

University of Windsor
Chemistry and Biochemistry
Chemistry 59-651, Fall Term 2004

Assignment 2

Due: Wednesday, November 24

For each of the following questions, be sure to adequately reference all sources you have used for your answers!

1) In 1998, Weiss et al. reported a new type of carbene that is stable for several hours at low temperature (*Angew. Chem., Int. Ed. Engl.* **1998**, 37, 344). In 3 typed pages or less (not including any pictures you wish to include) describe the similarities and differences between Weiss' carbene, an N-heterocyclic carbene of Arduengo-type (pick a simple one), and one of Bertrand's phosphino-carbenes (e.g. *Science*, **2000**, 288, 834; *Angew. Chem. Int. Ed.*, **2002**, 41, 2835.). In your discussion, you should describe the bonding in each type of carbene, using some of the approaches we have used in class, in addition to an examination of the metrical parameters in the molecular structures (calculated structures can be found on my web site or in the papers themselves); also, you may wish to discuss aspects of the syntheses and some of the reported reactivities (for Weiss' carbene reactivity, see: *Eur. J. Inorg. Chem.* **2000**, 1935).

2) Use bond energy comparisons to assess the stability of the hypothetical salt $[\text{N}_5]^+[\text{H}]^-$ in regard to reasonable alternative products. Then, in 1 typed page or less, provide some arguments to explain the relative stability of some of Christie's $[\text{N}_5]^+$ salts (it would be wise to look at some of the original references from the most recent paper : *Angew. Chem, Int. Ed.* **2004**, 43, 4919).

3) Construct MO diagrams for the C_{4v} and D_{3h} arrangements of the cation CH_5^+ . From your diagrams, explain why CH_5^+ would likely be more stable than CH_5^- .

Also, please think about the topic in Main Group chemistry that you would like to do for your presentation at the end of the term. I would like to have the topics all picked before the end of November.