OER 9.4

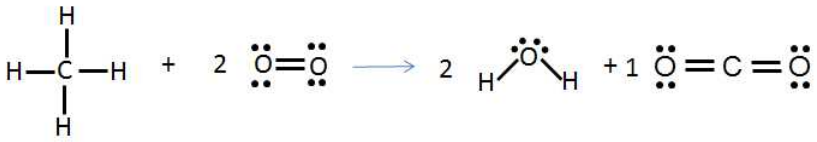
CHE 111 - Homework - Ch 9c
BDE's and Lattice Energy

Score: _____/55

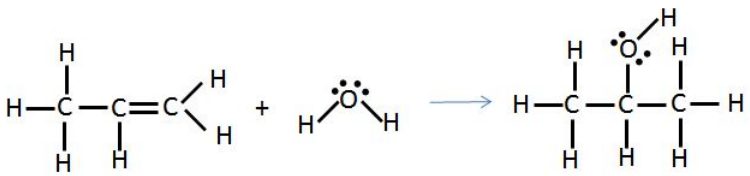
Name: _____ Date: _____

[3 pt] 1. Why are Bond Dissociation Energies (BDE) a useful method for calculating ΔH values? What advantage do they have over the tabulated ΔH_f° values? What disadvantage do they have?

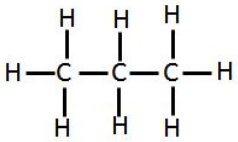
[5 pt] 2. Use the BDE's on the Equations Cheat Sheet to calculate the approximate ΔH° (in kJ) for the combustion of methane: $CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O(g)$ 2. _____



[5 pt] 3. Use the BDE's on the Equations Cheat Sheet to calculate the approximate ΔH° (in kJ) for the industrial synthesis of isopropyl alcohol from the reaction of propene and water: 3. _____



[7 pt] 4. Use the BDE's on the Equations Cheat Sheet to calculate the approximate ΔH° (in kJ) for the combustion of propane. (Hint: writing and balancing the complete reaction will no doubt prove useful.) 4. _____



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[3 pt] 5. Define the term Lattice Energy. Are they generally Endothermic or Exothermic? Why are they hard to calculate?

[5 pt] 6. Define Lattice Energy in terms of a mathematical equation, properly define each variable.

[3 pt] 7. Does the magnitude of the lattice energy Increase or Decrease as you move down a column (ex: LiCl vs CsCl. Explain the trend.

[3 pt] 8. Does the magnitude of the lattice energy Increase or Decrease as the charge on the atoms increases (ex: LiCl vs $MgCl_2$. Explain the trend.

[3 pt] 9. Order the following compounds according to their expected lattice energies $AlBr_3$, $MgBr_2$, LiBr. (Note, you will not have access to your book to look up the values on an exam, so try to do it without looking in the book.) Explain.

[3 pt] 10. Order the following compounds according to their expected lattice energies KF, KBr, KI. (Note, you will not have access to your book to look up the values on an exam, so try to do it without looking in the book.) Explain.

Using the back of the page or a separate sheet of paper to show work for the following problems and write your final answer in the space provided.

[5 pt] 11. Using a Born-Haber cycle (similar to Fig 9.25 p. 505) and various tables in your book (Appendix G, Figure 3.34/Table 3.3, Figure 3.35, and Table 9.3) and your Equations Cheat Sheet, calculate the Lattice Energy in kJ/mol for the formation of LiF from its elements. The sublimation energy for Li is 159.4 kJ/mol. 11. _____

[5 pt] 12. Using a Born-Haber cycle and various tables in your book, calculate the energy change in kJ/mol for the formation of CaF_2 from its elements. The sublimation energy for Ca is 178.2 kJ/mol and the lattice energy is -2630 kJ/mol. 12. _____

[5 pt] 13. Using the data below, calculate an overall energy change for the formation of CaCl and $CaCl_2$ from the elements. Which is more likely to form?
E_{ea} for Cl = -348 kJ/mol, E_{IE1} for Ca = 589.8 kJ/mol, E_{IE2} for Ca = 1145.4 kJ/mol, Heat of Sublimation for Ca = 178.2 kJ/mol, Lattice Energy for CaCl = 717 kJ/mol, and Lattice Energy for $CaCl_2$ = 2258 kJ/mol. 13. _____