Dougherty Valley HS Chemistry - AP
Bonding – VSEPR

Worksheet #6

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

Directions:

1. For each of the following molecules, determine the number of lone pairs and bonded pairs around the central atom. What is the steric number based on this?
2. Describe the structure according to the number of regions of electron density. In other words – what is the Electron Geometry?
3. Rename the shape you see based on the bonded atoms. In other words – what is the Molecular Geometry?
4. Estimate the angle between the atoms attached to the central atom.

Molecule	# of Lone Pairs	# of Bond Pairs	Steric #	Electronic Geometry (the one that includes lone pairs)	Molecular Geometry (the one that is based on the atoms)	Angle between bonds
$HgCl_2$						
CH_4						
NH_3						
H_2O						
PCl_5						
BF_3						
PBr_3						
SI_2						
SF_6						
HCN						

VSEPER SUMMARY

In the "Molecular Geometry" column, write one the following molecular shapes in the appropriate spot in the table.
Note that some terms may be used more than once.

bent	seesaw	T-shaped	trigonal bipyramidal
linear	square planar	tetrahedral	trigonal pyramidal
octahedral	square pyramidal	trigonal planar	

In the "Example of a Molecule" column, write one of the following chemical formulas in the appropriate spot in the table.

CO_2	ClF_3	PF_3	SF_2	SO_2	XeF_2
CF_4	ClF_5	PF_5	SF_4	SO_3	XeF_4
			SF_6		

In the "Example of a Polyatomic Ion" column, write one of the following chemical formulas in the appropriate spot in the table.

Br_3^-	ClO_2^-	NO_2^+	PF_4^-	SO_4^{2-}
	ClO_3^-	NO_2^-	PF_6^-	SF_5^+
	ClF_4^-	NO_3^-		

In the "Total Number of Valence Electrons" column, write one of the following numbers in the appropriate spot in the table.

16 18 20 22 24 26 28 32 34 36 40 42 48

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Bonding Domains around central atom	Nonbonding Domains around central atom	Total # of Electron Domains around central atom	Electron Domain Geometry	Molecular Geometry	Example of a Molecule	Example of a Polyatomic Ion	Total Number of Valence Electrons
2	0	2	linear				
3	0	3	trigonal planar				
2	1	3	trigonal planar				
4	0	4	tetrahedral				
3	1	4	tetrahedral				
2	2	4	tetrahedral				
5	0	5	trigonal bipyramidal				
4	1	5	trigonal bipyramidal				
3	2	5	trigonal bipyramidal			N/A	
2	3	5	trigonal bipyramidal				
6	0	6	octahedral				
5	1	6	octahedral			N/A	
4	2	6	octahedral				

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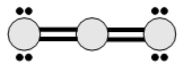
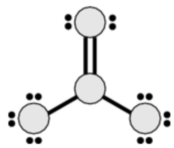
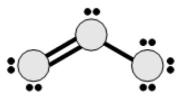
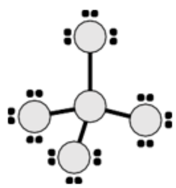
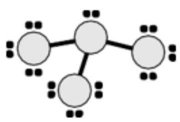
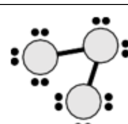
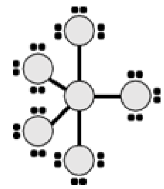
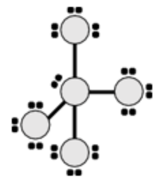
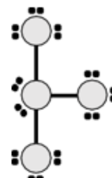
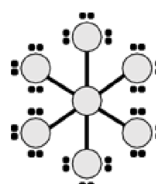
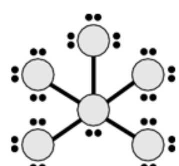
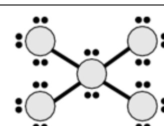
Directions: Determine the total number of valence electrons for each molecule or polyatomic ion below.

Formula	# Valence e-
CO_2	
CF_4	
ClF_3	
ClF_5	
PF_3	
PF_5	
SF_2	
SF_4	
SF_6	
SO_2	
SO_3	
XeF_2	
XeF_4	
Br_3^-	
ClO_2^-	
ClO_3^-	
ClF_4^-	
NO_2^+	
NO_2^-	
NO_3^-	
PF_4^-	
PF_6^-	
SO_4^{2-}	
SF_5^+	

Lewis Structure	# Valence e-
	
	
	
	
	
	

Lewis Structure	# Valence e-
	
	
	
	
	
	
	

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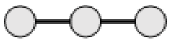
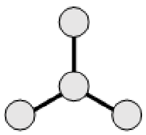
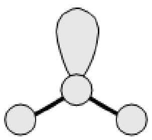
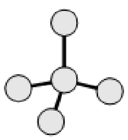
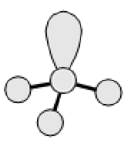
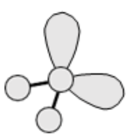
Directions: Identify the number of bonding and nonbonding domains around the central atom, and identify the name of the molecular geometry shape.

Molecule	# of Bonding Domains around central atom	# of Nonbonding Domains around central atom	Name of Molecular Geometry shape
			
			
			
			
			
			

Molecule	# of Bonding Domains around central atom	# of Nonbonding Domains around central atom	Name of Molecular Geometry shape