Name:	
Period:	**Seat #:**

Chapter #5

Bonding and Structure

WS # ✓ if there		Stamped?		Finished Includes work being shown!		Leave for Mrs. Farmer
1		YES	NO	YES	NO	
2		YES	NO	YES	NO	
3		YES	NO	YES	NO	
4		YES	NO	YES	NO	
5		YES	NO	YES	NO	
6		YES	NO	YES	NO	
7		YES	NO	YES	NO	
8		YES	NO	YES	NO	
9		YES	NO	YES	NO	
10		YES	NO	YES	NO	
11		YES	NO	YES	NO	
12		YES	NO	YES	NO	
13		YES	NO	YES	NO	
14		YES	NO	YES	NO	
15		YES	NO	YES	NO	
16*		*This optional worksheet was not printed for you, does not need to be in your packet, it is too long. If you want to print and do some of it that is great! Then include that in your packet.*				

*means doing the problems was optional, but the handout must be in the packet. If you did any of the problems, please include the binder paper after the worksheet handout!

During Remote Learning – if you did not print the worksheets then you will do the work directly on binder paper. CLEARLY label the heading of all binder paper so I know what I am looking at. Including Worksheet Number and Title. If you did not print the (*) optional worksheets then include a blank piece of paper with Worksheet Number and Title as a place holder.

Dougherty Valley HS Chemistry
Bonding and Structure – Bonding and Naming Basics

Worksheet #1

Name: **Period:** **Seat#:**

Answer the following questions:

1) What is the difference between an anion and a cation		**2)** What is the difference between an ionic bond and a covalent bond?
3) What is a valence electron? Why do you think valence electrons are the ones involved in bonding and not core electrons?		**4)** Explain why ionic compounds are electrically neutral
5) Elements within a group have the same number of what?	**6)** Are the majority of elements in the periodic table metals or nonmetals?	**7)** If you have a compound with a high electronegativity difference (one atom high, one atom low) – what type of bond is it?

How many electrons must be gained or lost by each atom to achieve a stable e- configuration:

8) Sr	**9)** Sb	**10)** Si	**11)** S	**12)** Se	**13)** Xe

Which of the following pairs of elements will form ionic bonds, and which will not? Explain why they do, or why the will not.

14) Sulfur and Xenon	**15)** Sodium and Calcium	**16)** Strontium and Sulfur	**17)** Selenium and Chlorine

How many valence electrons are there in each of the following elements AND COMPOUNDS (add up the valence electrons for each atom). Show your addition for the compounds:

18) Ca	**19)** P	**20)** Se
21) NH_3	**22)** NF_3	**23)** $Al_2(CO_3)_3$

Identify if each is an ionic compound, or a covalent molecule

24) LiF	**25)** MgO	**26)** CH_4	**27)** CH_3OH	**28)** NH_3	**29)** H_2O

Explain how to name each type of item:

30) Ionic Compounds	**31)** Covalent Molecules

32) Identify the prefixes for the following numbers:

1	**2**	**3**	**4**	**5**
6	**7**	**8**	**9**	**10**

Name each item:

Formula	*Metals, Nonmetals, Polyatomic Ions?*	*Ionic or Covalent?*	*Name*
33) CH_4			
34) C_2H_6			
35) Ag_2O			
36) SO_3			
37) MgBr			
38) Cu			
39) V			
40) $Ca(SO_4)$	*Polyatomic*	*Ionic*	
41) $(NH_4)_2(CO_3)$			

Dougherty Valley HS Chemistry
Bonding and Structure – Nomenclature Practice

Worksheet #2

Name: **Period:** **Seat#:**

Answer the following questions about compounds and molecules:

1)	Fill in each blank with the word *high* or *low* – you can use the same word multiple times if needed. Covalent bonds form when you have two (or more) atoms with _____________ electronegativity and _____________ ionization energy
2)	Fill in each blank with the word *high* or *low* – you can use the same word multiple times if needed. Ionic bonds form when you have one type of atom with _____________ electron affinity and one type of atom with _____________ ionization energy
3)	Draw a diagram of a metallic substance, showing what is unique about the electrons in such a material. Then draw a second drawing showing how the electrons behave when a charge is applied to the material.

Write the names of the following covalent molecules:

4) P_4S_5		**5)** O_2	
6) SeF_6		**7)** Si_2Br_2	
8) SCl_4		**9)** CH_4	
10) B_2Si		**11)** NF_3	
12) PCl_3		**13)** H_2O	

Write the formulas for the following covalent molecules:

14) Antimony tribromide		**15)** Hexaboron monosilicide	
16) Chlorine dioxide		**17)** Hydrogen monoiodide	
18) Iodine pentafluoride		**19)** Dinitrogen trioxide	
20) Phosphorus triiodide		**21)** Disulfur decafluoride	
22) Dicarbon hexahydride		**23)** Iodine heptafluoride	

Dougherty Valley HS Chemistry
Bonding and Structure – Nomenclature Practice

Write the names of the following ionic compounds:

24) $Ni_3(PO_4)_2$		**25)** FeI_2	
26) MnF_2		**27)** NaCN	
28) CuS		**29)** Li_2O	
30) $BeCl_2$		**31)** TiN	
32) MgO		**33)** NH_4NO_3	
34) Ag_2CO_3		**35)** $Zn(OH)_2$	
36) $Ca(C_2H_3O_2)_2$		**37)** $NaHCO_3$	
38) Mg_3P_2		**39)** $Al_2(CO_3)_2$	

40) **Draw a graph that shows the relationship between the energy of two atoms and the distance between the two when forming a bond** **hint* was in our notes!*	41) **Explain the graph you just drew in the previous question.**

Dougherty Valley HS Chemistry
Bonding and Structure – Bonding with a Classmate

Worksheet #3

Name: **Period:** **Seat#:**

BOND WITH A CLASSMATE!

1) Get an ion and figure out if it is a cation or anion
2) Go around the classroom and find other ions to bond with. Remember, we are making ionic bond so each bond should have ONE cation and ONE anion.
3) Write down the symbol and charge for each bonding cation and anion in the appropriate column.
4) With your partner figure out what the compound is that is formed between the two. Remember to pay attention to oxidation numbers so that there is a neutral charge overall.
5) With your partner write down the name of the compound you formed.
6) You will be told when to rotate and when to switch ion cards

Cation	Anion	Compound	Name
Ca^{+2}	N^{3-}	Ca_3N_2	Calcium nitride

Cation	Anion	Compound	Name

Dougherty Valley HS Chemistry
Bonding and Structure – Writing Neutral Compounds

Worksheet #4

Name: **Period:** **Seat#:**

Answer the following questions about compounds and molecules:

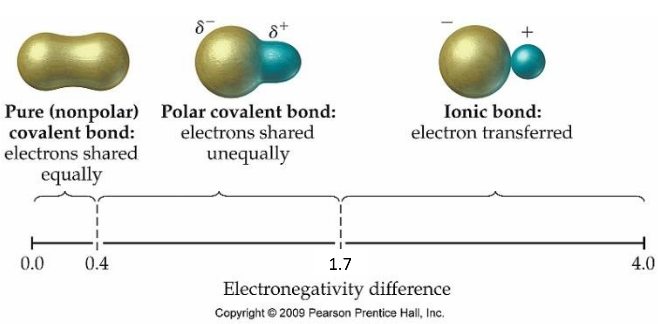
1) What type of charge does a cation have?	**2)** What type of charge does an anion have?	**3)** Why do atoms form ions?

4) What does "neutral compound" mean?	**5)** Draw a cartoon picture using puzzle pieces to represent why LiO is not neutral, but Li_2O is neutral.

Identify if each item is ionic, covalent, or metallic:

6) $(NH_4)_2O$	**7)** N_2O_2	**8)** SO_2
9) P_4O_{10}	**10)** Cu	**11)** $Mg_3(PO_3)_2$

Calculate the electronegativity difference:
You can actually measure how ionic or covalent a bond is by subtracting "electronegativity values." It is a measure of how hard the atom is able to pull on the electrons. If it can pull hard enough then it is an ionic bond because the electrons are considered to have been *transferred.* If they cannot pull hard enough then it is a covalent bond because the electrons are considered to still be shared, if they are shared unequally it is called "polar covalent" meaning it isn't quite ionic yet, but it isn't perfectly shared. Use the following information to determine where each bond lies. Show your calculations to justify your answers.



ΔEN	Ionic character
>1.7	Ionic
0.4-1.7	Polar covalent
<0.4	Covalent
0	Non-polar

12) NO

13) MgO

14) Br_2

15) LiH

16) LiBr

17) H_3P

H = 2.1	*N = 3.0*	*Mg = 1.2*	*Cl = 3.0*	**18)** ClBr
Li = 1.0	*O = 3.5*	*P = 2.1*	*Br = 2.8*	** You can look up electronegativity values online, or you would be given them. You are not expected to memorize the values for each atom, but you should know the range of electronegativity differences and which type of bond that results in.*

Dougherty Valley HS Chemistry
Bonding and Structure – Writing Neutral Compounds

Write the formulas for the following compounds. For these problems you must show your "crossing over" work to earn credit. Don't forget to look for polyatomic ions, don't forget to reduce subscripts when possible, and rewrite your final answer clearly.

19) Beryllium oxide	**20)** Sodium sulfate	**21)** Magnesium hydroxide
22) Copper (I) chloride	**23)** Zinc carbonate	**24)** Ammonium nitrate
25) Iron (III) sulfite	**26)** Vanadium (V) fluoride	**27)** Manganese (IV) nitride

Write the neutral formulas indicated by the chart. The first one was done for you. If you need to still do the "crossing over" method that's ok! You can do it on a piece of binder paper and staple it to this paper. If you can do it in your head that's great! That is the goal!

	Zinc Zn^{2+}	**Iron (II)** Zn^{2+}	**Iron (III)** Fe^{3+}	**Gallium**	**Silver**	**Lead (IV)**
Chloride Cl^-	$ZnCl_2$					
Acetate						
Nitrate NO_3^-						
Oxide						
Nitride						
Sulfate						

Worksheet #5

Name: **Period:** **Seat#:**

Answer the following questions:

1) What is the octet rule? Explain its role in bonding between atoms	**2)** Indicate on top of each atom how many valence electrons each atom has, then below each atom indicate how many electrons must be gained or lost by each of the following atoms to achieve a stable electron configuration Sr Sb Si S Se Xe
3) Which of the following pairs of elements will make COVALENT molecules. Explain why or why not for each pair of elements. *Sulfur & Xenon* *Sodium & Calcium* *Strontium & Sulfur* *Selenium & Chlorine*	

Draw the Lewis Structure for the following atoms:

4) K	**5)** Ba	**6)** C	**7)** S
8) Br	**9)** Li	**10)** N	**11)** Al

Draw the Lewis Structure for the following ionic compounds:

12) KBr	**13)** BaS	**14)** Li_3N	**15)** NaBr

Draw the Lewis Structure for the following molecules:

16) H_2O # Valence e-: # Lone Pairs:	**17)** HF # Valence e-: # Lone Pairs:	**18)** BF_3 # Valence e-: # Lone Pairs:

19) Br_2 # Valence e-: # Lone Pairs:	**20)** HCl # Valence e-: # Lone Pairs:	**21)** ICl # Valence e-: # Lone Pairs:
22) CH_4 # Valence e-: # Lone Pairs:	**23)** PCl_5 # Valence e-: # Lone Pairs:	**24)** N_2H_4 # Valence e-: # Lone Pairs:
25) NH_3 # Valence e-: # Lone Pairs:	**26)** HOOH # Valence e-: # Lone Pairs:	**27)** CH_2Cl_2 # Valence e-: # Lone Pairs:
28) CH_3OH # Valence e-: # Lone Pairs:	**29)** SF_6 # Valence e-: # Lone Pairs:	**30)** NBr_3 # Valence e-: # Lone Pairs:

Dougherty Valley HS Chemistry
Bonding and Structure – Lewis St. Multiple Bonds, & Mixed

Worksheet #6

Name: **Period:** **Seat#:**

Answer the following questions:

1) What are the common elements that can break the octet rule? List them as well as indicate how many e- each can be satisfied with.	**2)** What is an expanded Octet?
3) How many electrons are being shared in a single bond? In a double bond? In a triple bond?	**4)** What are the steps you need to follow in order to draw a Lewis Structure? Make sure you explain how we go about doing double or triple bonds.

Draw the Lewis Structure for the following molecules:

Molecule	Lewis Structure	Description		Molecule	Lewis Structure	Description	
5) HCN		# of Single Bonds	# of Double Bonds	**6) Carbonate Ion**		# of Single Bonds	# of Double Bonds
# Valence electrons		# of Triple Bonds	# of Lone Pairs	# Valence electrons		# of Triple Bonds	# of Lone Pairs
7) C_2N_2		# of Single Bonds	# of Double Bonds	**8) OCN^-**		# of Single Bonds	# of Double Bonds
# Valence electrons		# of Triple Bonds	# of Lone Pairs	# Valence electrons		# of Triple Bonds	# of Lone Pairs
9) NO_2^-		# of Single Bonds	# of Double Bonds	**10) N_2H_2**		# of Single Bonds	# of Double Bonds
# Valence electrons		# of Triple Bonds	# of Lone Pairs	# Valence electrons		# of Triple Bonds	# of Lone Pairs

Dougherty Valley HS Chemistry
Bonding and Structure – Lewis St. Multiple Bonds, & Mixed

11) C_2H_4		# of Single Bonds	# of Double Bonds	12) F_3NO		# of Single Bonds	# of Double Bonds
# Valence electrons		# of Triple Bonds	# of Lone Pairs	# Valence electrons		# of Triple Bonds	# of Lone Pairs
13) H_2CO		# of Single Bonds	# of Double Bonds	14) Phosphate Ion		# of Single Bonds	# of Double Bonds
# Valence electrons		# of Triple Bonds	# of Lone Pairs	# Valence electrons		# of Triple Bonds	# of Lone Pairs
15) ClO_3^-		# of Single Bonds	# of Double Bonds	16) HBr		# of Single Bonds	# of Double Bonds
# Valence electrons		# of Triple Bonds	# of Lone Pairs	# Valence electrons		# of Triple Bonds	# of Lone Pairs
17) CO		# of Single Bonds	# of Double Bonds	18) NO_3^-		# of Single Bonds	# of Double Bonds
# Valence electrons		# of Triple Bonds	# of Lone Pairs	# Valence electrons		# of Triple Bonds	# of Lone Pairs
19) SO_2		# of Single Bonds	# of Double Bonds	20) CF_4		# of Single Bonds	# of Double Bonds
# Valence electrons		# of Triple Bonds	# of Lone Pairs	# Valence electrons		# of Triple Bonds	# of Lone Pairs

Dougherty Valley HS Chemistry
National Mole Day Celebration

Worksheet #7

Name: **Period:** **Seat#:**

Introduction: The date, October 23^{rd}, had been designated as National Mole Day, starting at 6:02 AM. In celebration of this special date, you will be given an opportunity to make atomic cookies in class, but first…

Part I

1) Look up the definition of a mole. The chemistry "mole" not the weird little animal!

2) A mole is sometimes referred to as Avogadro's # when we are writing it as a conversion factor with mole and molecules as our units on the conversion factor. Write Avogadro's # as a conversion factor just like we do for something like inches and feet $\frac{12\ in}{1\ ft}$

3) Using Avogadro's number as a conversion factor, figure out how many molecules are in 3.58 moles of a substance. Show work in the "line method" dimensional analysis set up. Show units, cancel units, get an answer with units and a box!

4) Using Avogadro's number as a conversion factor, figure out how many moles are in 5.45×10^{25} molecules. Show work in the "line method" dimensional analysis set up. Show units, cancel units, get an answer with units and a box!

5) We can figure out how much one mole of something weighs by using the periodic table and atomic masses to calculate the "molar mass." The mass of one atom of Carbon is 12.01 amu but the mass of one mole of Carbon conveniently works out to be 12.01 grams! So the molar mass of carbon is said to be $\frac{12.01\ grams}{1\ mole}$ – which is another conversion factor we can use! Using the molar mass of Bromine, calculate how much 6.79 moles of Bromine would weigh. Show work in the "line method" dimensional analysis set up. Show units, cancel units, get an answer with units and a box!

6) Using the molar mass of the element with the electron configuration $1s^22s^22p^63s^1$ calculate how many moles are in 15 grams of that element. Show work in the "line method" dimensional analysis set up. Show units, cancel units, get an answer with units and a box!

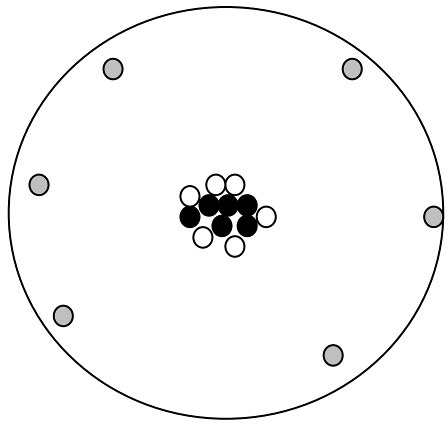
Demonstrate your knowledge of atomic structure by identifying the ion and atom below. Use the key to find the numbers of subatomic particles in each and fill in the spaces. Check this with your teacher before you proceed.

Identify these particles using this key

Proton = ● **Neutron =** ○ **Electron =** ◯

p^+ = ___________
n^0 = ___________
e- = ___________

Mass # =
Atomic # =



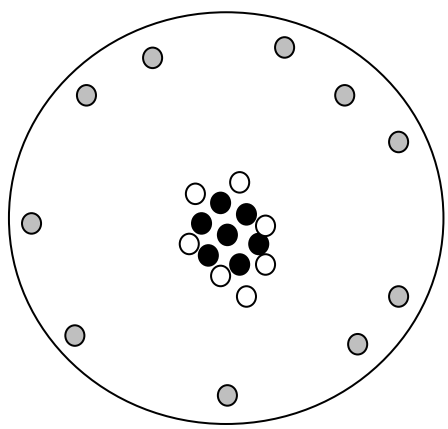
Atom or Ion?

Name of Element:

Charge =

p^+ = ___________
n^0 = ___________
e- = ____________

Mass # =
Atomic # =



Atom or Ion?

Name of Element:

Charge:

Part II

Create your own examples using the materials supplied by your classmates. Do one atom and one ion. Your examples must be for elements below atomic #7. Refer to the list below to determine the correct charge on ions. When directed, check your model with a key before making our "Atomic Cookies." Enjoy!

Ion List

H^+, Li^+, Be^{2+}, B^{3+}, N^{-3}, O^{-2}, F^{-1}

Atom

p^+ = ___________

n^0 = ___________

e- = ____________

Mass # =

Atomic # =

Name of Element:

Charge:

Ion

p^+ = ___________

n^0 = ___________

e- = ____________

Mass # =

Atomic # =

Name of Element:

Charge:

Dougherty Valley HS Chemistry
Bonding and Structure – Mixed Practice

Worksheet #8

Name: **Period:** **Seat#:**

Answer the following questions:

1) What are the common exceptions to the octet rule?	**2)** Which compound has the most ionic character? Explain why. (Think about what periodic trend causes a compound to be ionic in the first place.) LiCl vs. LiF	
3) What kind of bond is likely to form if the atoms have very similar electronegativity differences?	**4)** What type of bond is formed when electrons are delocalized and move throughout the substance?	**5)** What is the formula for Mercury (I) Chloride?
6) If an unknown compound XY has an electronegativity difference of 1.0, what type of bond is it?	**7)** Using the information in Question #6 and the information below, what must the unknown compound XY be? N = 3.0; O = 3.4 C = 2.5; Cl = 3.2; H =2.2	**8)** Do atoms form bonds because they are moving towards higher or lower potential energy?

Provide the information asked for:

1) Sodium Oxide *Type of bond:* *Formula:* *Lewis Structure:*	**2)** Iodine gas *Type of bond:* *Formula:* *Lewis Structure:*
3) Hydrogen cyanide *Type of bond:* *Formula:* *Lewis Structure:*	**4)** Iodine trifluoride *Type of bond:* *Formula:* *Lewis Structure:*

5) NH_4^+ *Type of bond:* *Name:* *Lewis Structure:*	**6)** PCl_5 *Type of bond:* *Name:* *Lewis Structure:*
7) C_2H_2 *Type of bond:* *Name:* *Lewis Structure:*	**8)** XeF_4 *Type of bond:* *Name:* *Lewis Structure:*
9) CH_3OCH_3 *Type of bond:* *Name: Dimethyl ether* *Lewis Structure:*	**10)** CH_3COCH_3 *Type of bond:* *Name: Acetone* *Lewis Structure:*
11) ClF_2^+ *Type of bond:* *Name:* *Lewis Structure:*	**12)** CH_3Cl *Type of bond:* *Name: Methyl chloride* *Lewis Structure:*

Dougherty Valley HS Chemistry
Bonding and Structure – Mixed Practice

Worksheet #9

Name: **Period:** **Seat#:**

Answer the following questions:

1) What are the three types of bonds and how are their electron positions different?	**2)** Why do you need to use prefixes for naming covalent bonds and not for naming ionic bonds?
3) Why does carbon dioxide have two double bonds?	**4)** Why can some elements have more than 8 electrons in their valance shell and what do we call it when they do?
5) List the Roman numerals from 1 to 10.	

Complete the following table:

Formula	Type of Bond	Name
6) **Na_2SO_4**		
7) **SiO_2**		
8)		**Lead (II) nitrite**
9)		**Chromium (III) oxide**
10) **HgO**		
11)		**Iron (II) phosphate**
12)		**Hexaboron silicide**
13) **SCl_4**		
14) **P_4S_5**		
15) **$NaHCO_3$**		

Dougherty Valley HS Chemistry
Bonding and Structure – Mixed Practice

Draw the Lewis Structure for the following molecules:

Molecule	Lewis Structure	Description		Molecule	Lewis Structure	Description	
16) SF_6		# of Single Bonds	# of Double Bonds	17) Sulfate ion		# of Single Bonds	# of Double Bonds
# Valence electrons		# of Triple Bonds	# of Lone Pairs	# Valence electrons		# of Triple Bonds	# of Lone Pairs
18) CH_3OH		# of Single Bonds	# of Double Bonds	19) $BFCl_2$		# of Single Bonds	# of Double Bonds
# Valence electrons		# of Triple Bonds	# of Lone Pairs	# Valence electrons		# of Triple Bonds	# of Lone Pairs
20) O_3		# of Single Bonds	# of Double Bonds	21) BeH_2		# of Single Bonds	# of Double Bonds
# Valence electrons		# of Triple Bonds	# of Lone Pairs	# Valence electrons		# of Triple Bonds	# of Lone Pairs
22) SiI_4		# of Single Bonds	# of Double Bonds	23) K_2SO_3		# of Single Bonds	# of Double Bonds
# Valence electrons		# of Triple Bonds	# of Lone Pairs	# Valence electrons		# of Triple Bonds	# of Lone Pairs
24) $Fe_3(PO_4)_2$		# of Single Bonds	# of Double Bonds	25) NaOH		# of Single Bonds	# of Double Bonds
# Valence electrons		# of Triple Bonds	# of Lone Pairs	# Valence electrons		# of Triple Bonds	# of Lone Pairs

Worksheet #10

Name: **Period:** **Seat#:**

Purpose: To construct a series of compounds using the VSEPR model and to use your model to determine the type of bonding and hybridization, and the geometry around each **central** atom.

Background: The VSEPR model is based on the premise that electron pairs around a central atom will position themselves to allow for maximum separation. Instead of writing an actual Background Paragraph, just answer these questions below.

1) What does VSEPR stand for?

2) Name the seven different structural shapes

3) Explain why pairs of electrons around a central atom repel each other.

Materials:
- Styrofoam Balls
- 2 different colors of Playdough
- Protractor
- Toothpicks
- Color pencils/markers

Procedure: ***(Steps with a * should be completed before you get to class. Steps with a ** should be completed after class.)***

1. ***** Draw Lewis Structure
2. ***** Determine the following for each atom:
   a. Number of lone pairs and bond pairs around the central atom.
   b. AXE formula (A center atom, X bonded atoms, E lone pairs)
   c. Steric Number
3. ***** Using the information from Step 2 and a VSPER chart (which should be memorized!), determine the following:
   a. Electronic Geometry (*linear, trigonal planar, tetrahedral, trigonal bi-pyramidal, or octahedral*)
   b. Molecular Geometry (*linear, trigonal planar, trigonal pyramidal, tetrahedral, bent, trigonal bi-pyramidal, or octahedral*)
   c. Bond angle between the atoms attached to the central atom. (Based on the molecular geometry)
   d. Type of hybridization of the central atom in each molecule – if any (sp, sp^2, sp^3, sp^3d)
4. Construct a 3D model for each compound or ion with the provided materials.
   a. Use the Styrofoam balls as the center atoms (A), the Playdough for your outer atoms (X), and plain toothpicks as lone pairs (E).
   b. Use one toothpick for single bonds, two toothpicks for double bonds, and three toothpicks for triple bonds.
   c. Use your protractor to get the bond angles as close as possible – it's hard to do with playdough and toothpicks, that's ok!
   d. Have someone from your group take a photo of your models, use the index cards to label each model.
      i. ****** Add photos to a Google Doc that will be turned in as a GROUP assignment! Detailed instructions will be given in class.
5. ***** *or* ****** *depending on timing in class* - Sketch a 3D picture of your model.
   a. Needs to show effort, be neat, accurate representation of bond angles, etc.

Molecular Formula	AXE Formula	Lewis Structure	Electronic Geometry	Bond Angle	3D Sketch
NO_3^-					
# Bond Pairs	Steric Number		Molecular Geometry	Hybridization	
# Lone Pairs					

Molecular Formula	AXE Formula	Lewis Structure	Electronic Geometry	Bond Angle	3D Sketch
$SiCl_4$					
# Bond Pairs	Steric Number		Molecular Geometry	Hybridization	
# Lone Pairs					

Molecular Formula	AXE Formula	Lewis Structure	Electronic Geometry	Bond Angle	3D Sketch
CO_2					
# Bond Pairs	Steric Number		Molecular Geometry	Hybridization	
# Lone Pairs					

Dougherty Valley HS Chemistry
Bonding and Structure – Molecular Geometry Activity

Molecular Formula	AXE Formula	Lewis Structure	Electronic Geometry	Bond Angle	3D Sketch
$NClH_2$					
# Bond Pairs	Steric Number		Molecular Geometry	Hybridization	
# Lone Pairs					

Molecular Formula	AXE Formula	Lewis Structure	Electronic Geometry	Bond Angle	3D Sketch
XeF_4					
# Bond Pairs	Steric Number		Molecular Geometry	Hybridization	
# Lone Pairs					

Molecular Formula	AXE Formula	Lewis Structure	Electronic Geometry	Bond Angle	3D Sketch
CH_2O					
# Bond Pairs	Steric Number		Molecular Geometry	Hybridization	
# Lone Pairs					

Dougherty Valley HS Chemistry
Bonding and Structure – Molecular Geometry Activity

Molecular Formula	AXE Formula	Lewis Structure	Electronic Geometry	Bond Angle	3D Sketch
SF_6					
# Bond Pairs	Steric Number		Molecular Geometry	Hybridization	
# Lone Pairs					

Molecular Formula	AXE Formula	Lewis Structure	Electronic Geometry	Bond Angle	3D Sketch
BF_3					
# Bond Pairs	Steric Number		Molecular Geometry	Hybridization	
# Lone Pairs					

Molecular Formula	AXE Formula	Lewis Structure	Electronic Geometry	Bond Angle	3D Sketch
NO_2^-					
# Bond Pairs	Steric Number		Molecular Geometry	Hybridization	
# Lone Pairs					

Dougherty Valley HS Chemistry

Bonding and Structure – Molecular Geometry Activity

Molecular Formula	AXE Formula	Lewis Structure	Electronic Geometry	Bond Angle	3D Sketch
SF_4					
# Bond Pairs # Lone Pairs	Steric Number		Molecular Geometry	Hybridization	

Molecular Formula	AXE Formula	Lewis Structure	Electronic Geometry	Bond Angle	3D Sketch
ClF_3					
# Bond Pairs # Lone Pairs	Steric Number		Molecular Geometry	Hybridization	

Molecular Formula	AXE Formula	Lewis Structure	Electronic Geometry	Bond Angle	3D Sketch
BrF_5					
# Bond Pairs # Lone Pairs	Steric Number		Molecular Geometry	Hybridization	

Dougherty Valley HS Chemistry
Bonding and Structure – Molecular Geometry Activity

<table>
<tr><th>Molecular Formula</th><th>AXE Formula</th><th>Lewis Structure</th><th>Electronic Geometry</th><th>Bond Angle</th><th>3D Sketch</th></tr>
<tr><td>N_2</td><td></td><td rowspan="3"></td><td></td><td></td><td rowspan="3"></td></tr>
<tr><td rowspan="2"># Bond Pairs

Lone Pairs</td><td>Steric Number</td><td>Molecular Geometry</td><td>Hybridization</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

<table>
<tr><th>Molecular Formula</th><th>AXE Formula</th><th>Lewis Structure</th><th>Electronic Geometry</th><th>Bond Angle</th><th>3D Sketch</th></tr>
<tr><td>NH_4^+</td><td></td><td rowspan="3"></td><td></td><td></td><td rowspan="3"></td></tr>
<tr><td rowspan="2"># Bond Pairs

Lone Pairs</td><td>Steric Number</td><td>Molecular Geometry</td><td>Hybridization</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

Done early? You can try doing these too!

CCl_4, NH_3, H_2O, SCl_2, I_3^-, SO_2, ICl_4^-, AsF_5, IF_4^+, H_3O^+, TeF_5^-, HCN, IOF_5, BrF_3, SO_4^{2-}, CO_3^{2-}

Please clean up!
Put the playdough away in the cans, close the lids tightly.
Put toothpicks and Styrofoam balls back in the correct weigh boats.
Put everything back on the tray.

Dougherty Valley HS Chemistry
Bonding and Structure – VSPER Practice

Worksheet #11

Name: **Period:** **Seat#:**

1) What is the main idea behind VSEPR theory?	**2)** Describe what hybridization is. Give an example.

For each of the following compounds, draw a Lewis Structure, determine the AXE formula, steric number, electronic geometry, molecular geometry, bond angles, and hybridizations.

3) Carbon tetrachloride Lewis Structure Formula: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:	**4)** BH_3 Lewis Structure Name: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:
5) Silicon disulfide Lewis Structure Formula: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:	**6)** C_2H_2 Lewis Structure Name: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:
7) Phorsphorus trifluoride Lewis Structure Formula: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:	**8)** SF_6 Lewis Structure Name: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:

Dougherty Valley HS Chemistry
Bonding and Structure – VSPER Practice

9) Dihydrogen monoxide — Lewis Structure Formula: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:	**10)** PCl_5 — Lewis Structure Name: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:
11) SeF_2 — Lewis Structure Name: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:	**12)** CO_3^{2-} — Lewis Structure Name: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:
13) Xenon tetraoxide — Lewis Structure Formula: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:	**14)** ClF_5 — Lewis Structure Name: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:
15) Br_3^- — Lewis Structure Name: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:	**16)** SO_3^{2-} — Lewis Structure Name: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:

Dougherty Valley HS Chemistry
Bonding and Structure – VSPER Practice

17) CO_2 Lewis Structure Name: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:	**18)** KrF_4 Lewis Structure Name: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:
19) SF_4 Lewis Structure Name: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:	**20)** O_3 Lewis Structure Name: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:
21) $CHCl_3$ Lewis Structure Name: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:	**22)** SO_2 Lewis Structure Name: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:
23) Iodine pentafluoride Lewis Structure Formula: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:	**24)** Find a molecule not on this WS and fill out the info: Formula: Name: AXE: Steric #: Electron Geo: Molecular Geo: Bond Angles: Hybridization:

Dougherty Valley HS Chemistry
Bonding and Structure – Bing Bing Toe

Worksheet #12

Name: **Period:** **Seat#:**

You must participate during the Bing-Bing-Toe Review activity! Please make sure to do the following so you can earn full credit for this assignment:

- Number each problem to match the PowerPoint numbering
- Highlight the question numbers so I can quickly and easily give you points!
- Show any/all work if applicable
- Show all final answers
- Correct your answers if they were wrong!
- Staple binder paper to the back of this if you ran out of space.

Dougherty Valley HS Chemistry
Bonding and Structure – Bing Bing Toe QUESTIONS

Worksheet #12B

Name: **Period:** **Seat#:**

These are the questions that went with WS #12 Bing Bing Toe Game. For any questions you did not complete in class, use this paper to finish the problems on WS #12. Put your work and answers on WS #12 not this paper, this is just the questions! This must be included in your rainbow packet!

1) How many valence electrons does Aluminum have?
2) How is a covalent bond formed?
3) What is the name given to the electrons in the highest occupied energy level of an atom?
4) What does calcium do in order to form an ionic bond?
5) What is the formula for sodium sulfate?
6) Draw the Lewis dot structure for carbon dioxide and how many lone pairs does it have?
7) What is the electron configuration for Strontium?
8) What is the name of the following compound: $Cu(SO_4)_2$
9) Draw the Lewis dot structure for peroxide
10) What is the charge on the compound sodium sulfide?
11) Which is more electronegative – Oxygen or carbon?
12) What kind(s) of elements do you (usually) need to form an ionic compound?
13) When can you form an ionic bond without having a metal present?
14) What is wrong with the following formula? Cu_2o_4
15) fill in the blanks: ionic bonds form when one atom has ____ electron affinity and one has ____ ionization energy
16) How many e- does BARIUM give up to achieve a noble gas config.? What is that config. In noble gas format?
17) What type of elements do you need to form a covalent bond?
18) What type of bond is in copper and describe how the e-'s behave in this type of bond?
19) What is the name of the following compound? $Cr_3(PO_4)_2$
20) Complete the following rxn and name the type of rxn. ${}^{42}_{19}K \rightarrow {}^{0}_{-1}e + ?$
21) Do covalent bonds exibit high or low electronegativity differences?
22) Name the Diatomic elements.
23) Write the formula for potassium nitrate.
24) Draw the Lewis dot structure for beryllium fluoride.
25) What is the formula for CH_4?
26) Draw the Lewis str. for sulfur hexaiodide.
27) What is the name of the compound Si_2Br_6
28) What is the name for the following compound? P_4O_{10}
29) What is the formula for silver nitrate?
30) What is the formula for potassium chlorite?
31) What is the formula of the compound strontium phosphite?
32) Why is a water molecule bent? Draw me a picture!
33) What is the formula of the compound strontium phosphide?
34) How many items are in a mole?
35) What is the name of the polyatomic ion NH_4^+?

Dougherty Valley HS Chemistry
Bonding and Structure – Polarity

Worksheet #13

Name: **Period:** **Seat#:**

For each of the following pairs write the name or formula if it is missing, draw the Lewis structure, identify any polarity present with one of the ways you were shown in class, and then if both are polar determine which is most polar and explain your reason:

1)	carbon disulfide	sulfur difluoride
2)	nitrogen trichloride	oxygen dichloride
3)	boron trihydride	ammonia
4)	chlorine	phosphorus trichloride
5)	silicon dioxide	carbon dioxide
6)	methane	CH_2Cl_2
7)	silicon tetrabromide	HCN

8)	nitrogen trifluoride	phosphorus trifluoride
9)	methyl chloride ($CHCl_3$)	methyl bromide ($CHBr_3$)
10)	water	hydrogen sulfide (H_2S)
11)	hydrochloric acid (HCl)	hydroiodic acid (HI)
12)	bromoacetylene (C_2HBr)	chloroacetylene (C_2HCl)
13)	methanol (CH_3OH)	diethyl ether [$(CH_3)_2O$]
14)	acetone [$(CH_3)_2CO$]	propanol (C_3H_8O)

Dougherty Valley HS Chemistry
Bonding and Structure – IMFs

Worksheet #14

Name: **Period:** **Seat#:**

Indicate the **strongest** IMF holding together crystals of the following:

		Molecular Crystal			Metal	Ionic Crystal	Network Solid
		London forces	Dipole-dipole attractions	Hydrogen Bonds	Metallic Bonds	Ionic Bonds	Covalent Bonds
1.	NH_3						
2.	Kr						
3.	HCl						
4.	F_2						
5.	$KMnO_4$						
6.	NaCl						
7.	SO_2						
8.	CO_2						
9.	C_3H_8						
10.	CH_4						
11.	CH_3Cl						
12.	HF						
13.	C_6H_6						
14.	NO						
15.	H_2SO_4						
16.	WC						
17.	Si						
18.	SiO_2						
19.	$C_{(graphite)}$						
20.	N_2						
21.	CH_3OH						
22.	Ag						
23.	$(C_2H_5)_2NH$						
24.	NaOH						
25.	Al						
26.	PCl_3						

		Molecular Crystal			Metal	Ionic Crystal	Network Solid
		London forces	Dipole-dipole attractions	Hydrogen Bonds	Metallic Bonds	Ionic Bonds	Covalent Bonds
27.	XeF_4						
28.	He						
29.	Na						
30.	CO						
31.	Ar						
32.	$Ba(OH)_2$						
33.	O_2						
34.	H_2O						
35.	NH_4Cl						
36.	Hg						
37.	P_4						
38.	HCN						
39.	CaO						
40.	N_2H_2						
41.	H_2						
42.	Pb						
43.	XeF_2						
44.	SF_4						
45.	SiC						
46.	Si_4H_{10}						
47.	PH_3						
48.	SiH_4						
49.	H_2Se						
50.	C_2H_2						
51.	I_2						
52.	Cu						
53.	AsH_3						
54.	K_2S						

Dougherty Valley HS Chemistry
Bonding and Structure – IMF Card Sort and Practice

Worksheet #15

Name: **Period:** **Seat#:**

TASK #		ANSWER		
1	Sort by: Ionic, covalent or metallic	Ionic	Covalent	Metallic
2	Sort by: Polar or non-polar	Polar	Non-Polar	
3	Sort by: "Dominant" IMF present – Dipole-dipole or London Forces	Dipole-Dipole	London Forces	
4	Sort by: Hydrogen bonding or No Hydrogen bonding	Hydrogen Bonding	No Hydrogen Bonding	
5	Sort by: Dipole-dipole or hydrogen bonding	Dipole-Dipole	Hydrogen Bonding	
6	Sort by: "Dominant" IMF present – London, Dipole-dipole, or Hydrogen Bonding	London Forces	Dipole-Dipole	Hydrogen Bonding
7	Rank from: Lowest to Highest expected boiling point	Lowest		Highest
8	Rank from: Lowest to Highest expected boiling point	Lowest		Highest

Dougherty Valley HS Chemistry
Bonding and Structure – IMF Card Sort and Practice

Q#	Questions
1	H_2S, O_2 and CH_3OH all have comparable molecular masses. List the dominant type of IMF. (*H_2S is bent like water*), then rank the strength of each compound based on IMFs within the samples. (1 = strongest, 2 = in between, 3 = weakest). Substance IMF Relative Strength HBr O_2 CH_3OH
2	Circle the substances below that can form a hydrogen bond in its pure form. Explain why the other species couldn't hydrogen bond. C_2H_6 CH_3NH_2 KCl $CH_3CH_2CH_2OH$ CH_3OCH_3
3	Rank the following compounds from weakest intermolecular forces to strongest. Justify your answers. H_2S I_2 N_2 H_2O
4	Rank the following from weakest intermolecular forces to strongest. Justify your answers. *They are all bent like water)* H_2Se H_2S H_2Po H_2Te
5	Using your knowledge of molecular structure, identify the main intermolecular force in the following compounds. You may find it useful to draw Lewis structures to find your answer. PF_3 H_2CO HF
6	Explain how dipole-dipole forces cause molecules to be attracted to one another.
7	Explain how London Forces cause molecules to be attracted to one another.
8	Rank the following compounds from lowest to highest boiling point: calcium carbonate, methane, methanol (CH_4O), dimethyl ether (CH_3OCH_3).
9	Explain why nonpolar molecules usually have much lower surface tension than polar ones.
10	What is the difference between a regular dipole-dipole force and a hydrogen bond force? What is an example of hydrogen bonding that occurs in your body?

Dougherty Valley HS Chemistry
Bonding and Structure – IMF Card Sort and Practice

Worksheet #15B

Name: **Period:** **Seat#:**

Fill out the missing information in the chart below:

Q#	Name	Formula	Type of IMF
1	Aluminum sulfate		
2	Ammonium phosphate		
3		CO_2	
4		$CaCO_3$	
5	Nitrogen trihydride		
6		S_2F_2	
7		P_3O_5	
8	Magnesium nitrate		
9		Pb_3P_2	

Q#	Formula	Lewis Structure	Polar or non-polar?	Q#	Formula	Lewis Structure	Polar or non-polar?
10	CH_2F_2			**13**	CH_2O		
11	CO_2			**14**	SeH_2		
12	NCl_3			**15**	NO_3^-		

Order each group below from strongest to weakest IMF and give the type of IMF:

16	N_2, HF, Na, CH_2O						
	Formula	*Strongest*					*Weakest*
	IMF						
17	H_2S, NH_3, CH_4, $(NH_4)_2SO_4$						
	Formula	*Strongest*					*Weakest*
	IMF						