- chlorite (b/c it has one less oxygen than –ate form)
        - ClO^- hypochlorite (b/c it has one less oxygen than the –ite form
    - F, Cl, Br, I all behave the same
        - Therefore, if chlorate is ClO_3^-, the bromate ion is BrO_3^-
        - Simply substitute one halogen for the other
        - If you learn the chlorate series, you also know the bromate, iodate, and fluorate series

- Hydrogen can be added to -2 or -3 ions to make a "new ion" (ie. $H_2PO_4^-$ is dihydrogen phosphate)
- See also our Google Classroom -> Classwork -> 0 Review for H. Chem Resources -> R3 Common Ions

1. Identify the number of significant figures in the following:
    - 738.90 meters _____
    - 0.0304 grams _____
    - 1.4×10^4 joules _____
    - 40 mL _____
2. Calculate the following to the correct number of sig figs, include units:
    - $1.27\ g/5.296\ cm^3$ _____
    - 12.2 g + 0.38 g _____
    - 2.1 m x 3.215 m _____
    - 17.6g – 2.838g + 110.77g _____

3. The density of bismuth metal is 9.80 g/cm^3. What is the mass of a sample of bismuth that displaces 7.21mL of water to the proper number of significant digits?

4. Perform the necessary calculations to convert temperature:

Fahrenheit	Celsius	Kelvin
32.0 °F		
	37.0 °C	
		373.15 K

5. Determine the number of protons, neutrons, and electrons in each of the following:
   - Potassium atom _____P _____N _____E
   - Sodium ion _____P _____N _____E
   - Lead-208 _____P _____N _____E
   - Iron (II) ion _____P _____N _____E

6. White gold is an alloy that typically contains 45.0% by mass gold and the remainder is platinum. If 154 grams of gold are available, how many grams of platinum are required to combine with the gold to form this alloy?

7. Explain the following scientific principles in your own words:
   - Law of Conservation of Mass

- Law of Definite Composition

- Law of Multiple Proportions

8. Determine the number of molecules present in a 4.56 mol sample of methane gas (CH_4); then determine its mass in grams.

9. In an experiment, a student gently heated a hydrated copper compound to remove the water of hydration. The following data was recorded:
    1. Mass of empty crucible and cover = 18.82 grams
    2. Mass of crucible, cover, and contents before heating = 23.40 grams
    3. Mass of crucible, cover, and contents after heating to constant mass = 20.94 grams

    Calculate the percent composition by mass of water in the copper compound.

10. A hydrated compound has an analysis of 18.29% Ca, 32.37% Cl, 49.34% water. What is its formula?

11. What mass of copper is required to completely replace silver from 4.00g of silver nitrate dissolved in water by the reaction: $Cu\ (s) + 2AgNO_3\ (aq) \rightarrow Cu(NO_3)_2\ (aq) + 2\ Ag\ (s)$

12. Write the chemical formula for the following:
    - Calcium sulfate _____
    - Ammonium phosphate _____
    - Potassium perchlorate _____
    - Calcium iodide _____
    - Aluminum carbonate _____
    - Magnesium acetate _____
    - Potassium cyanide _____
    - Iron (ii) chromate _____
    - Zinc nitrate _____
    - Sodium oxide _____

13. Calculate the molar mass (g/mol) of:
    - Ammonia
    - Sodium bicarbonate
    - Calcium sulfate dihydrate

14. The molecular formula of morphine, a pain-killing narcotic, is $C_{17}H_{19}NO_3$.
    - Calculate its molar mass.
    - What fraction of atoms in morphine is accounted for by carbon?
    - Which element contributes least to the molar mass?

15. Complete the list of ionic compounds. (Supply the name or formula)
    - Cupric hydroxide _____
    - Strontium sulfate _____
    - Ammonium perchlorate _____
    - $CaCO_3$ _____
    - $Fe(NO_3)_3$ _____
    - Sodium acetate _____
    - H_3PO_4 _____ Acid

16. Calculate the percentage by mass of oxygen in the following compounds:
    - Sulfur trioxide
    - Acetic Acid
    - Ammonium nitrate

Show your work here:

17. In nature, Strontium consists of four isotopes with masses and percent abundance of 83.9134 amu (0.50%), 85.9094 amu (9.9%), 86.9089 amu (7.0%), and 87.9056 amu (82.6%). Calculate the atomic mass of Sr to two decimal places.

18. Determine both the empirical and molecular formulas of the compound with a molar mass of approximately 230 g/mol and the following composition by mass:
10.4% C, 27.8% S, 61.7% Cl

19. Washing soda is a hydrate of sodium carbonate. Its formula is $Na_2CO_3 \bullet xH_2O$. A 2.714g sample of washing soda is heated until a constant mass of 1.006g of Na_2CO_3 is reached. Calculate 'x' in the formula.

20. Write balanced chemical equations for the reaction of sodium with the following nonmetals to form ionic solids:
    - Nitrogen
    - Oxygen
    - Sulfur
    - Bromine

21. Write a balanced equation for each of the following – predict the products where necessary.
    - The reaction of magnesium oxide with iron to form iron (III) oxide and magnesium
    - Solid cyanamide ($CaCN_2$) reacts with water to form calcium carbonate and ammonia gas.
    - Propane (C_3H_8) burns in excess oxygen.

- Nitrogen gas reacts with hydrogen to form ammonia.

- Sodium oxide reacts with water to form sodium hydroxide

- Hydrochloric acid reacts with sodium hydroxide to form sodium chloride and water.

22. Sodium hydroxide reacts with carbon dioxide as follows:

$2NaOH\ (s) + CO_2\ (g) \rightarrow Na_2CO_3\ (s) + H_2O\ (l)$

Which reagent is limiting when 1.85 mol of sodium hydroxide and 1.00 mol carbon dioxide are allowed to react? How many moles of sodium carbonate will be produced?

23. When hydrogen sulfide gas, H_2S, reacts with oxygen, sulfur dioxide gas and steam are produced.

- Write the balanced chemical equation for this reaction, including states of matter.

- How many liters of sulfur dioxide would be produced from 4.0L of O_2 gas?

24. When benzene (C_6H_6) reacts with bromine (Br_2), bromobenzene (C_6H_5Br) is obtained:

$C_6H_6 + Br_2 \rightarrow C_6H_5Br + HBr$

The actual yield of bromobenzene in this reaction is 52.3 g. What is the percent yield of this reaction if the theoretical yield is calculated to be 56.7grams?

25. Name the following molecular compounds:

- P_4O_{10} _____
- NI_3 _____
- CCl_4 _____
- SF_6 _____
- CO_2 _____
- SBr_5 _____

Please reach out if you have any questions about this assignment or anything course-related - jzuczek@ltps.info and I look forward to seeing you all in September!