# 7.E: Exercises

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| 1. | Arrange the following compounds in the order of the increasing polarity of their bonds:<br>CO, HF, NaCI, $O_2$ |
| 2. | Pauling introduced the idea of defining the percent ionic character possessed by a chemical bond. A covalent bond with equal sharing of the charge density has 0% ionic character, and a perfect ionic bond would of course have 100% ionic character. One method of estimating the percent ionic character is to set it equal to the ratio of the observed dipole moment to the value of eR, all multiplied by 100. $\text{percent ionic character} = \left(\frac{\mu}{eR}\right)100$<br>The value of eR is, it will be recalled, the value of the dipole moment when one charge is completely transferred in the formation of the bond and the resulting ions are spherical.<br>Use this method to determine the percent ionic character of the bonds in the diatomic hydrides, LiH to HF. Could any real molecule ever exhibit 100% ionic character according to this definition? |
| 3. | Pauling has proposed an empirical relationship which relates the percent ionic character in a bond to the electronegativity difference. $\text{percent ionic character} = \left(1 - e^{-(1/4)(\chi_A - \chi_B)}\right)100$<br>From the electronegativity values given in Table 7-2, it is seen that the difference ($c_F$ - $c_H$) is greater than the value ($c_H$ - $c_{Li}$). Using the above relationship, we can calculate that the bond in HF should be 59% ionic while that in LiH should be only 26% ionic. Does the estimate of the relative ionic character in HF and LiH based on the electronegativity difference agree with that obtained by a comparison of the molecular charge density and density difference maps for these two molecules? |