

CHEM 3311-200, Fall 2005

**Exam 1**

September 22, 2005

Professor Rebecca Hoenigman

I pledge to uphold the CU Honor Code:

Signature \_\_\_\_\_

Name (printed) \_\_\_\_\_

Last four digits of your student ID number \_\_\_\_\_

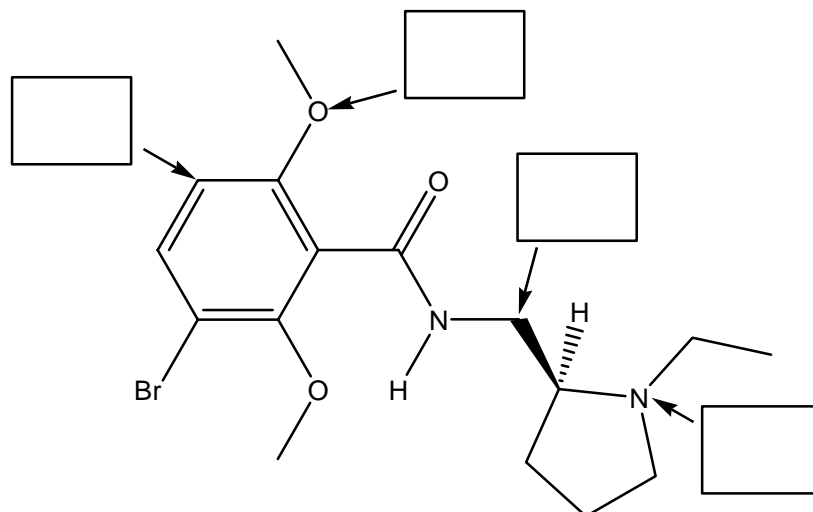
Recitation TA \_\_\_\_\_

Recitation number, day, and time \_\_\_\_\_

You have 1.5 hours to complete this exam.  
No model kits allowed; periodic table and scratch paper are attached.

**DO NOT TURN PAGE UNTIL INSTRUCTED TO DO SO.**

1. (10 pts) Remoxipride (shown below) was once a promising antipsychotic drug. However, in 1993 it was pulled from the market due to an association with several cases of aplastic anemia.



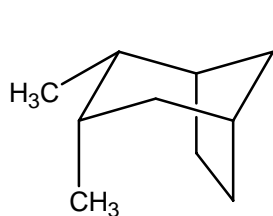
A. Circle **all** of the terms below that describe one or more structural feature of Remoxipride.

- |         |        |                   |
|---------|--------|-------------------|
| Amine   | Alkene | Non-aromatic ring |
| Amide   | Ester  | Aromatic ring     |
| Alcohol | Halide | Ketone            |
| Thiol   | Ether  | Aldehyde          |

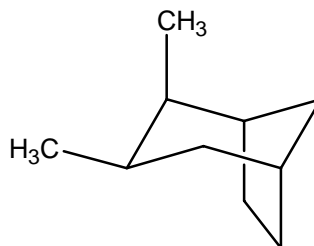
B. In the boxes above, write the hybridization of the indicated atom.

2. (10 pts) Circle the more stable stereoisomer in each of the following pairs and give the reason for your choice.

A.

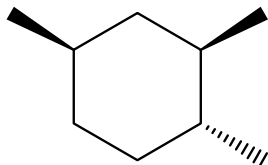


*or*

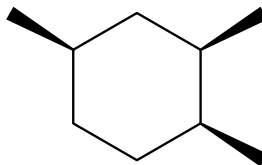


B. *cis*-1-isopropyl-4-methylcyclohexane *or trans*-1-isopropyl-4-methylcyclohexane

C.

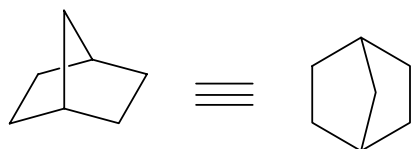


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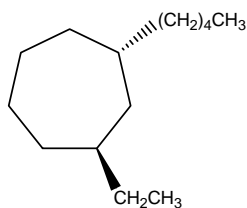


3. (10 pts) Give IUPAC names for the following compounds.

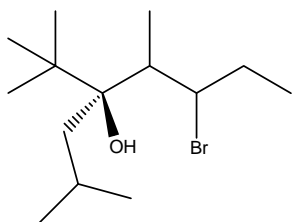
A. Norbornane



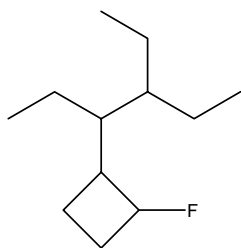
B.



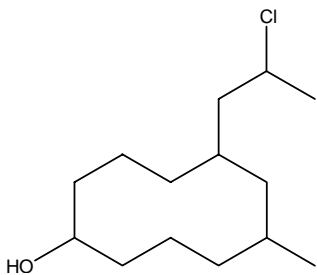
C.



D.



E.

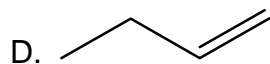


4. (10 pts) Circle the more acidic compound in the following pairs.

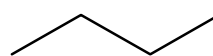
A. acid with  $pK_a = 10$       *or*      acid with  $K_a = 1.7 \times 10^{-4}$

B. 1-propanol      *or*      1-bromo-1-propanol

C.  $(CH_3)_2NH$       *or*       $CH_3NHCOCH_3$

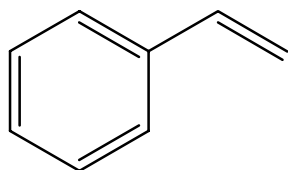


*or*

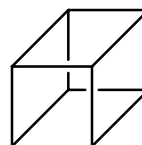


E.  $NH_4^+$       *or*       $CH_3OH_2^+$

5. (5 pts) A compound with the molecular formula  $C_8H_8$  gives off 3600 kJ/mol when burned in air. An isomer of this compound has a heat of combustion of 4200 kJ/mol. One of the isomers is styrene, the other is cubane.



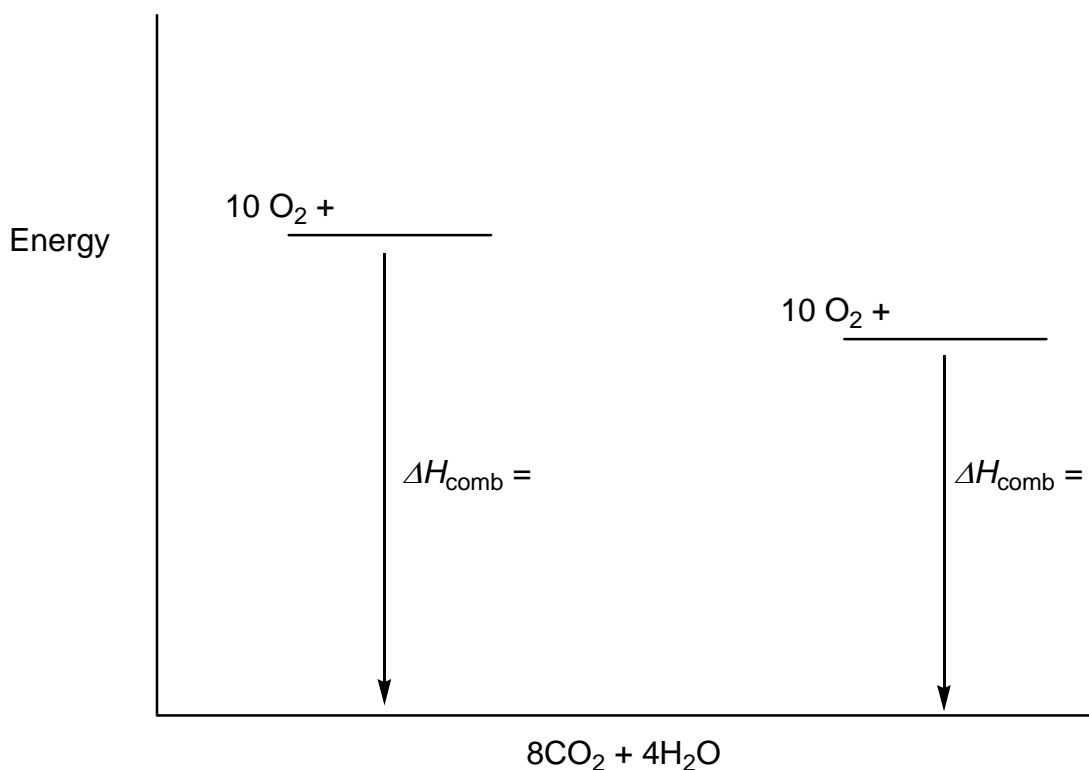
Styrene



Cubane

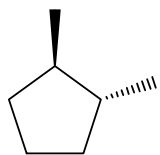
A. Which  $C_8H_8$  isomer is more stable?

B. Use the energy diagram below to illustrate your answer. Fill in the missing compounds and heat of combustion values.

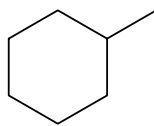


6. (10 pts) State whether the following pairs of compounds are constitutional isomers, stereoisomers, conformers, resonance structures, the same structure, or have no relation. Place your answer in the box.

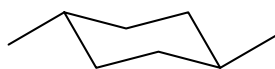
A.



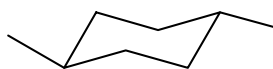
and



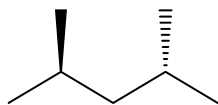

B.



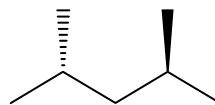
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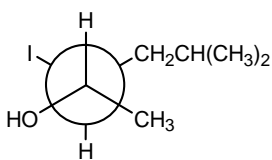

C.



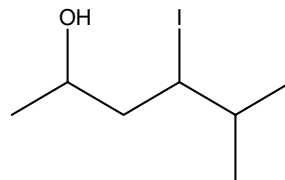
and




D.



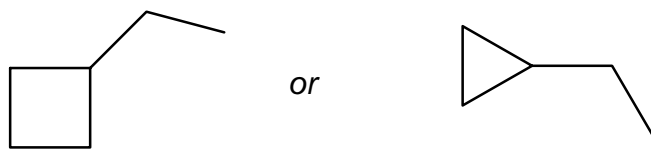
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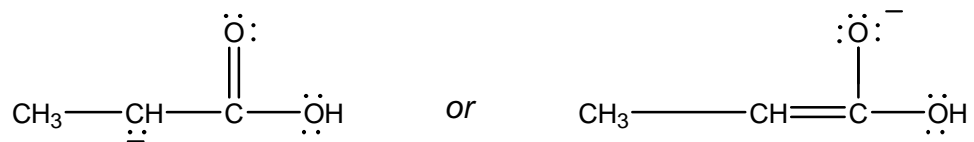

E. 3-chloro-2-ethyl-5-methylhexane *and* 4-chloro-2,5-dimethylheptane

7. (10 pts) Circle the more stable structure in each pair.

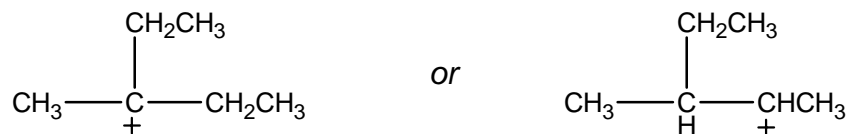
A.



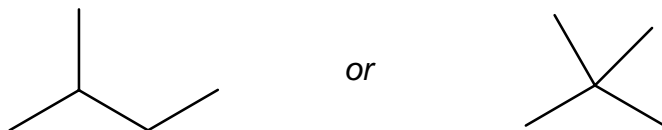
B.



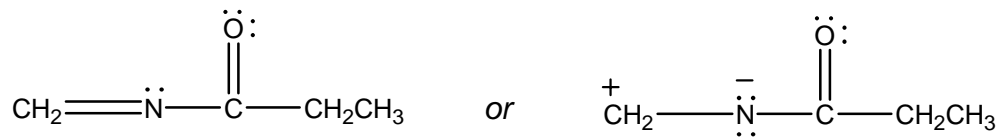
C.



D.

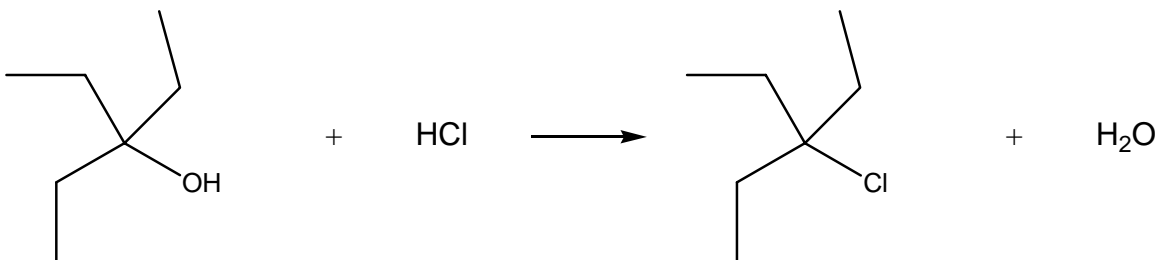


E.





8. (15 pts) The following reaction occurs via a three step mechanism.



Show each step of the mechanism below, using arrows to show the movement of electrons.

Step 1:

Step 2:

Step 3:

9. (20 pts) Draw bond-line formulas for all the constitutional isomers that have the formula  $C_8H_{18}$  and that would be named in the IUPAC system as trimethylpentanes.

## Happy Autumn!

**Score:**

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Page 3 \_\_\_\_\_

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