

Chem 155 Homework #9 Due at the start of class on **Mon. Mar. 8**

Reading: Chapter 6, begin Chapter 20 (yes, back to 20!)

Note 1: It is easy to be overwhelmed by chapter 20. I recommend reading the homework problems FIRST, then reading the chapter to focus on the sections needed to answer the homework (and those covered in lecture).

Note 2: You'll hopefully find this homework easier than average. This is your hint to start your lab 5 write up before Monday night.

Chapter 6 Problems:

6.8

6.9

6.17

6.20

6.28

6.33

Chapter 20 Problems:

20.31

20.35

20.39

Additional Problems:

1) Discuss the experimental evidence supporting the existence of molecular orbitals. Explain how a chemist might measure the energy of an electron in a particular molecular orbital.

2) When we breath in air, O₂ is taken up in the blood by the protein hemoglobin, which contains Fe²⁺ ions bound to a heme group [(heme)Fe²⁺]. The iron-heme reversibly binds O₂, picking it up and releasing it in the other tissues (see Oxtoby, pp. 640-641). In the bound form (oxygenated heme), one electron is transferred from the iron to the O₂ so that this species can be described as [(heme)Fe³⁺ (O₂⁻)]. Is the oxygen-oxygen bond length in heme longer or shorter than the bond in O₂. Explain.

3) Find a paper with a molecular orbital measurement *that shows an experimental measurement of a molecular wavefunction* (e.g. via STM, angle resolved UPS, or otherwise). Include a printout on your homework and the citation.

4) Draw, and label the hybridization, and bond angles of each carbon atom in:

a) toluene

b) butane

c) acetic acid

d) methyl cyanate