

# POSNACK

S C H O O L

Summer Assignment 2021 - 2022 • AP Chemistry

Welcome to AP Chemistry! This class is going to be extremely interesting, challenging, fast-paced, and of course, FUN! It is impossible to cover all of the material required by the AP College Board in the time allotted, so you have some work to do over the summer. The due date for this summer assignment is the first day of class August 2021 (or sooner). Please be prepared to take a summative assessment on this material by the end of the first week of school. Please complete the following questions (#1 - #25) using a calculator, the periodic table, and any other tutorials/videos provided.

**Concept: Mass, Moles, Atoms Conversions, and Limiting Reactants. Use these video tutorials to help answer questions #1-4**

Limiting reactant tutorial: <https://www.youtube.com/watch?v=j2OfDUboqDg>

Calculating Excess of Limiting Reactant: [https://www.youtube.com/watch?v=oCq\\_X4ESdBk](https://www.youtube.com/watch?v=oCq_X4ESdBk)

Limiting Reactant Practice Problem video: <https://www.youtube.com/watch?v=dQD-sC5oWao>

Percent Yield Calculations: <https://www.youtube.com/watch?v=tf7KzG6qCZY>

Take the reaction:  $\text{NH}_3 + \text{O}_2 \rightarrow \text{NO} + \text{H}_2\text{O}$ .

In an experiment, 3.25 g of  $\text{NH}_3$  are allowed to react with 3.50 g of  $\text{O}_2$ .

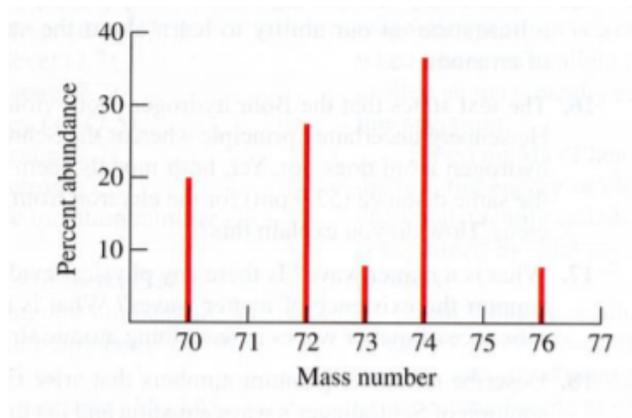
- 1.) Which reactant is the limiting reactant?
- 2.) Which is the excess reactant and how much of the excess reactant remains after the reaction?
- 3.) How many grams of NO are formed?
- 4.) If 1.75 g NO are actually produced, what is the percent yield of NO for this reaction?

## Mass Spectrometry

Spectrometry tutorial video: <https://www.youtube.com/watch?v=sTi--ixdAME>

Spectrometry video of common AP exam questions: [https://www.youtube.com/watch?v=O\\_BV-kaGYw8](https://www.youtube.com/watch?v=O_BV-kaGYw8)

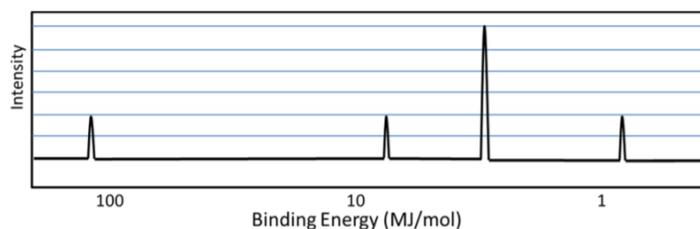
5.) The atomic masses of the five naturally occurring isotopes of germanium are germanium-70, 69.9243 amu; germanium-72, 71.9217 amu; germanium-73, 72.9234 amu; germanium-74, 73.9219 amu; germanium 76, 75.9214 amu. Use these values and data from the accompanying bar graph mass spectrum of germanium to determine a weighted average atomic mass of germanium.



PES tutorial: [Chp 7 Photoelectron Spectroscopy \(PES\) for AP Chemistry Review - YouTube](#)

PES tutorial and example problems: [https://www.youtube.com/watch?v=NRIqXeY1R\\_I](https://www.youtube.com/watch?v=NRIqXeY1R_I)

## Photoelectron Spectroscopy (PES)



6.) What is the e- configuration of this element?

7.) Identify the element.

## Naming and Forming Ionic and Covalent Compounds

8.) What is the formula of the following compound: Copper (II) Phosphate

9.) What is the name of the following compound:  $(\text{NH}_4)_2\text{SO}_4$

10.) What is the name of the following compound:  $N_3S_8$

11.) What is the formula for the following compound: pentaphosphorus heptafluoride

### Electron Configurations

Video about orbital notation e- configuration: <https://www.youtube.com/watch?v=wTm2mst-The>

E- configuration using exponent notation: <https://www.youtube.com/watch?v=ov2ZHoXIBF0>

12.) Which of the following e- configurations violates the Aufbau Rule?

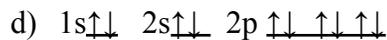
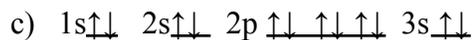
- a)  $1s\uparrow\downarrow$   $2s\uparrow\downarrow$   $2p\uparrow\downarrow\uparrow\downarrow\uparrow\downarrow$   $3s\uparrow\downarrow$
- b)  $1s\uparrow\downarrow$   $2s\uparrow\downarrow$   $2p\uparrow\downarrow\uparrow\downarrow\uparrow\downarrow$   $3s\uparrow\downarrow$   $3p\uparrow\uparrow\uparrow$
- c)  $1s\uparrow\downarrow$   $2s\uparrow\downarrow$   $2p\uparrow\downarrow\uparrow\downarrow\uparrow\downarrow$   $3s\uparrow$
- d)  $1s\uparrow\downarrow$   $2s\uparrow\downarrow$   $2p\uparrow\downarrow\uparrow\downarrow\uparrow$   $3s\uparrow$

13.) Which of the following e- configurations violates the Pauli Exclusion Principle?

- a)  $1s\uparrow\downarrow$   $2s\uparrow\downarrow$   $2p\uparrow\downarrow\uparrow\uparrow\uparrow\downarrow$   $3s\uparrow\downarrow$
- b)  $1s\uparrow\downarrow$   $2s\uparrow\downarrow$   $2p\uparrow\downarrow\uparrow\downarrow\uparrow\downarrow$   $3s\uparrow\downarrow$   $3p\uparrow\uparrow\uparrow$
- c)  $1s\uparrow\downarrow$   $2s\uparrow\downarrow$   $2p\uparrow\downarrow\uparrow\downarrow\uparrow\downarrow$   $3s\uparrow\downarrow$
- d)  $1s\uparrow\downarrow$   $2s\uparrow\downarrow$   $2p\uparrow\downarrow\uparrow\downarrow\uparrow\downarrow$   $3s\uparrow$

14.) Which of the following e- configurations violates Hund's Rule?

- a)  $1s\uparrow\downarrow$   $2s\uparrow\downarrow$   $2p\uparrow\downarrow\uparrow\downarrow\uparrow\downarrow$   $3s\uparrow\downarrow$
- b)  $1s\uparrow\downarrow$   $2s\uparrow\downarrow$   $2p\uparrow\downarrow\uparrow\downarrow\uparrow\downarrow$   $3s\uparrow\downarrow$   $3p\uparrow\downarrow\uparrow\downarrow$

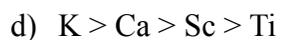
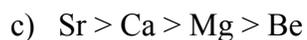


### **Ionization Energy, Electronegativity, and Atomic Radii**

15.) When comparing Ionization Energy between Potassium (K) and Calcium (Ca), which element has the higher 1st ionization energy and why?

16.) When comparing Ionization Energy between Potassium (K) and Calcium (Ca), which element has the higher 2nd ionization energy and why?

17.) Of the following, which is the correct order for decreasing electronegativity?



18.) Explain the Atomic Radii trend for neutral atoms as you go down a group. Use examples to justify your answer.

19.) Explain the Atomic Radii trend for ions as you go left to right across a period. Use examples to justify your answer.

### Percent Composition by Mass

In 1987, the first substance to act as a superconductor at a temperature above that of liquid nitrogen (77K) was discovered. The formula of this substance is  $\text{YBa}_2\text{Cu}_3\text{O}_7$ . Calculate the Percent by Mass of each element in this material. **You must show all of your work for full credit!**

20.) %Y

21.) %Ba

22.) %Cu

23.) %O

### Empirical and Molecular Formulas

24.) A compound contains 47.08% Carbon, 6.59% Hydrogen, and the rest Chlorine by mass; the molar mass of the compound is 153 g/mol. What are the empirical and molecular formulas of the compound? **You must show all of your work for full credit!**

### Balancing Chemical Equations

25.) Balance the following equation:

