Chem 220a

Problem Set 6

Chapter 7

Due: Monday, October 22, 2001

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(1818-1892)

Royal College of Chemistry (1845)

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1. Learn how to determine the Degree of Unsaturation of a compound from its formula. We will be using this concept in class. The text uses a formula. I think the website method is easier. Try this one: $C_{12}H_{17}Br_2ClN_2O_2S$.

2. Do problems 2-4 in the Alkyl Halide module in ORGO. They need not appear on your homework.

3. Construct a diagram [like the one here] that interrelates the heats of formation and the heats of hydrogenation (Table 7-1, pg. 307) of (*E*)-2-hexene, (*Z*)-2-hexene and n-hexane, and the standard state. Provide numerical values. Do your values for the heats of hydrogenation make sense with relevant data in Table 7-1, pg. 307?

4. Determine the heat of formation of 2-methyl-2-butane given the data provided in Table 7-1, pg. 307, and the heats of formation provided in the Study Aids.

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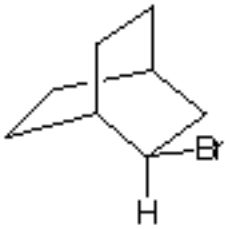
5. Treatment of (*3S, 4S*)-3-bromo-3,4-dimethylhexane **A** with aqueous sodium hydroxide gives a tetrasubstituted alkene **B**, an optically active (*E*)-trisubstituted alkene **C** and a small amount of an optically active alkene **D**. Why is (*E*)-**C** favored over (*Z*)-**C**? Does the racemate of **A** give the same products? Explain. When the diastereomer (*3R, 4S*)-**A** is used in the reaction, what are the structures of **B'**, **C'** and **D'**?

6. Treatment of bromide **1** with t-C_4H_9OK gives only bicyclic alkene **2**. Bromide **3** is unreactive under the same conditions. Explain. Provide an accurate mechanism for the formation of **2** from **1**.



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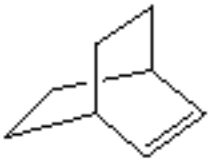
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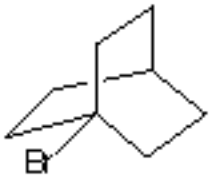

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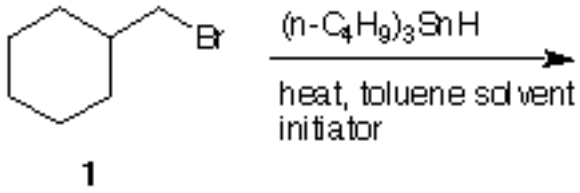
7. A student decides to synthesize *tert*-butyl methyl ether (MTBE) by the reaction of *tert*-butyl chloride with CH_3ONa in CH_3OH. His classmate tells him that his experiemnt is doomed to failure. She, being well-informed and generous, offers two alternative methods for the solution of his synthesis. Where did he go wrong and what did she offer as alternatives?

8. Compound **A**, C_8H_{12}, reacts with hydrogen in the presence of the catalyst Pt to afford **B**, C_8H_{14}. [How many rings and double bonds in **A** and **B**?] Compound **B** forms **only** 2 monochloro derivatives, **C** and **D**, upon free radical chlorination. Compound **C** forms **A** and alcohol **E** ($C_8H_{12}O$) upon reaction with KOH. Compound **D** cannot undergo an S_N2 reaction (why?) with KOH nor can it undergo elimination. What are the structures of **A-E**? Show your reasoning.

9. Predict the products of the reaction on the right. Provide a mechanism.



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