Chemy 102 _Summer 2012-2013

Quiz # 2

Name Key ID _____ Sec ___

1	6	7	8
H	C	N	O
1.01	12.01	14.01	16.00

The relative energies of molecular orbitals:

$H_2 - N_2$:

$$\sigma_{1s} < \sigma^*_{1s} < \sigma_{2s} < \sigma^*_{2s} < \pi_{2p_y} = \pi_{2p_z} < \sigma_{2p_x} < \pi^*_{2p_y} = \pi^*_{2p_z} < \sigma^*_{2p_x}$$

O_2 and F_2 :

$$\sigma_{1s} < \sigma^*_{1s} < \sigma_{2s} < \sigma^*_{2s} < \sigma_{2p_x} < \pi_{2p_y} = \pi_{2p_z} < \pi^*_{2p_y} = \pi^*_{2p_z} < \sigma^*_{2p_x}$$

Q1 . Write the electron configuration of N_2^-. What is the bond order of N_2^- ? Is it diamagnetic or paramagnetic?

$\sigma_{1s}^2\ \sigma_{1s}^{*2}\ \sigma_{2s}^2\ \sigma_{2s}^{*2}\ \pi_{2p_y}^2 = \pi_{2p_z}^2\ \sigma_{2p_x}^2\ \pi_{2p_y}^{*1}$ (or $\pi_{2p_z}^{*1}$)

B.O $= \frac{1}{2}(6-1) = 2.5$; paramagnetic

Q2. A 2.50 g sample of ethanol, C_2H_5OH, is combusted in a bomb calorimeter. The temperature of the calorimeter increases by 14.2°C. If the heat capacity of the calorimeter is 5.22 kJ/°C, what is the heat evolved per mole of ethanol combusted?

heat evolved per mole of ethanol combusted = – 1.37×10^3 kJ

Q3. The molar enthalpies of formation for $H_2O(l)$ and $H_2O(g)$ are -285.8 kJ and -241.8 kJ, respectively. How much heat is released when 25 g of water condenses from the gas to the liquid phase?

a. -2.4 kJ b. -32 k J (c) -61 kJ d. -88 kJ e. -127 kJ

Q4. Given: $2Pb\ (s) + 3O_2\ (g) \rightarrow 2PbO\ (s) + 2SO_2\ (g)$ $\Delta H = -830.8$ kJ

Then for $PbO\ (s) + SO_2\ (g) \rightarrow Pb\ (s) + 3/2O_2\ (g)$ $\Delta H = +415.4$ kJ