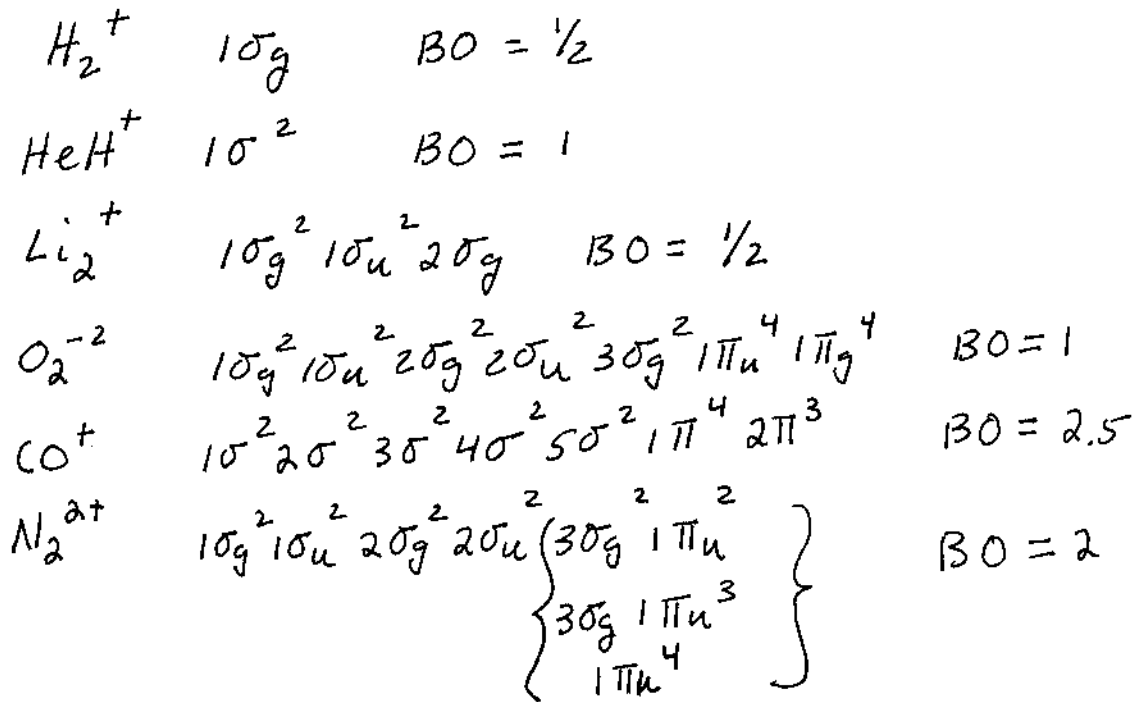
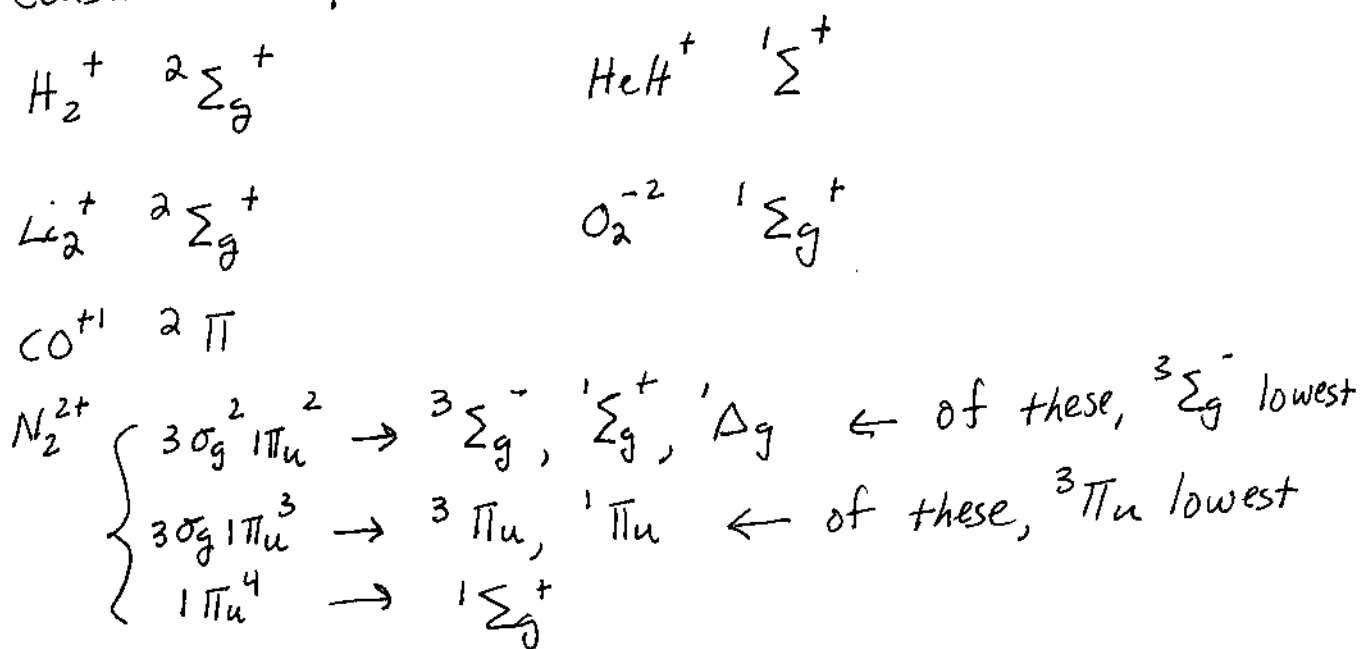


Homework #7 - Answers - Chem 1410

1. Give the electronic configurations and Bond orders of the following molecules:



2. Give the term symbols for the species considered in problem #1.



9-19. The electronic configurations and bond orders of the molecules in the table are:

- 1) B_2 : $1\sigma_g^2 1\sigma_u^2 2\sigma_g^2 2\sigma_u^2 3\sigma_g^2 \rightarrow B.O. = 1$
- 2) C_2 : $1\sigma_g^2 1\sigma_u^2 2\sigma_g^2 2\sigma_u^2 1\pi_u^4 \rightarrow B.O. = 2$
- 3) N_2 : $1\sigma_g^2 1\sigma_u^2 2\sigma_g^2 2\sigma_u^2 3\sigma_g^2 1\pi_u^4 \rightarrow B.O. = 3$
- 4) O_2 : $1\sigma_g^2 1\sigma_u^2 2\sigma_g^2 2\sigma_u^2 3\sigma_g^2 1\pi_u^4 1\pi_g^2 \rightarrow B.O. = 2$
- 5) F_2 : $1\sigma_g^2 1\sigma_u^2 2\sigma_g^2 2\sigma_u^2 3\sigma_g^2 1\pi_u^4 1\pi_g^4 \rightarrow B.O. = 1$

Comparing these results with the force constants in the table, it is seen that the force constants "track" the bond orders. I.e., high bond order \Rightarrow high force constant.

9-24. The IP from the fluorine lone-pair orbital of HF is 1550 kJ/mol, whereas the IP associated with the p orbital of the F atom is 1795 kJ/mol. Explain.

HF has partial ionic ($H^{\delta+} F^{\delta-}$) character. The partial - charge on the F makes it easier to remove an electron.

9-36. What would the dipole moment of LiH be if the molecule were 100% ionic.

$$\mu = q \cdot R = (1.602 \times 10^{-19} \text{ C}) (1.59 \times 10^{-10} \text{ m}) = 2.55 \times 10^{-29} \text{ C}\cdot\text{m}$$

What is the % of ionic character.

$$\% \text{ ionic character} = \frac{\text{actual dipole}}{\text{ideal dipole}} \times 100 = \frac{1.962 \times 10^{-29}}{2.55 \times 10^{-29}} \times 100 = 96.9\%$$