

Problem Set 1

Out: October 2, 1998

Due Back: October 9, 1998

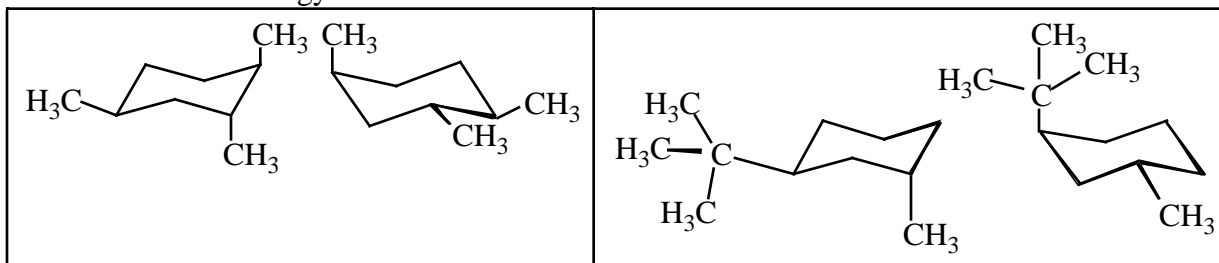
Chemistry 221, 1998

Answers to the following problems should be written, in order and labeled, on 8 1/2 x 11 inch paper. Answers written on the problem set itself will not be graded.

Section A

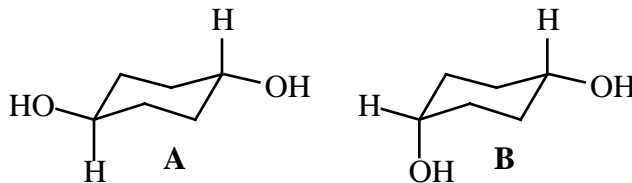
1. For each of the two pairs of conformers below:

- Recopy the two chair forms shown below.
- Identify the more stable of the two.
- Give the energy difference between the two. Show calculations.



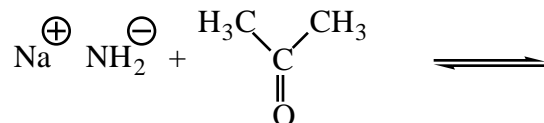
2. Molecules **A** and **B** below respond differently to a technique which probes the types of hydrogens in a compound.¹ Molecule **A** shows signs of three types of hydrogens, while molecule **B** shows signs of only two. You will need to know that this technique looks at molecules much like a camera with a slow shutter speed: the result of conformational change is the display of only one signal from any hydrogens which exchange types due to these changes.

- Explain why these compounds show the number of signals that they do.
- Show clearly which hydrogens are in each of the groups (3 for **A** and 2 for **B**).



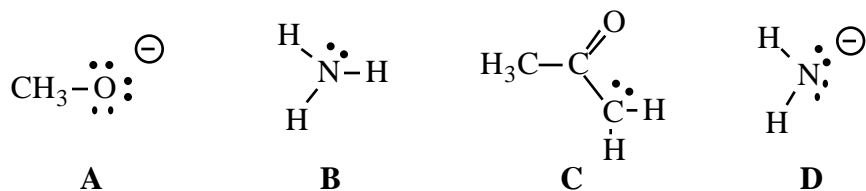
Section B

1. Complete the following Brønsted acid/base equation, and use pK_a values to determine whether or not the reaction is favorable. Show calculations.

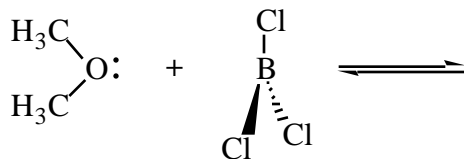


¹NMR spectroscopy uses a powerful magnet and radio waves to probe the hydrogen nuclei, determining the exact chemical environment of each hydrogen. Hydrogens which are in exactly the same environment will overlap, giving one signal, while hydrogens in other environments give separate signals. We will study NMR in chapter 13.

2. Arrange the following molecules in order of *base strength*. Draw the conjugate acid for each base. Support your ranking with data (how did you know?) and explain the molecular basis for the ranking, as best you can.



3. Write the products of the following Lewis acid/base reaction. Label each of the reactants as either Lewis acid or Lewis base.

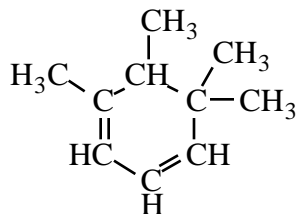


Section C

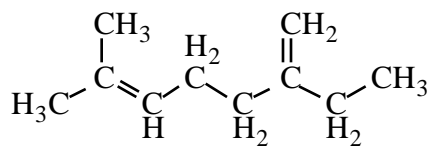
Provide IUPAC names for the following compounds:

1. Also, redraw these, and show the isoprene units in them (they could be terpenes).

a.



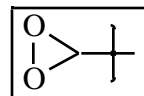
b.



2. Draw a clear representation of the following compounds:

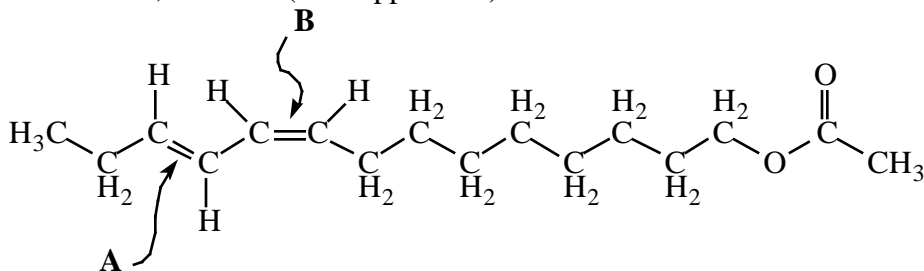
- a. 2,6-dimethyl-5-ethyl-5-propylnonane
 b. 1-cyclopropyl-3-methylcyclohexene

Bonus: Draw a skeleton representation of 1-(2,3-dioxiranyl)-2,3,5,6-tetra(2,2-dimethylpropyl)cyclohexane. The oxiranyl group is drawn in the box to the right; try drawing it at the top of the structure.



Section D

Determine the configuration of the identified double bonds in this molecule.¹ Use the letters E, Z or NA (Not Applicable).



¹This is Prodlure, a major component of sex pheromone of female *Spodoptera litura* (F.) and Egyptian cotton leafworm, *S. littoralis* (Boisd.).

