

Hello and Welcome to AP Chemistry.

I am excited to see some familiar names on my rosters and for those of you whom I don't know yet, I look forward to getting to know you! Please log on to our AP Chemistry Classroom with the following invite link:

<https://classroom.google.com/c/NjE0NDQ0OTk3Nzkw?cjc=wykmp4r>

You will find a copy of this assignment there for you. Please submit this assignment by August 26th on Classroom. Please do not rush through this assignment. You are not going to easily find answers to the questions, you will need to use your knowledge of chemistry and critically think about each question. I am looking to see well-reasoned and well-thought out explanations for these questions.

AP Chemistry is a rigorous and challenging course. We have a lot of material to explore and we will be recalling a lot of information from your year in chemistry class. I know for some of you, it has been more than a year since you have studied chemistry and for others, you are currently wrapping it up. The goal for this summer assignment is to get your brain thinking about chemistry again, think critically about concepts in chemistry and see how it truly affects everything in the world around us. As you read the articles and websites I have selected on two topics, you will work through questions that require you to draw on your previous knowledge of chemistry. I have posted links to excellent, short video explanations of concepts covered in your first year of chemistry at HP. Please take the time to watch the videos and refresh your memory on the concept.

I look forward to a fun and challenging year together. If you have any questions, please do not hesitate to send me an email. I enjoy working with hard-working students. While it is important for you to be independent in an AP class, I do not want you to feel frustrated. So if you start to become frustrated with a question/concept please send me an email and I will help you. sayers@hpregonal.org.

Have a great summer!
Ms. Ayers

Assignment #1 The 2019 Nobel Prize in Chemistry Goes to Chemists Who Developed Lithium Batteries! Read the following two articles and answer the questions below.

<https://www.nytimes.com/2019/10/09/science/nobel-prize-chemistry.html>

<https://www.scientificamerican.com/article/high-energy-award-lithium-batteries-win-2019-nobel-prize-in-chemistry1/>

I am including the following videos to help jog your memory on writing electron configurations and the trends of the PT. If you remember it all, then there is no need to watch them, but if you'd like to refresh your memory, these are excellent.

<https://www.youtube.com/watch?v=2AFPfg0Como&list=PLIIVwaZQkS2op2kDuFifhStNsS49LXkZ&index=5>

<https://www.youtube.com/watch?v=0tP6bV89log&list=PLIIVwaZQkS2op2kDuFifhStNsS49LXkZ&index=6>

Type the answers to these questions in red please.

1. Lithium Batteries replaced the first type of rechargeable battery: Lead-acid. Lithium and lead, while both metals are very different from one another and the differences (and the success of lithium over lead) can be determined and analyzed from using a periodic table and comparing the two elements. Complete the table below, using a periodic table. Refer to the videos to refresh your memory on electron configuration and periodicity.

	Lithium	Lead
Electron configuration		
Noble Gas electron configuration		
Atomic #		
Atomic mass		
# of valence electrons		
Relative ionization energy		

(which is higher/lower)		
Relative Atomic Radius (larger/smaller)		
Relative Electronegativity (Higher/lower)		
Ionic Charge		

2. Dr. Goodenough's contribution was replacing the more explosive compound, titanium disulfide, with cobalt oxide.

a) Write the formula for titanium disulfide:

b) Cobalt (II) oxide and Cobalt (III) oxide can be used in batteries. Write the formula of each respectively:

Need a refresher--watch this video:

<https://www.youtube.com/watch?v=8KSWRy2MMyM>

c) Determine if each compound is ionic, non-polar covalent or polar covalent. Provide your answer and an explanation for how you determined the bond type below.

-Use the website to help you:

https://en.wikipedia.org/wiki/Lithium_cobalt_oxide

3. The batteries are referred to as Lithium batteries or Lithium-ion batteries.

a) Define the term ion.

b) Explain the charge Lithium has as an ion.

c) Explain if Lithium becomes a cation or anion.

4. How is this technology important in relation to Climate Change?

5. Lithium is also harmful to the environment.

a) Explain how.

b) What is a potential solution to this problem? Why are we not doing it?

Assignment #2--What is ozone, the ozone layer, and do we still have a problem? Read the following three articles/websites (do not do the activity on the NASA site, only read and study the data and information):

[https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_\(Physical_and_Theoretical_Chemistry\)/Kinetics/Case_Studies%3AKinetics/Depletion_of_the_Ozone_Layer](https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Kinetics/Case_Studies%3AKinetics/Depletion_of_the_Ozone_Layer)

https://www.nasa.gov/pdf/752034main_Ozone_Hole_Poster.pdf

<https://time.com/5681661/climate-change-ozone-history/>

1. Review the Chapman Cycle presented in the first link. If ozone is constantly being created and destroyed in a natural process, why does it matter if there is less ozone?
2. Explain what chlorine does (use and explain the term catalyst).
3. Is chlorine a reactive element? Discuss how you can answer this question by looking at its placement on the Periodic Table.
4. a) Write the chemical reaction that displays how ozone is created.

b) Write the Lewis Dot Structure for Oxygen and O_2 .
--Need a refresher on this? Watch this (only the first 2 mins)
<https://www.youtube.com/watch?v=amEOUogghuE>

c) Find the molar mass of O_2 and O_3 .

d) Convert 0.5 moles of O_2 and O_3 to grams of each.
--Need a refresher? Refer to this website:
[https://chem.libretexts.org/Bookshelves/Introductory_Chemistry/Book%3A_Introductory_Chemistry_\(CK-12\)/10%3A_The_Mole/10.04%3A_Conversions_Between_Moles_and_Mass](https://chem.libretexts.org/Bookshelves/Introductory_Chemistry/Book%3A_Introductory_Chemistry_(CK-12)/10%3A_The_Mole/10.04%3A_Conversions_Between_Moles_and_Mass)
5. How is ozone measured?

6. In the Time interview with Solomon, she states that the ozone layer is an environmental success story due to the timely response. Look at the resource (#2) from NASA and use the data provided to defend/explain this statement.
 7. What historical parallel does Solomon recognize in today's climate change activism?
 8. Why does Solomon believe people acted quickly and effectively to solve the ozone issue and we are not seeing that response for climate change?
 9. What do scientists predict will happen to the "hole" in the ozone layer over the next 50 years? Use the data presented in the NASA website to defend your answer.
10. In your opinion, how can we turn the current Climate Change challenge into a similar success story?