Name:_____

CHEM 1110.20787
Test 3, Form A
Spring 2013

Part 1 – Balancing equations and Stoichiometry Calculations (50 pts), show ALL work for credit.

1. (6 pts) Balance the following equations and identify the reaction type.

   a. _____Al + _____Cl_2 → _____$AlCl_3$ Reaction Type: _____

   b. _____ NH_4NO_3 → _____N_2O + _____ H_2O Reaction Type: _____

2. (4 pts) Balance the following equations.

   a. _____ $Mg(NO_3)_2$ + _____ NaOH → _____$Mg(OH)_2$ + _____$NaNO_3$

   b. _____ $CaCl_2$ + _____ K_3PO_4 → _____ $Ca_3(PO_4)_2$ + _____KCl

3. (10 pts) Write the balanced equation for the combustion of ethane, C_2H_6.

4. (10 pts) Allicin is the compound responsible for the characteristic smell of garlic. The molecular formula of allicin is $C_6H_{10}OS_2$. What is the mass of carbon in 3.45 g of $C_6H_{10}OS_2$? (MM of $C_6H_{10}OS_2$ = 162.27 g/mol)

5. (10pts) Automotive air bags inflate when sodium azide, NaN_3, rapidly decomposes to its component elements. What mass of sodium is formed when 15.0g of NaN_3 decompose? (MM of NaN_3 = 65.01 g/mol)

$$2\ NaN_3 \rightarrow 2\ Na + 3\ N_2$$

6. (10 pts) The fermentation of glucose ($C_6H_{12}O_6$) produces ethanol (C_2H_5OH) and carbon dioxide. The balanced reaction is below. What mass of CO_2 is produced when 7.50 g $C_6H_{12}O_6$ are fermented? (MM of $C_6H_{12}O_6$ = 180.18 g/mol, MM of CO_2 = 44.01 g/mol)

$$C_6H_{12}O_6 \rightarrow 2\ C_2H_5OH + 2\ CO_2$$

Part 2 – Lewis Dot Structures, Molecular Geometry, VSEPR Theory, Hybridization and Polarity (40 pts) For each of the following molecules or ions: draw the correct Lewis Dot Structure, determine the molecular geometry, give the hybridization of the central atom and determine if the molecule is polar or nonpolar. **Include all possible resonance structures.**

SO_3

Molecular Geometry: _____
Hybridization: _____
Polarity: _____

OF_2

Molecular Geometry: _____
Hybridization: _____
Polarity: _____

SF_4^{2-}

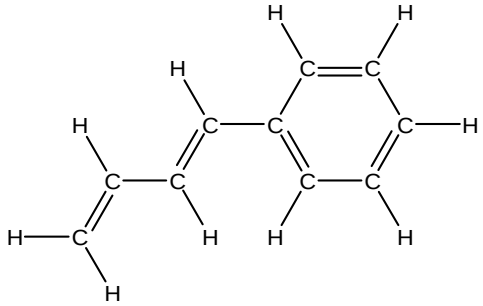
Molecular Geometry: _____
Hybridization: _____
Polarity: _____

IF_5

Molecular Geometry: _____
Hybridization: _____
Polarity: _____

Part 3 – Bonding and Electronegativity (10pts)

1. (5 pts) How many sigma and pi bonds are there in the following molecule?



2. (5 pts) Rank the following atoms in order of electronegativity: P, F, Cl, and Ge

/100

Periodic Table of the Elements

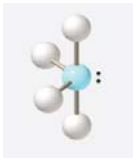
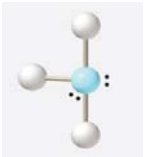
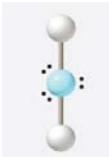
	1 IA	2 IIA	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8	9 VIIIB	10	11 IB	12 IIB	13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
1	1 **H** 1.008																	2 **He** 4.00
2	3 **Li** 6.94	4 **Be** 9.01											5 **B** 10.81	6 **C** 12.01	7 **N** 14.01	8 **O** 16.00	9 **F** 19.00	10 **Ne** 20.18
3	11 **Na** 22.99	12 **Mg** 24.31											13 **Al** 26.98	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.06	17 **Cl** 35.45	18 **Ar** 39.95
4	19 **K** 39.10	20 **Ca** 40.08	21 **Sc** 44.96	22 **Ti** 47.90	23 **V** 50.94	24 **Cr** 52.00	25 **Mn** 54.94	26 **Fe** 55.85	27 **Co** 58.93	28 **Ni** 58.693	29 **Cu** 63.546	30 **Zn** 65.37	31 **Ga** 69.72	32 **Ge** 72.59	33 **As** 74.92	34 **Se** 78.96	35 **Br** 79.90	36 **Kr** 83.80
5	37 **Rb** 85.47	38 **Sr** 87.62	39 **Y** 88.91	40 **Zr** 91.22	41 **Nb** 92.91	42 **Mo** 95.94	43 **Tc** [98]	44 **Ru** 101.07	45 **Rh** 102.91	46 **Pd** 106.4	47 **Ag** 107.87	48 **Cd** 112.40	49 **In** 114.82	50 **Sn** 118.69	51 **Sb** 121.75	52 **Te** 127.60	53 **I** 126.90	54 **Xe** 131.30
6	55 **Cs** 132.91	56 **Ba** 137.34	71 **Lu** 174.97	72 **Hf** 178.49	73 **Ta** 180.95	74 **W** 183.85	75 **Re** 186.21	76 **Os** 190.2	77 **Ir** 192.22	78 **Pt** 195.09	79 **Au** 196.97	80 **Hg** 200.59	81 **Tl** 204.37	82 **Pb** 207.19	83 **Bi** 208.98	84 **Po** [209]	85 **At** [210]	86 **Rn** [222]
7	87 **Fr** [223]	88 **Ra** [226]	103 **Lr** [262]	104 **Rf** [261]	105 **Db** [262]	106 **Sg** [263]	107 **Bh** [262]	108 **Hs** [265]	109 **Mt** [276]	110 **Ds** [281]	111 **Rg** [280]	112 **Uub** [285]	113 **Uut** [284]	114 **Uuq** [289]	115 **Uup** [288]	116 **Uuh** [293]		118 **Uuo** [294]

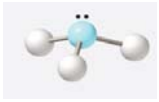
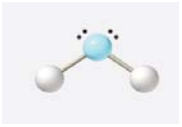
DO NOT WRITE ON PERIODIC TABLE

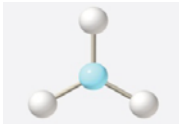
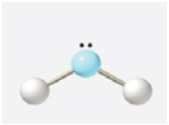
57 **La** 138.91	58 **Ce** 140.12	59 **Pr** 140.91	60 **Nd** 144.24	61 **Pm** [145]	62 **Sm** 150.35	63 **Eu** 151.96	64 **Gd** 157.25	65 **Tb** 158.92	66 **Dy** 162.5	67 **Ho** 164.93	68 **Er** 167.26	69 **Tm** 168.93	70 **Yb** 173.04
89 **Ac** [227]	90 **Th** 232.04	91 **Pa** [231]	92 **U** 238.03	93 **Np** [237]	94 **Pu** [244]	95 **Am** [243]	96 **Cm** [247]	97 **Bk** [247]	98 **Cf** [251]	99 **Es** [252]	100 **Fm** [257]	101 **Md** [258]	102 **No** [259]

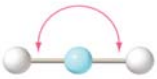
REPRESENTATIVE VSEPR STRUCTURES

			
Bonded Atoms	**6**	**5**	**4**
Lone Pair Electrons	**0**	**1**	**2**
Molecular Geometry	**Octahedral**	**Square pyramidal**	**Square planar**
Hybridization	**sp^3d^2**	**sp^3d^2**	**sp^3d^2**

				
Bonded Atoms	**5**	**4**	**3**	**2**
Lone Pair Electrons	**0**	**1**	**2**	**3**
Molecular Geometry	**Trigonal bipyramidal**	**See-saw**	**T-Shaped**	**Linear**
Hybridization	**sp^3d**	**sp^3d**	**sp^3d**	**sp^3d**

			
Bonded Atoms	**4**	**3**	**2**
Lone Pair Electrons	**0**	**1**	**2**
Molecular Geometry	**Tetrahedral**	**Trigonal pyramidal**	**Bent**
Hybridization	**sp^3**	**sp^3**	**sp^3**

		
Bonded Atoms	**3**	**2**
Lone Pair Electrons	**0**	**1**
Molecular Geometry	**Trigonal planar**	**Bent**
Hybridization	**sp^2**	**sp^2**


Bonded Atoms **2**
Lone Pair Electrons **0**
Molecular Geometry **Linear**
Hybridization **sp**