AS Chemistry – Honors Chemistry Review Packet
Packet Link (for Videos): https://tinyurl.com/4ht38tmf

Greetings, AS Chemistry Scholars,

It is my distinct pleasure to welcome you to the exhilarating world of AICE Chemistry. As we embark on this educational expedition together, I'd like to take a moment to set the stage for the challenges and triumphs that await you in the coming months.

Let's address the elephant in the room: AS Chemistry is not for the faint of heart. It demands dedication, curiosity, and hard work in abundance. It's a course that will stretch your intellectual boundaries and foster your growth as scholars. While the road ahead might be demanding, the rewards are boundless, and I have full faith that each of you possesses the potential to thrive.

In this academic arena, I ask you to embrace the role of a college student. That means taking charge of your learning journey, actively seeking understanding, and participating in insightful discussions. The level of engagement and initiative you bring to this class will mirror that of a college setting, where independent thinking and self-directed learning are paramount.

As we venture into the intricacies of AS Chemistry, I want to remind you of the solid foundation you built in Honors Chemistry. The material we explore will build upon that groundwork, propelling you toward a deeper understanding of the subject. Furthermore, be prepared for a swift pace. Our class will move briskly, requiring you to stay ahead of the curve and invest considerable time outside of class to master the material.

As your guide on this academic journey, I am committed to supporting your growth and success. I am here to answer questions, provide guidance, and create an environment that fosters exploration and excellence. However, remember that your journey is your own; it will be shaped by your commitment, perseverance, and willingness to step outside your comfort zone.

Let's embark on this exciting adventure with optimism and a hunger for knowledge. Embrace the challenges, relish the moments of discovery, and take pride in the progress you'll make. This year promises to be one of transformation and accomplishment, and I am eager to witness your growth.

Welcome to AS Chemistry—a realm of possibility and growth.

Warm regards,
Mr. Pendola

*These exercises will refresh and fortify the information that you learned in honors chemistry last year. Each section has one or more videos that you can use to review the material. At the end of the first week of school you will have a test on these topics to gauge your preparedness for the course. This test will be graded.

CHEMICAL SYMBOLS AND IONS – Video Refresher

Fill in the blanks in the chart below. Make sure to include charges on the element symbols where needed.

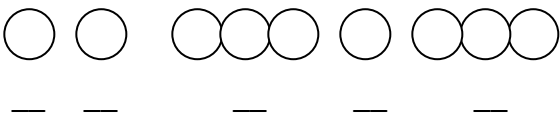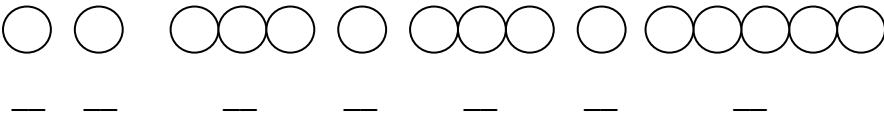| Element Symbol	Atomic number	Mass number	# of protons	# of neutrons	# of electrons
$80200Hg$					
			19	20	18
	24			28	21
		127	53		54
$1531P^{-3}$					
	38	88			36
	79			118	79
$56137Ba_{+2}$					

ATOMIC MASS – Video Refresher

1. Calculate the atomic mass of oxygen if the three common isotopes of oxygen have masses of 15.995 amu (99.759% abundance), 16.995 amu (0.037 % abundance), and 17.999 amu (0.204 % abundance).

2. Calculate the atomic mass of sulfur if the four common isotopes of sulfur have masses of 31.972 amu (95.00 % abundance), 32.971 amu (0.76 %), 33.967 amu (4.22 %), and 35.967 amu (0.014 %).
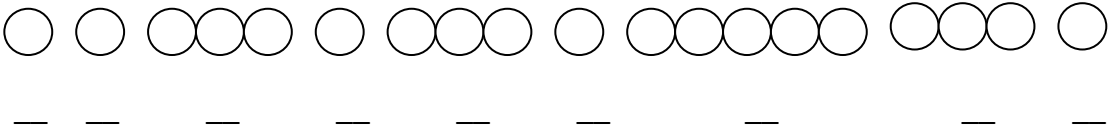
3. Vanadium has an atomic mass of 50.9415 amu. It has two common isotopes. One isotope has a mass of 50.9440 amu and a relative abundance of 99.75 %.
   a) What is the abundance of the other isotope?
   b) What is the mass of the other isotope?

4. Lithium has an atomic mass of 6.941 amu. Lithium has two common isotopes. The one isotope has a mass of 6.015 amu and a relative abundance of 7.49%.
   a) What is the abundance of the other isotope?
   b) What is the mass of the other isotope?

ELECTRON CONFIGURATION – Video Refresher 1, 2, 3

1. Sulfur
   a) Orbital Notation:

   b) Electron Configuration:

2. Iron (Fe)
   a) Orbital Notation:

   b) Electron Configuration:

3. Rubidium (Rb)
   a) Orbital Notation: (see below)

   b) Electron Configuration:

4. Please identify each element associated with the orbital notation or electron configuration. *Note: One "slash" is one electron, two "slashes" are two electrons.*

   a) $1s^2 2s^2$

   b) $1s^2 2s^2 2p^5$

   c)

↑↓	↑↓	↑↓	↑↓	↑↓	↑
1s	2s		2p		3s

5. Write the electron configuration, for Cl and Cl⁻. How many electrons are in the valence energy level?

Cl:

Cl⁻¹:

Which neutral atom is isoelectronic with Cl⁻¹?

How many valence electrons does neutral Cl have?

6. Write the electron configuration, for Sr and Sr^{+2}. How many electrons are in the valence energy level?

Sr:

Sr^{+2}:

Which neutral atom is isoelectronic with Sr^{+2}?

How many valence electrons does neutral Sr have?

LIGHT – Video Refresher

1. What is the energy of a 7.66×10^{14} Hz wave?

2. What is the frequency of a wave carrying 8.35×10^{-18} J of energy?

3. What is the frequency of a wave with a wavelength of 4.103×10^{-7} m?

4. What is the Energy of a wave with a wavelength of 434.2 nm?

5. **Circle the atom with the larger first ionization energy:**

    a) P   or   S   c) K   or   Li

    b) Al   or   Cl   d) O   or   Te

6. **Circle the atom or ion that is larger:**

    a) F^{-1} or   F   c) Mg^{+2} or   Mg

    b) Cr^{+2} or Cr^{+3} d) P^{-1} or P^{-3}

7. **Circle the atom with the larger electronegativity:**

    a) B   or   In   c) C   or   F

    b) Rb   or   Cs   d) Sn   or   Sb

8. _____ Which of the following is an impossible electron configuration?
    a. $1s^2\ 2s^22p^5$ d. $1s^2\ 2s^22p^6\ 3s^23p^6$
    b. $1s^2\ 1p^62s^2$ e. $1s^2\ 2s^22p^6\ 3s^23p^63d^3$
    c. $1s^2\ 2s^22p^6$

9. _____ Which of the following is the electron configuration from the atoms of a transition element?
    a. $1s^2\ 2s^22p^5$ d. $1s^2\ 2s^22p^63s^1$
    b. $1s^2\ 2s^2$ e. $1s^2\ 2s^22p^63s^23p^5$
    c. $1s^2\ 2s^22p^63s^2\ 3p^64s^23d^{10}$

10. _____ Which of the following is the electron configuration from the atoms of a halogen?
    a. $1s^22s^22p^6$ d. $1s^22s^22p^63s^23p^5$
    b. $1s^2$ e. $1s^22s^22p^63s^2$
    c. $1s^22s^22p^62d^{10}3s^23p^6$

11. _____ Which of the following is the electron configuration from the atoms of an alkaline earth metal?
    a. $1s^22s^22p^53s^2$ d. $1s^22s^22p^63s^23p^63d^5$
    b. $1s^22s^22p^63s^23p^2$ e. $1s^22s^22p^63s^23p^63d^3$
    c. $1s^22s^22p^63s^2$

12. ____ Which of the following lists Ca, As, and Br in order of increasing atomic radius?

a. Br < As < Ca
b. Br < Ca < As
c. Ca < As < Br

d. Ca < Br < As
e. As < Br < Ca

13. ___ Which of the following elements has the largest first ionization energy?

a. As
b. Ca
c. Ga
d. Ge
e. K

Element	Atomic Radius	First Ionization Energy
Sulfur	180 pm	1000 kJ/mol
Phosphorous	-	-

14. ___ Based on periodic trends and the data in the table above, which of the following are the most probable values of the atomic radius and the first ionization energy for Phosphorous, respectively?

a. 242 pm, 1633 kJ/mol
b. 175 pm, 419 kJ/mol
c. 120 pm, 633 kJ/mol
d. 245 pm, 1419 kJ/mol
e. 283 pm, 590 kJ/mol

BONDING – Video Refresher 1, 2, 3, 4 & 5

Substance	Lewis Structural Formula	Molecular Shape		Polarity		Intermolecular Force
		Name	Angle	Bond	Molecule	
a) Br$_2$						
b) H$_2$Se						
c) HF						
d) SiBr$_4$						

Substance	Lewis Structural Formula	Molecular Shape		Polarity		Intermolecular Force
		Name	Angle	Bond	Molecule	
e) PF_3						
f) SiO_2						
g) HCN						
h) PH_3						

15. Draw the structure of the metallic in bonding Strontium.

16. Draw the structure of the ionic in bonding Magnesium Oxide.

Nomenclature – Video Refresher 1, 2 & 3

You are expected to know the ions from the ions list given to you in honors chemistry. You will also be expected to know the symbols for the first 52 elements of the periodic table.

1. NO_2	2. $HClO$
3. $NaBr$	4. $Be(OH)_2$
5. SiO_2	6. SO_3
7. P_2Br_4	8. $KMnO_4$
9. $FeSO_4$	10. $HClO_4$
11. SF_6	12. Cu_2S
13. HCl	14. BF_3
15. H_2S	16. P_4Cl_8
17. Si_3Cl_9	18. Ca_3N_2
19. Ca_3P_2	20. SnS_2
21. calcium sulfide	22. hydrobromic acid.
23. dinitrogen pentoxide	24. diboron tetrabromide.
25. aluminum sulfate	26. phosphoric acid.
27. sulfurous acid	28. potassium carbonate.
29. nitric acid.	30. ammonium oxide.
31. calcium bromate.	32. xenon tetrafluoride.
33. hyrdrobromic acid.	34. pentaphosphorus hexafluoride.
35. silicon dioxide.	36. cobalt(II) hypochlorite.
37. silicon pentanitride.	38. ammonium nitride
39. bromic acid.	40. magnesium hydroxide.

Directions: Determine the molar mass of the following substances.

1. CaO

2. $Zn(NO_3)_2$

3. Cu_2CrO_4

4. $Ba(MnO_4)_2$

5. Na_2S
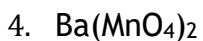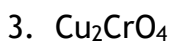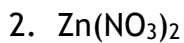
Directions: Use **dimensional analysis** to perform the following calculations. Show all work, include your units, correct significant figures and **box** your final answers.

6. How many molecules are in 13.5 g of sulfur dioxide, SO_2?

7. What is the mass of 2.23×10^{23} atoms of sulfur?

8. How many formula units of silver fluoride, AgF, are equal to 42.15 g of this substance?

9. What is the mass of 8.83×10^{23} formula units of Iron (III) oxide, Fe_2O_3?

10. What is the mass of 9.80×10^{23} formula units of zinc chlorate, $Zn(ClO_3)_2$?

11. How many molecules are in a 189 g sample of carbon tetrabromide, CBr_4?

12. How many formula units are equal to a 0.25 g sample of chromium (III) sulfate, $Cr_2(SO_4)_3$?

13. How many molecules are there in a 42.3 g sample of water, H_2O?

14. What is the mass of 2.23×10^{23} atoms of sulfur?

15. How many molecules of OF_2 would have a mass of 0.132 g?

16. What is the volume of 8.7×10^{23} molecules of chlorine gas (Cl_2) at STP?

17. What is the mass of 3.20×10^{23} formula units of iron (III) oxide (Fe_2O_3)?

1. What is the % of each element in $Ni_3(PO_4)_2$?

2. What is the % of each element in $Al_2(CrO_4)_3$?

3. What is the % of each element in $(NH_4)_2(SO_4)$?

EMPIRICAL AND MOLECULAR FORMULA – Video Refresher

1. What is the empirical formula for a compound that is 67.6% mercury, 10.8% sulfur, and 21.6 % oxygen?

2. What is the molecular formula for a compound that is 26.37 % carbon, 5.541% hydrogen, 52.70 % oxygen and 15.38% nitrogen and has a molar mass of 182.16g?

3. What is the molecular formula for a compound that is 34.31% sodium, 17.93% carbon, 47.76% oxygen and has a molar mass of 134.00g?

CHEMICAL REACTIONS – Video Refresher

1. _____ Cesium Carbonate 🡒

2. _____ Aluminum Sulfate + Calcium Phosphate 🡒

3. _____ Lithium + Water 🡒

4. _____ Aluminum Oxide + Water 🡒

5. _____ $C_4H_{10}O$ + Oxygen 🡒

6. _____ Magnesium + Hydrochloric Acid 🡒

7. _____ Strontium + Lead (IV) Acetate 🡒

8. _____ Rubidium Chlorate 🡒

9. _____ Cadmium + Bromine 🡒

10. _____ Ammonium Hydroxide + Barium Chloride 🡒

Directions: Provide (a) the balanced equation, (b) write out the complete ionic equation, (c) spectator ions and (d) net ionic equation for each of the following. Make sure your balanced equation has the right (aq)'s, (s)'s, (l)'s and (g)'s.

1. Sodium Phosphate + Copper (II) Sulfate ⬚

(a)

(b)

(c) *Spectator Ions:*

(d)

2. Aluminum Bromide + Fluorine ⬚

(a)

(b)

(c) *Spectator Ions:*

(d)

3. Potassium + Magnesium Acetate ⬚

(a)

(b)

(c) *Spectator Ions:*

(d)

4. Ammonium Phosphate+ Cobalt(III) Nitrate ☐

(a)
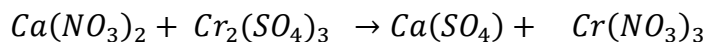
(b)

(c) *Spectator Ions:*

(d)

<u>STOICHIOMETRY</u> – <u>Video Refresher</u>

1. How many moles of calcium nitrate would react with 4.55 moles of chromium (III) sulfate to produce calcium sulfate and chromium(III) nitrate?

$$Ca(NO_3)_2 + Cr_2(SO_4)_3 \rightarrow Ca(SO_4) + Cr(NO_3)_3$$

2. What mass of gallium chloride would react with excess fluorine to produce 78.9 g of chlorine? Gallium fluoride is the other product.

$$GaCl_3 + F_2 \quad GaF_3 + Cl_2$$

3. How many grams of ammonium carbonate are needed to decompose in order to produce 6.52g of carbon dioxide? Ammonium oxide is the other product.

$$(NH_4)_2(CO_3) \rightarrow (NH_4)_2O + CO_2$$
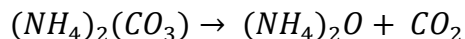
4. What volume of nitrogen gas at STP would react with 37.2 g of magnesium to produce magnesium nitride?

$$Mg + N_2 \quad \square \quad Mg_3N_2$$
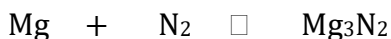
5. How many molecules of sulfur trioxide would react with 68.9 L of water at STP to produce sulfuric acid?

$$SO_3 + H_2O \rightarrow H_2SO_4$$
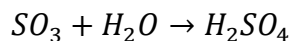
6. What is the maximum number of grams of silver phosphate that can be produced from the reaction of 287 g of silver chlorate with 52.8 g of sodium phosphate?

$$Ag(ClO_3) + Na_3(PO_4) \rightarrow Na(ClO_3) + Ag_3(PO_4)$$
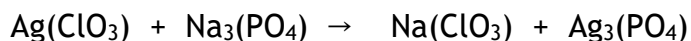
7. How many grams of iron(III) oxide can be produced from the reaction of 108 g of iron with 72.1 g of oxygen gas at STP?

$$Fe + O_2 \rightarrow Fe_2O_3$$
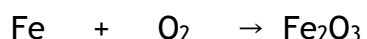
8. a) What is the maximum number of grams of nickel bromide that can be produced from the reaction of 67.8 g of nickel with 37.3 g of bromine?

b) Which reactant is in excess and what mass of this reactant is left over?

c) What is the percent yield if 46.3 g of nickel (II) bromide were actually produced?

$$Ni + Br_2 \rightarrow NiBr_2$$

ACIDS AND BASES – Video Refresher

1. What is the molarity of a solution that contains 1.45 moles of KCl in 1, 250 mL of solution?

2. How many moles of $AlCl_3$ are present in 2.25 L of a 0.15 M solution of $AlCl_3$?

3. How many liters of a 0.352 M solution of $Ca(SO_4)$ would contain 62.1 g of $Ca(SO_4)$?

4. How many grams of $Fe(NO_3)_2$ are present in 555 mL of a 0.650 M solution of $Fe(NO_3)_2$?

5. **Two parts:** Identify the following as **(a) acids or bases** and then **(b) name them.**

   a) HNO_3 e) $Pb(OH)_2$

   b) $Ni(OH)_2$ f) $HClO_4$

   c) HBr g) H_2CO_3

   d) $H_2C_2O_4$ h) $Al(OH)_3$