Chemistry 105 A

First Letter of Last Name

PLEASE PRINT YOUR NAME IN BLOCK LETTERS

KEY

Last 4 Digits of USC ID: ____ ____ ____ ____

Lab TA's Name: _____

Lab: Tu 9 / Tu 1 / Tu 4 / W 1 / W 4 / F 1

Please circle lab section above.

Question	Points	Score	Grader
1	12		
2	12		
3	12		
4	21		
5	12		
6	10		
7	10		
8	18		
9			
10			
Total	**100**		

Please Sign Below:

I certify that I have observed all the rules of Academic Integrity while taking this examination.

Signature: _____

Instructions:

1. You must show work to receive credit.
2. If necessary, please continue your solutions on the back of the preceding page (facing you).
3. YOU MUST use black or blue ink. (No pencil, no whiteout, no erasable ink.)
4. There are 10 problems on 9 pages. Please count them before you begin. A periodic table and some useful equations can be found on the last page.
5. You MUST submit all pages to the proctors, including the periodic table page. Put your name onto the periodic table page in the space provided.
6. Only a Casio FX-260 calculator may be used on Chem 105a/b exams.
7. Turn off cell phones and other electronic devices and put them away, out of sight. They may not be taken out of your bag during the exam.
8. When time is called, stop working on your exam immediately, turn the exam over and pass it to the aisle.
9. Your exam will be returned to you in your next lab period.
10. Good luck!! =)

1. (12 pt) Answer the following multiple choice questions:

i. Which has the longer N-O bond length, NO_2^- or NO_3^-?

a. NO_2^- b. NO_3^-

c. the bond lengths are the same d. more information is needed

ii. Consider the reaction: $A_2 + B_2 \rightarrow 2\ AB\ \Delta H = -285$ kJ. The bond energy for A_2 is half the amount for AB. The bond energy of $B_2 = 432$ kJ/mol. What is the bond energy of A_2?

a. 717 kJ/mol b. 478 kJ/mol c. 239 kJ/mol

d. -143 kJ/mol e. 98 kJ/mol f. none of these

iii. If four atomic orbitals on one atom overlap with four orbitals on a second atom, how many molecular orbitals will form?

a. 1 b. 4 c. 8 d. 16 e. none of these

iv. Consider the molecular orbital description of NO^- anion (see question 5 for diagram). Which of the following statements is false?

a. NO^- is paramagnetic.

b. NO^- is isoelectronic with CO

c. The bond energy of NO^+ is greater than the bond energy of NO^+.

d. The bond order of NO^- is 2.

e. None of these statements is false.

2. (12 pt) Give the equations for each of the steps involved in the formation of the ionic solid $MgCl_2$:

a. Sublimation of Mg $\quad Mg_{(s)} \rightarrow Mg_{(g)}$

b. 1st ionization energy of Mg $\quad Mg_{(g)} \rightarrow Mg^+_{(g)} + e^-$

c. 2nd ionization energy of Mg $\quad Mg^+_{(g)} \rightarrow Mg^{2+}_{(g)} + e^-$

d. Formation of Cl atom $\quad Cl_{2(g)} \rightarrow 2\,Cl_{(g)}$

e. Electron affinity of Cl $\quad Cl_{(g)} + e^- \rightarrow Cl^-_{(g)}$

d. Lattice energy of $MgCl_2$ $\quad Mg^{2+}_{(g)} + 2Cl^-_{(g)} \rightarrow MgCl_{2(s)}$