CHEM 3311 Spring 2006

Exam 1

February 16, 2006
Professor Rebecca Hoenigman

I pledge to uphold the CU Honor Code:

Signature_____

Name (printed)_____

Last four digits of your student ID number_____

Recitation TA_____

Recitation number_____

Recitation day, and time_____

You have 1 hour and 15 minutes to complete this exam.
No model kits or calculators allowed; periodic table and scratch paper are attached.

PUT YOUR NAME ON ALL PAGES OF THE EXAM.

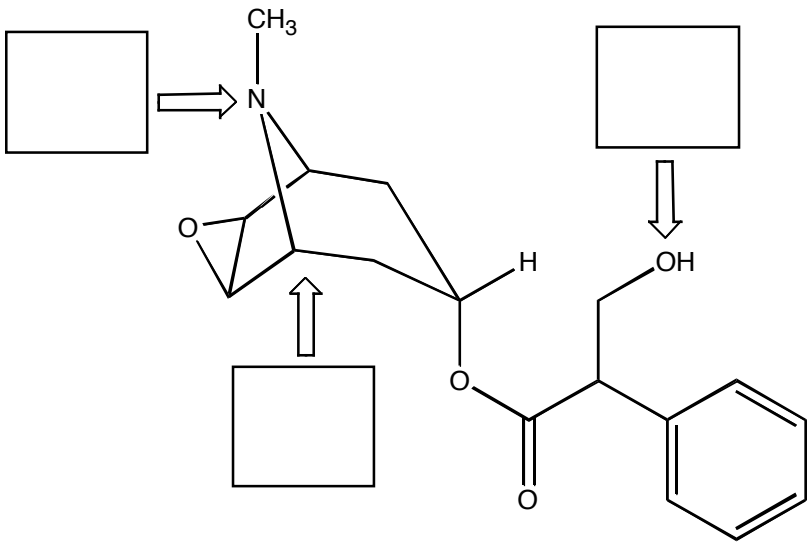
DO NOT TURN THIS PAGE UNTIL INSTRUCTED TO DO SO.

Recitation Sections:

Number	Day	Time	TA
121	Tuesday	8 am	Andrew
131	Tuesday	1 pm	Heather
141	Wednesday	8 am	Chris
151	Wednesday	12 pm	Andrew
153	Wednesday	12 pm	Nicole
152	Wednesday	5 pm	Chris
171	Thursday	12 pm	Heather

1. (5 pts) Define organic chemistry in one or two sentences.

2. (9 pts) Devil's apple is a flowering plant (of the *Datura stramonium* family). This plant produces delirium when consumed in small amounts, and coma or death in large amounts. One of the active ingredients in devil's apple is scopolamine, shown below.



scopolamine

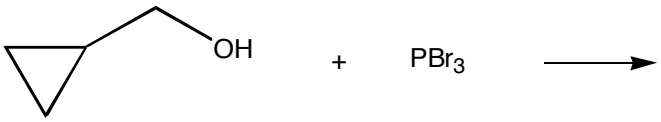
A. Circle **all** of the terms below that describe one or more structural feature of scopolamine.

1° Amine	Alkene	Non-aromatic ring
2° Amine	Amide	Ester
3° Amine	Aromatic ring	Epoxide
Alcohol	Halide	Ketone
Thiol	Ether	Aldehyde

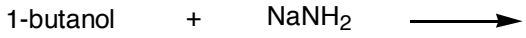
B. In the boxes above, write the hybridization of the indicated atom.

3. (8 pts) Give the products for the following reactions. If no reaction, write NR.

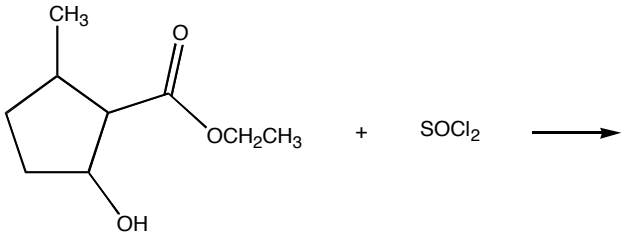
A.



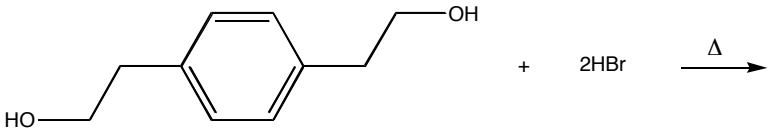
B.



C.

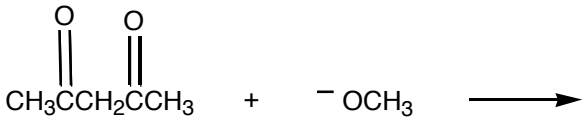


D.



4. (10 pts)

A. For the following acid-base reaction, use curved arrows to show the formation of products. Show all major resonance structure(s) of the conjugate base. Be sure to include all non-zero formal charges.

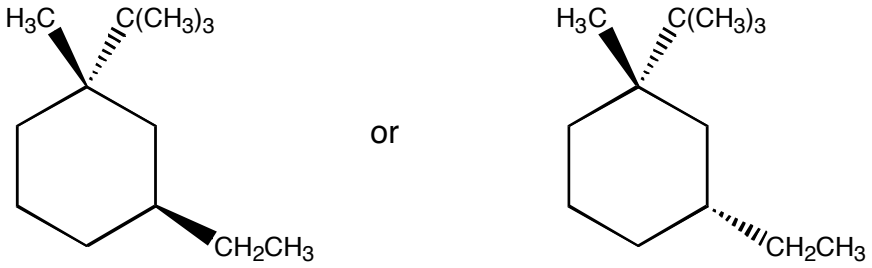


B. Predict whether the equilibrium lies to the left or right. Explain why.

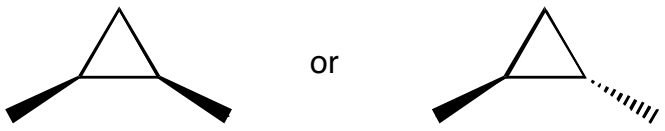
5. (15 pts) For each of the following pairs, circle the compound that has the higher heat of combustion. Give the reason for your choice.

A. *cis*-1-*t*-butyl-2-propylcyclohexane *or trans*-1-*t*-butyl-2-propylcyclohexane

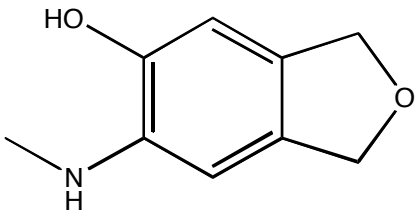
B.



C.



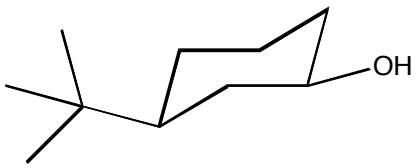
6. (2 pts) The following is a similar question to one found on a practice dental assessment exam. Draw the conjugate base of the following compound.



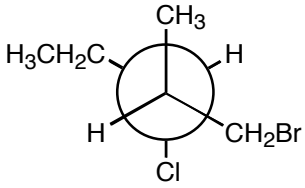
7. (10 pts) Use a molecular orbital diagram to explain why He_2 does not exist. Be sure to label the bonding and antibonding orbitals.

8. (9 pts) Give IUPAC names for the following compounds.

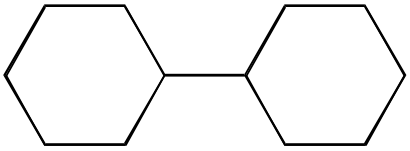
A.



B.



C.



9. (8 pts) Match the boiling points to the corresponding compounds. Boiling points: 99 °C, 117 °C, 126 °C, and 151 °C.

octane _____

2-methylheptane _____

2,2,4-trimethylpentane _____

nonane _____

10. (24 pts) Draw bond-line formulas for all the constitutional isomers that have the formula $C_6H_{14}O$ and that would be named in the IUPAC system as pentanols. Label each alcohol as primary, secondary, or tertiary. Do not repeat structures.

Scratch Page

Scratch Page

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Total _____