Chem 111, Exam II, Summer 2002

Name: _____ ID: _____ - ____ - _____

The Periodic Table

IA												IIIA	IVA	VA	VIA	VIIA	VIIIA
H 1 1.01	IIA																He 2 4.00
Li 3 6.94	Be 4 9.01											B 5 10.81	C 6 12.01	N 7 14.01	O 8 16.00	F 9 19.00	Ne 10 20.18
Na 11 22.99	Mg 12 24.31	IIIB	IVB	VB	VIB	VIIB	VIIIB	VIIIB	VIIIB	IB	IIB	Al 13 26.98	Si 14 28.09	P 15 30.97	S 16 32.07	Cl 17 35.45	Ar 18 39.95
K 19 39.10	Ca 20 40.08	Sc 21 44.96	Ti 22 47.88	V 23 50.94	Cr 24 52.00	Mn 25 54.94	Fe 26 55.85	Co 27 58.93	Ni 28 58.69	Cu 29 63.55	Zn 30 65.39	Ga 31 69.72	Ge 32 72.61	As 33 74.92	Se 34 78.96	Br 35 79.90	Kr 36 83.80
Rb 37 85.47	Sr 38 87.62	Y 39 88.91	Zr 40 91.22	Nb 41 92.91	Mo 42 95.94	Tc 43 (97.9)	Ru 44 101.07	Rh 45 102.91	Pd 46 106.42	Ag 47 107.87	Cd 48 112.41	In 49 114.82	Sn 50 118.71	Sb 51 121.76	Te 52 127.60	I 53 126.90	Xe 54 131.29
Cs 55 132.91	Ba 56 137.33	La 57 138.91	Hf 72 178.49	Ta 73 180.95	W 74 183.85	Re 75 186.21	Os 76 190.2	Ir 77 192.22	Pt 78 195.08	Au 79 197.97	Hg 80 200.59	Tl 81 204.38	Pb 82 207.2	Bi 83 208.98	Po 84 (209)	At 85 (210)	Rn 86 (222)
Fr 87 223.02	Ra 88 226.03	Ac 89 227.03	Rf 104 (261)	Db 105 (262)	Sg 106 (263)	Bh 107 (262)	Hs 108 (265)	Mt 109 (266)									

Ce 58 140.12	Pr 59 140.91	Nd 60 144.24	Pm 61 (145)	Sm 62 150.36	Eu 63 152.97	Gd 64 157.25	Tb 65 158.93	Dy 66 162.50	Ho 67 164.93	Er 68 167.26	Tm 69 168.93	Yb 70 173.04	Lu 71 174.97
Th 90 232.04	Pa 91 231.04	U 92 238.03	Np 93 237.05	Pu 94 (240)	Am 95 243.06	Cm 96 (247)	Bk 97 (248)	Cf 98 (251)	Es 99 252.08	Fm 100 257.10	Md 101 (257)	No 102 259.10	Lr 103 262.11

Useful Information

- $N = 6.02 \times 10^{23}\ mol^{-1}$
- $h = 6.626 \times 10^{-34}\ J.s$
- $c = 2.998 \times 10^{8}\ m/s$
- $\lambda\nu = c$
- $E = h\nu$
- Density = m/v

Question 1 Draw the Lewis dot structures for the following:

12 Points

SO_2	HCN
XeF_2	BF_3

Question 2 Draw the Lewis dot structures of NO_2^- and NO_2^+ showing any resonance structures where applicable.

10 Points

NO_2^-	NO_2^+

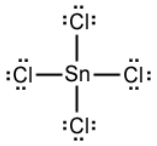
1. What is the N to O bond order in:

   NO_2^+: _____ NO_2^-: _____

2. Which molecule has the smallest O-N-O bond angle? _____

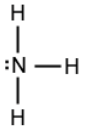
Question 3
16 Points

Give the Electron Pair Geometry and the Molecular Geometry for each of the following 'Lewis Dot Structures'.



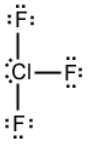
Electron Pair Geometry: _____

Molecular Geometry: _____



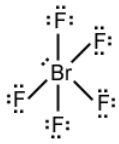
Electron Pair Geometry: _____

Molecular Geometry: _____



Electron Pair Geometry: _____

Molecular Geometry: _____



Electron Pair Geometry: _____

Molecular Geometry: _____

Question 4
7 Points

Give the formal charge of each atom in each of the two resonance structures for the azide ion shown below.

What is the charge on an azide ion? _____

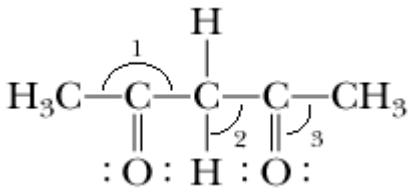
Question 5
6 Points

Give the correct formula for each of the following ionic compounds?

1. Potassium permanganate _____
2. Ammonium carbonate _____
3. Magnesium nitrite _____
4. Aluminum sulfite _____
5. Calcium sulfate _____
6. Iron(III) oxide _____

Question 6
6 Points

For the molecule depicted below what are the expected bond angles for 1, 2 and 3.



1. _____

2. _____

3. _____

Question 7
8 Points

In the laboratory a student combines **47.5** mL of a **0.304** M $Ba(NO_3)_2$ nitrate solution with **29.2** mL of a **0.379** M $NaNO_3$ solution.

What is the final concentration of **nitrate** anion ?

Question 8
6 Points

With respect to the following molecules circle those, which you expect to be polar.

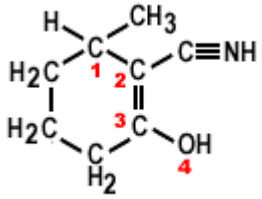
CCl_4	CO_2	NH_3
BF_3	H_2O	XeF_4

Question 9
3 Points

Would you expect the hypothetical molecule PBr_3F_2 to be polar or non-polar? Briefly explain your reasoning.

Question 10
10 Points

Answer the following with respect to the following molecule:



The hybridization about atom 1	sp^3
Number of pi bonds in the molecule.	3
The hybridization about atom 2.	sp^2
The orbitals used to make the pi bond between atoms 2 and 3.	p
The hybridization about atom 4.	sp^3

Question 11
3 Points

What type of hybridization would you invoke to describe the bonding about the central atom in XeF_4?