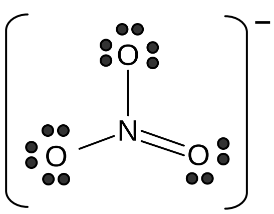
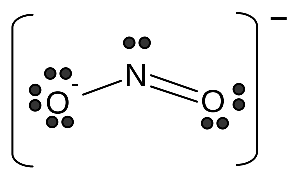
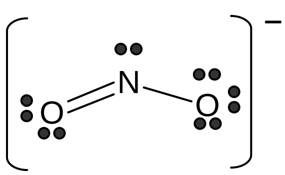
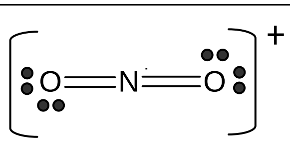
Chem 115 Exam 3
α and β versions, 5/6/08

Multiple Choice

α and β versions	
1. B	11. D
2. D	12. C
3. A	13. D
4. D	14. D
5. B	15. A
6. A	16. C
7. C	17. B
8. B	18. A
9. C	19. B
10. E	20. C

Problem 1

alpha (α) and beta (β) exam versions had the same problem 1		
a)	NO_3^-  or one of the other two possible resonance structures	NO_2^- 
b)	the other resonance structure of NO_2^- (as compared to the one drawn in part (a)) 	
c)	$\frac{3}{2}$ or 1.5	
d)	NO_2^- bond order ($\frac{3}{2}$ or 1.5) is larger than NO_3^- bond order ($\frac{4}{3}$ or 1.33). Greater bond order is stronger, and therefore shorter	
XC	 The bond order for NO_2^+ is 2. Greater bond order in NO_2^+ ion is stronger than lesser bond order in NO_2^- and therefore leads to shorter bond.	

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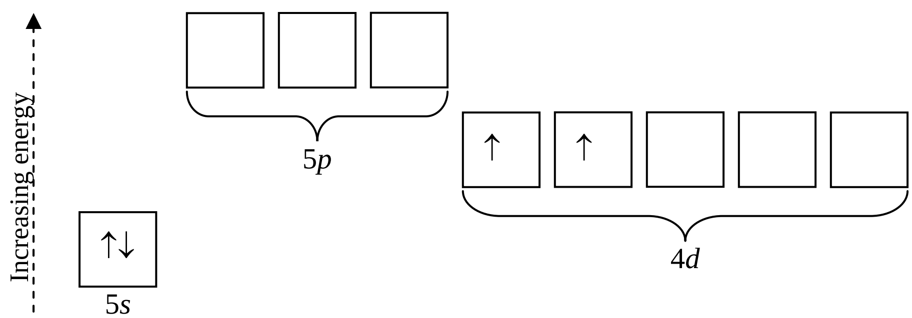
<u>Problem 2</u>

<table>
<tr><td colspan="2">alpha (α) and beta (β) exam versions had the same problem 2</td></tr>
<tr><td>a)</td><td>Every answer was marked correct (3 out of 3 points) due to typo on the test. However, the correct answer for the symbol of the atom which has valence electron configuration of $3s^2\ 3p^2$ is Si.</td></tr>
<tr><td>b)</td><td>$4s^2\ 3d^6$</td></tr>
<tr><td>c)</td><td>$3s^2\ 3p^6$</td></tr>
<tr><td>d)</td><td>O (that is, the symbol for oxygen)</td></tr>
<tr><td>e)</td><td>
</td></tr>
<tr><td>f)</td><td>$$\Delta E_{3\to 2} = -Rhc\left(\frac{1}{n_{final}^2} - \frac{1}{n_{initial}^2}\right)$$
$$= -\left(1312\,\frac{kJ}{mol}\right)\left(\frac{1}{2^2} - \frac{1}{3^2}\right)$$
$$= -\left(1312\,\frac{kJ}{mol}\right)\left(\frac{1}{4} - \frac{1}{9}\right)$$
$$= -182\,\frac{kJ}{mol}$$</td></tr>
<tr><td>XC</td><td>$$\lambda = \frac{hc}{\Delta E_{3\to 2}}$$
$$= \frac{\left(6.626\times 10^{-34}\,J\cdot s\right)\left(2.998\times 10^{8}\,\frac{m}{s}\right)}{182\,\frac{kJ}{mol}\times\frac{1000\,J}{1\,kJ}\times\frac{1\,mol}{6.022\times 10^{23}}}\times\frac{10^{9}\,nm}{1\,m} = 656\,nm$$</td></tr>
</table>