Chemistry 105a
Fall, 2005
Exam #4

Nov. 17, 2005
Dr. Robert Bau

First letter of last name	PLEASE PRINT YOUR NAME IN BLOCK LETTERS Name:
	Last 3 digits of USC I.D. Number:
	Lab T.A.'s name

(M aft / M eve / Tu morn / Tu aft / W aft / Th morn / F aft / no lab)
Please circle your lab section above)

Question	Maximum points	Score	Grader	Question	Maximum points	Score	Grader
1	9			7	10		
2	10			8	5		
3	9			9	10		
4	12			10	12		
5	8			11	7		
6	8			Sub-Total	(44)		
Sub-Total	(56)			TOTAL	100		

ANSWER KEY

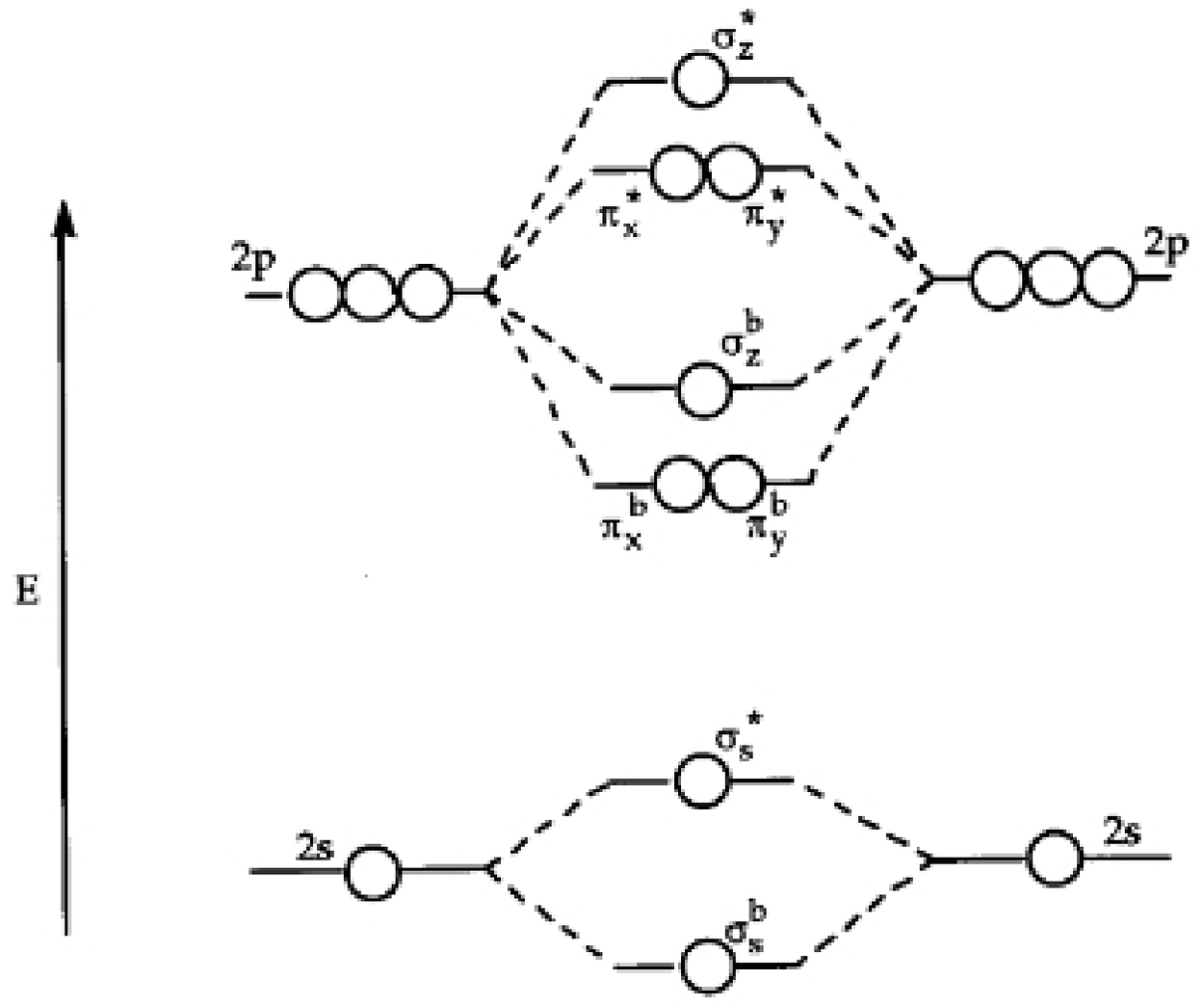
I	II											III	IV	V	VI	VII	VIII
1 H 1.00797																	2 He 4.00260
3 Li 6.941	4 Be 9.01218											5 B 10.811	6 C 12.0111	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.179
11 Na 22.9897	12 Mg 24.305											13 Al 26.9814	14 Si 28.086	15 P 30.9737	16 S 32.064	17 Cl 35.453	18 Ar 39.948
19 K 39.0983	20 Ca 40.08	21 Sc 44.9559	22 Ti 47.90	23 V 50.941	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.69	29 Cu 63.546	30 Zn 65.377	31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.904	36 Kr 83.80
37 Rb 85.467	38 Sr 87.62	39 Y 88.9059	40 Zr 91.22	41 Nb 92.9064	42 Mo 95.94	43 Tc 98.9062	44 Ru 101.07	45 Rh 102.905	46 Pd 106.4	47 Ag 107.868	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.904	54 Xe 131.30
55 Cs 132.905	56 Ba 137.34	57 La 138.905	72 Hf 178.49	73 Ta 180.948	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 196.966	80 Hg 200.59	81 Tl 204.38	82 Pb 207.19	83 Bi 208.980	84 Po (209)	85 At (210	86 Rn (222)
87 Fr (223)	88 Ra 226.025	89 Ac 227.027	104	105	106	107	108	109									

Lanthanides	58 Ce 140.12	59 Pr 140.907	60 Nd 144.24	61 Pm	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.925	66 Dy 162.50	67 Ho 164.930	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.97
Actinides	90 Th 232.081	91 Pa 231.059	92 U 238.029	93 Np 237.482	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)	103 Lw

Please sign below: I certify that I have observed all the rules of Academic Integrity while taking this examination

_____
(Signature)

Question #1 (9 pts)



Using the molecular orbital scheme above, predict the bond orders of the following species (fill in the blanks), and also predict whether each is expected to be diamagnetic or paramagnetic (circle correct answers)

CO bond order = 3 ((diamagnetic) paramagnetic)

$[NF]^+$ bond order = 2 ½ (diamagnetic /(paramagnetic)

$[OF]^{2-}$ bond order = ½ (diamagnetic (paramagnetic)

Question #2 (10 points)

What are the correct structures (and placement of charges) in the following molecules or ions ?

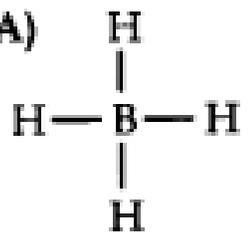
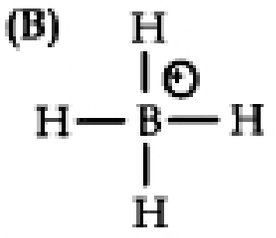
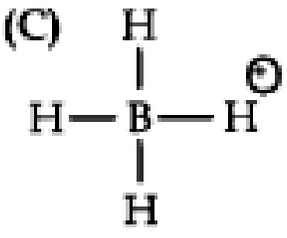
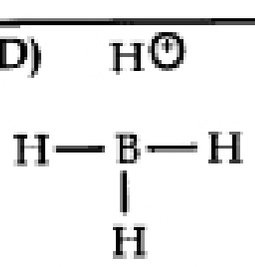
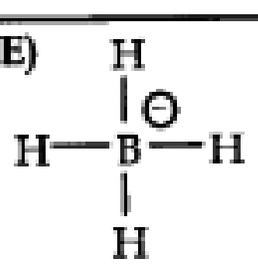
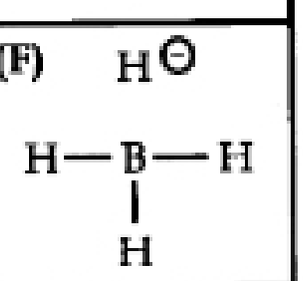
carbon monoxide **C**

(A) $\ominus$C—O$\oplus$	(B) $\ominus$C=O$\oplus$	(C) $\ominus$C≡O$\oplus$
(D) $\oplus$C—O$\ominus$	(E) $\oplus$C=O$\ominus$	(F) $\oplus$C≡O$\ominus$

$[NO]^+$ cation **F**

(A) $\oplus$N—O	(B) $\oplus$N=O	(C) $\oplus$N≡O
(D) $\ominus$N—O	(E) $\ominus$N=O	(F) $\ominus$N≡O

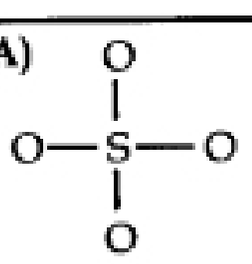
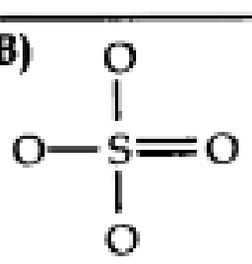
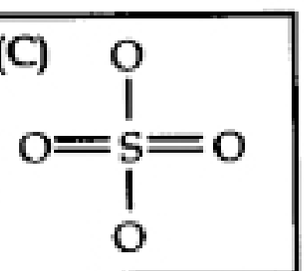
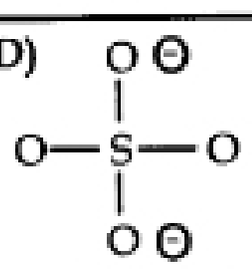
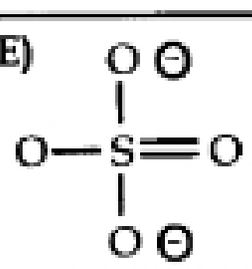
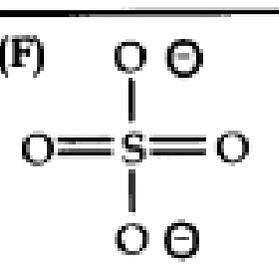
$[BH_4]^-$ anion **E**

(A) 	(B) 	(C) 
(D) 	(E) 	(F) 

Ozone **B**

(A) O—O—O	(B) $\ominus$O—O$\oplus$=O	(C) $\oplus$O—O$\ominus$=O
(D) O=O=O	(E) $\oplus$O—O$\ominus$=O	(F) $\ominus$O—O$\oplus$=O

Sulfate ion **F**

(A) 	(B) 	(C) 
(D) 	(E) 	(F) 

(Fill in the boxes above with your answers, "A" or "B" or "C", etc.)