

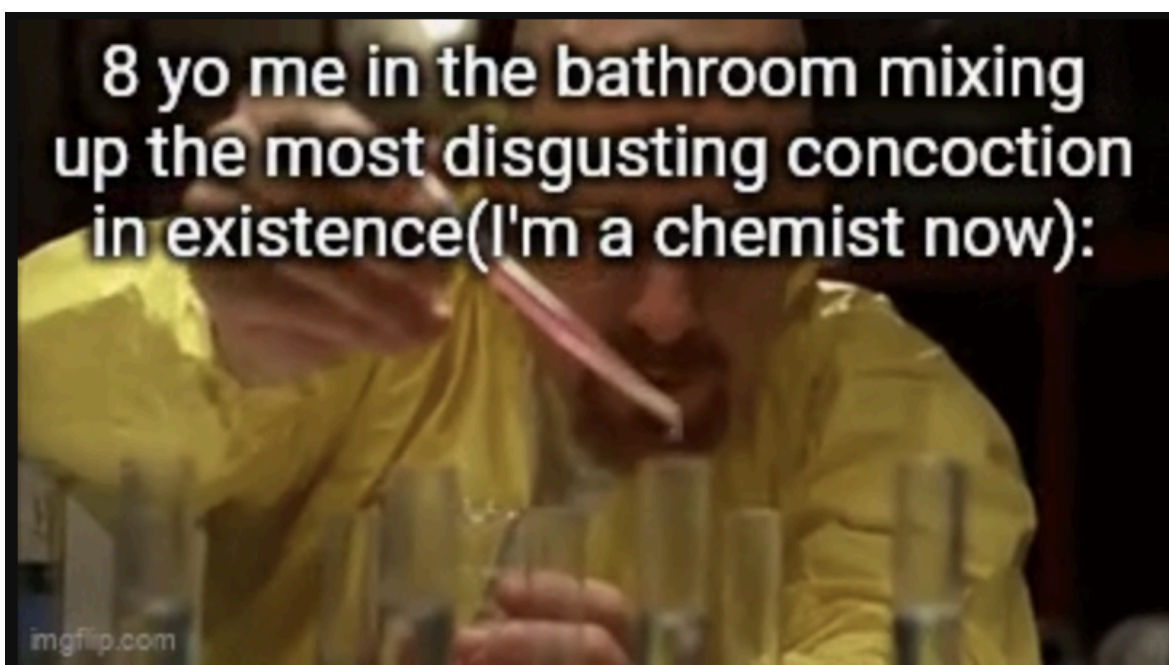
Name: \_\_\_\_\_ Grade Level: \_\_\_\_\_

## AP CHEMISTRY SUMMER PACKET ASSIGNMENT 2025-2026

### Taking AP Chemistry next school year?

To be successful in AP Chemistry, a solid understanding of general chemistry concepts is essential. To help prepare you, a summer assignment is **required** for all prospective AP Chemistry students. This assignment will be followed by a **diagnostic exam** at the start of the school year, based on the material covered in the packet (your study guide!). Please be sure to set aside adequate time over the summer to complete it thoroughly.

You may use a separate sheet of paper to complete this packet.

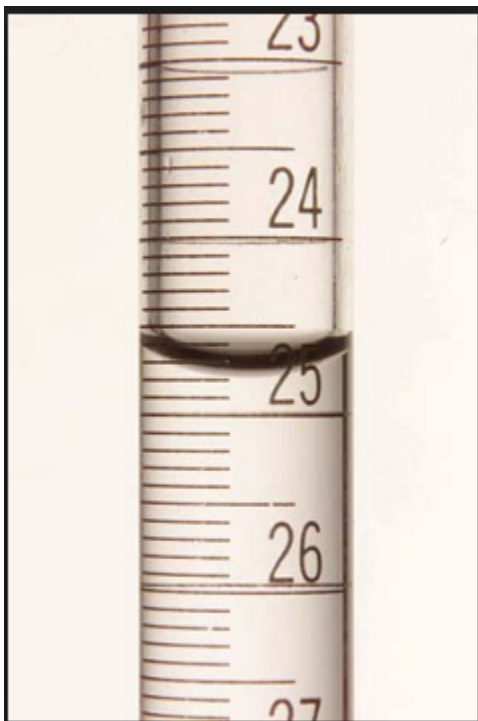


# AP Chemistry

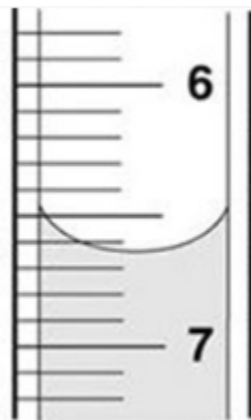
## Thou Shalt Not Forget Questions

### Unit 1

- What type of change separates a compound into elements?
  - What type of change separates a mixture into its components?
- Filtering separates mixtures based on differences in what property?
- Distillation separates mixtures based on differences in what property?
- Chromatography separates mixtures based on differences what property?
- In paper chromatography, if water is used as the “mobile phase”, what kind of substance will move moves up the farthest: something polar or something nonpolar?
  - In paper chromatography, if a nonpolar substance is used as the “mobile phase”, which component of a mixture will move moves up the farthest: something polar or something nonpolar?
- What type of change conserves mass: chemical, physical, both or neither?
- What is the volume of liquid in the buret?



- What is the volume of liquid in the buret?



8. a) Which piece of glassware is the most precise: beaker, burette, or graduated cylinder?  
b) Which piece of glassware is the least precise: graduated cylinder, beaker, or burette?  
c) List these pieces of glassware from most precise to least precise: burette, beaker, graduated cylinder  
d) Which piece of glassware only has one line on it to so it can only be used to measure one specific volume?
  9. What is the equation for calculating the density of a substance?
  10. The % composition by mass of which substance does not change: het. mixture, ho. mixture or compound?
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## Unit 2

1. a) When an electron is in a higher/lower energy level, is it closer or farther away from the nucleus?  
b) When an electron is in a higher/lower energy level does it have more or less Coulombic attraction to the nucleus?  
c) When an electron is in a higher/lower energy level, is it easier to remove or harder to remove?  
d) When an electron is in a higher/lower energy level, does it have a higher or lower 1st ionization energy?  
e) Why is a calcium atom larger than a magnesium atom?
2. a) Moving across a row (L to R) on the periodic table, does  $Z_{\text{eff}}$  increase, decrease, or stay the same?  
b) Moving across a row (L to R) on the periodic table, are the valence electrons more or less attracted to the nucleus?  
c) Moving across a row (L to R) on the periodic table, does the atomic radius increase or decrease?  
d) Moving across a row (L to R) on the periodic table, does the ionization energy increases or decrease?  
e) Why do atoms get smaller moving across a row (L to R) on the periodic table?
3. a) When reading a PES graph, what does the height of a peak represent?  
b) When reading a PES graph, a larger binding energy means that the electrons are closer or farther from the nucleus?
4. Which orbital comes after 4s? 3d? 4p? 5s?
5. a) Which electrons are removed first when making a cation? s, p, d, or f?  
b) Arrange these electrons in the order in which they are removed when forming a cation: s, p, d, f.
6. a) Isotopes of an element have the same number of \_\_\_\_\_, but different number of \_\_\_\_\_.  
b) What makes an isotope of an element different from one another?
7. a) What do mass spectroscopy graphs measure?  
b) What instrument measures the atomic masses of the isotopes of an element?

8. a) Elements in the same group (vertical columns) have similar \_\_\_\_\_.
  - b) Elements in the same \_\_\_\_\_ have similar chemical and physical properties.
  9. Is a gallium/hydrogen/uranium a metal, nonmetal or metalloid?
  10. a) Are cations/anions larger or smaller than their atoms?
  - b) Why are anions larger than their atoms?
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### Unit 3

1. What type of bond forms between hydrogen and chlorine: polar covalent, nonpolar covalent., ionic, metallic or h-bond?
  2. a) Ionic bonds are formed between what types of elements?
  - b) When forming an ionic bond, which element gains/loses electrons?
  3. As the electronegativity difference between 2 atoms increases, what happens to the polarity of the bond?
  4. Combustion reactions produce what two substances?
  5. Name the 7 diatomic elements.
  6. a) The simplest whole # ratio of the atoms in a compound is called the \_\_\_\_\_ formula.
  - b) Complete the rhyme for calculating the empirical formula for a compound: “% to mass, mass to mole, \_\_\_\_\_, \_\_\_\_\_, times ‘til whole.”
  7. Give a possible molecular formula for the following compound:  $\underline{AB_3} / \underline{A_2B}$
  8. What is the formula for calculating % yield?
  9. What is the formula for calculating % error?
  10. What is a limiting reactant?
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### Ch. 10 Gases

1. Why are all gas mixtures homogeneous?
  2. Why are gases compressible?
  3. What causes gas pressure?
  4. P and V are inversely or directly related?
  5. T and V are inversely or directly related?
  6. T and P are inversely or directly related?
  7. In the formula  $PV=nRT$ , what are the units for P, V, n, and T
  8. One mole of an ideal gas = \_\_\_\_\_ Liters at STP.
  9. Gas pressure and # of moles are inversely or directly related?
  10. a)  $dRT/P$  equals what quantity?
  - b) The “d” in  $dRT/P$  has what metric units?
  11. The more molar mass a gas has, the faster or slower it moves?
  12. Average Kinetic Energy is another term for \_\_\_\_\_.
  13. What 2 pressures add together when calculating the total pressure of a gas collected by water displacement?
  14. a) Real gases behave most like an ideal gas at what conditions of temperature and pressure?
  - b) What gases deviate from ideal behavior the most/the least: small polar, large polar, small nonpolar, large nonpolar?
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## Ch. 5 Thermochemistry

1. a) exo/endo reactions: (-)/(+)  $\Delta H$ : feels hot/cold; heat is a product/reactant; temperature goes up/down
  2. Breaking bonds/Forming Bonds is endo/exo.
  3.  $\Delta H_{\text{rxn}} = \Delta H_{\text{products}} - \Delta H_{\text{reactants}}$  or  $\Delta H_{\text{reactants}} - \Delta H_{\text{products}}$
  4. If a reaction is exo/endo, then the bonds formed in the products are stronger or weaker than the reactants?
  5. Doubling a reaction?/Reversing a reaction?/Adding reactions? What happens to  $\Delta H$ ?
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## Ch. 8/9 Bonding & Molecular Geometry

1. What is the total # of covalent bonds carbon has to make when drawing a Lewis (e- dot) structure?
  2. What is the bond angle in  $\text{BF}_3$  /  $\text{H}_2\text{O}$  /  $\text{NH}_3$  /  $\text{CO}_2$  ?
  3. What is the hybrid orbital used in  $\text{BF}_3$  /  $\text{H}_2\text{O}$  /  $\text{NH}_3$  /  $\text{CO}_2$  ?
  4. a) Are asymmetrical/symmetrical molecules polar or nonpolar?  
b) Why are asymmetrical/symmetrical molecules polar/nonpolar?
  5. How many sigma and pi bonds are there in a triple bond?  
b) Count the # of sigma and pi bonds in this molecule: (draw an example on the white board)
  6. a) What term do we use for the energy to break the ionic bond in a compound?  
b) What 2 properties affect the lattice energy?  
c) Which ionic compound would have the most lattice energy? large/small ion charges; large/small ion radii
  7. Calculate the formal charges in this compound: (draw an example on the white board)
  8. When drawing a Lewis (electron dot) Structure, after connecting the atoms with single bonds, if you notice that you have too few remaining electrons to give every atom an octet, that's an indication that you are going to have to do what?
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## Ch. 11/13 Properties of Liquids and Solids--IMF's

1. List the 4 IMF's from weakest/strongest.
2. "More polarizable" refers to which IMF?
3. List the IMF's in  $\text{BF}_3$  /  $\text{H}_2\text{O}$  /  $\text{NH}_3$  /  $\text{CO}_2$
4. Draw a representation of a hydrogen bond.
5. Name any 3 properties that increase as IMF's increase.
6. Name 2 properties that decrease as IMF's increase.
7. Which type of solid has the lowest melting/boiling points?
8. Which type of solid will not conduct electricity until it is a liquid or aqueous?
9. a) Give 2 examples of a covalent network solid.  
b) Which type of solid has the highest melting/boiling points?
10. What type of solid always conducts electricity?
11. When a molecular solid melts or boils, which bonds break?
12. a) What type of alloy is made when the radii of the atoms are different/similar in size?  
b) Draw a representation of a substitutional/interstitial alloy using 12 atoms.