

CHEM 3311-100 Spring 2007

## Final Exam

Professor R. 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 2 hours and 30 minutes to complete this exam.

No model kits or calculators allowed.

Periodic table and scratch paper are attached.

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

### Recitation Sections:

#	Day	Time	TA
121	Tuesday	8 am	Kelly
131	Tuesday	1 pm	Kelly
141	Wednesday	8 am	Greg
151	Wednesday	12 pm	Greg
153	Wednesday	12 pm	Kelly
152	Wednesday	5 pm	Kelly
171	Thursday	12 pm	Greg

### Score:

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**TOTAL** \_\_\_\_\_/250

1. (10 pts) Uscharidin is a poisonous natural product with the structure shown below.

A. Label the configuration of each indicated chirality center in Uscharidin.

B. Circle **all** of the terms below that describe one or more structural feature of Uscharidin.

Amine

Ketone

Aldehyde

Amide

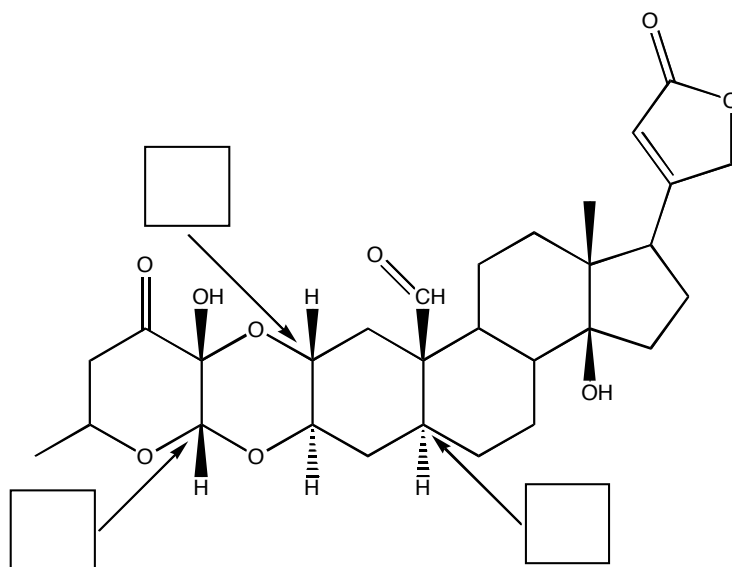
Ester

Sulfide

Nitrile

Ether

Thiol



2. (6 pts) One or more of the following names do not follow the IUPAC rules. Circle the incorrect name(s) and provide a correct IUPAC name.

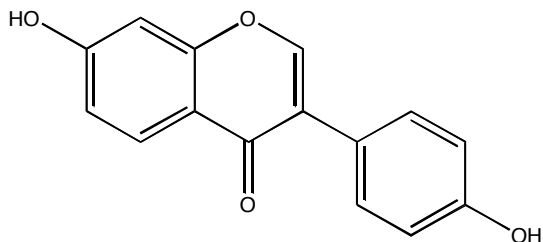
A. (3*E*)-4-isopropyl-2,3-dimethyl-3-pentene

B. 2,6-dimethyl-2-octen-4-yne

C. (3*S*,4*S*)-1-bromo-3-chloro-4-hexanol

D. (2*R*)-3,3,5,5-tetramethyl-6-hepten-2-ol

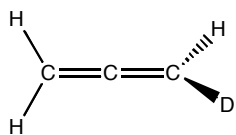
3. (5 pts) Although many Southerners think Kudzu is, to put it mildly, a noxious weed, Kudzu does have some medicinal properties. The roots of Kudzu have been used in traditional Chinese folk medicine to suppress the affects of alcohol. The active ingredient in Kudzu root is diadzein, shown below. Circle the most acidic hydrogen in diadzein.



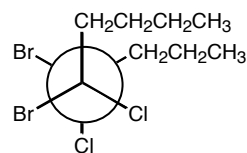
4. (10 pts) Explain why a cyano group is a deactivating, *meta* director. Use resonance structures to support your discussion.

5. (15 pts) Using curved arrows to show the flow of electrons, give a mechanism to account for the Friedel-Crafts alkylation of aniline with 1-chloro-2,2-dimethylpropane.

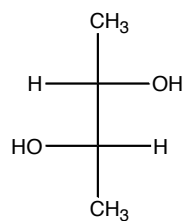
6. (5 pts) Circle the compounds below that are chiral.



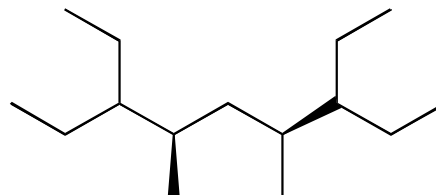
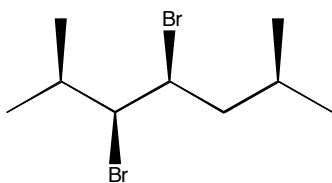
*cis*-3-methylcyclopentanol



(3*S*,4*S*)-3,4-dimethylhexane



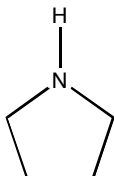
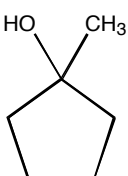
(2*R*,3*S*)-2,3-butanediol



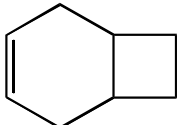
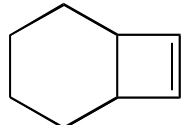
7. (15 pts) Circle the more acidic compound in the following pairs. Give the reason for your choice in the adjacent box.

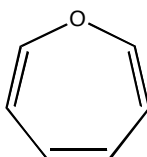
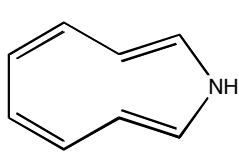
A. phenol *or* cyclohexanol

B. HI *or* HF

C.  *or* 

8. (15 pts) Circle the more stable compound. Give the reason for your choice in the adjacent box.

A.  *or* 

B.  *or* 

C. (1*R*,2*R*)-1-ethyl-2-isopropyl-1-methylcyclohexane  
*or*  
(1*R*,2*S*)-1-ethyl-2-isopropyl-1-methylcyclohexane

9. (10 pts) As a method for the preparation of alkenes, a weakness in the acid-catalyzed dehydration of alcohols is that the initially formed alkene (or mixture of alkenes) sometimes isomerizes under the conditions of its formation. Write a mechanism showing how 2-methyl-1-butene might isomerize to 2-methyl-2-butene in the presence of sulfuric acid.

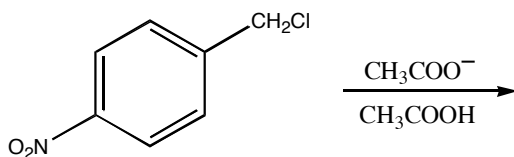
10. (5 pts) Match the following alkenes with the appropriate  $\Delta H_{\text{comb}}$  value. Heats of combustion: 5293 kJ/mol, 4658 kJ/mol, 4650 kJ/mol, 4638 kJ/mol, 4632 kJ/mol

- \_\_\_\_\_ 1-heptene
- \_\_\_\_\_ 2,4-dimethyl-1-pentene
- \_\_\_\_\_ 2,4-dimethyl-2-pentene
- \_\_\_\_\_ (Z)-4,4-dimethyl-2-pentene
- \_\_\_\_\_ 2,4,4-trimethyl-2-pentene

11. (5 pts) What is the difference between the absolute configuration and relative configuration of (+)-tartaric acid?

12. (80 pts) Give the major organic product(s) of the following reactions. Be sure to clearly show stereochemistry using dashes and wedges. Write NR if no reaction occurs. **Clearly label any enantiomers, diastereomers, and/or meso compounds.** (Note: some problems have more than one step.)

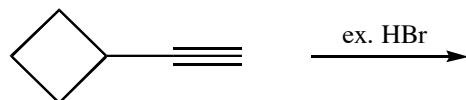
A.



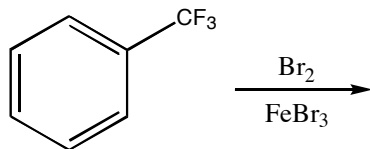
B.



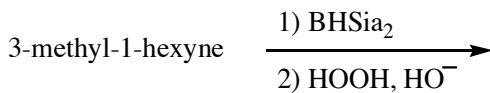
C.



D.



E.



F.

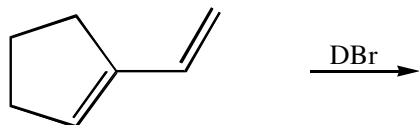


G.

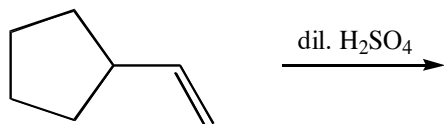


12. continued. [Be sure to clearly show stereochemistry using dashes and wedges. Write NR if no reaction occurs. Clearly label any enantiomers, diastereomers, and/or meso compounds; some problems have more than one step.]

H.



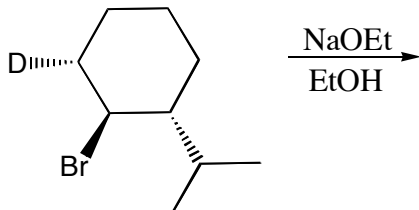
I.



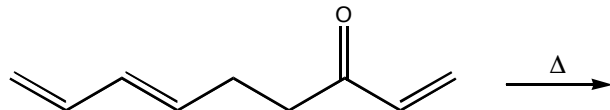
J.



K.



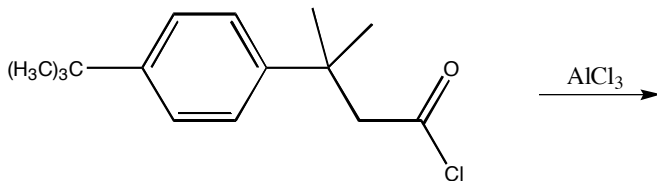
L.



M.



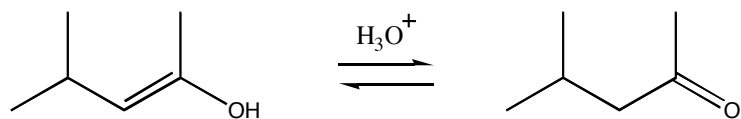
N.





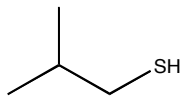
13. (12 pts) Using curved arrows to show the flow of electrons, draw a mechanism for the chlorination of *trans*-2-butene.

14. (12 pts) Using curved arrows to show the flow of electrons, propose a mechanism for the acid catalyzed enol-keto tautomerization shown below.



15. (45 pts) Propose an efficient synthesis for each of the following transformations. You may use any reagents you like. Be sure to show any intermediates. (Do not draw a mechanism.)

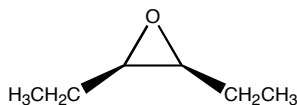
A.



*starting from* 2-methylpropene

B. 1,4-dimethyl-2-nitrobenzene *starting from* benzaldehyde

C.



*starting from* acetylene and any other organic reagents

Extra Credit: (10 pts) Draw a parody of aromatic nomenclature. For example, below is paraphrase. (You don't have to use elements.)

