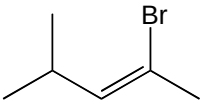
CHEM 2311
E4 practice-iv (answers *not* provided)

1. (32 points) Circle the letter *on the right* that corresponds to the answer to each question. There is only one correct answer for each question.

(i) Which of the following reactions of alkenes is *not* stereospecific?

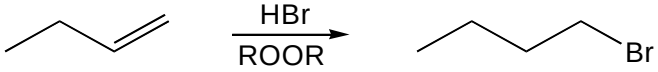
A. epoxidation (treatment with *m*-chloroperbenzoic acid) **A**
B. acid-catalyzed hydration (treatment with aqueous H_2SO_4) **B**
C. cyclopropanation (treatment with CH_2I_2 and Zn(Cu)) **C**
D. bromination (treatment with Br_2) **D**

(ii) What is the IUPAC name of the following compound?



E. (*E*)-4-bromo-2-methyl-4-pentene **E**
F. (*Z*)-4-bromo-2-methyl-4-pentene **F**
G. (*E*)-2-bromo-4-methyl-2-pentene **G**
H. (*Z*)-2-bromo-4-methyl-2-pentene **H**

(iii) Which species undergoes reaction with 1-butene in the following transformation?



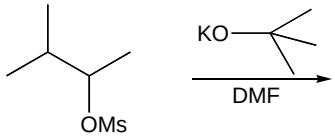
I. H^+ **J.** Br^- **K.** $RO^{\cdot}$ **L.** $Br^{\cdot}$ **I J K L**

(iv) Which of the following alcohols is most likely to undergo rearrangement during acid-promoted dehydration?

M. 2,3-dimethyl-2-butanol **N.** 3,3-dimethyl-2-butanol **M N**
O. 3,3-dimethyl-1-butanol **P.** 4-methyl-2-pentanol **O P**

(v) What is the major product of the following reaction?

Q. 3-methyl-2-butene **Q**
R. 2-metyl-3-butene **R**
S. 2-ethyl-1-propene **S**
T. 3-methyl-1-butene **T**



(vi) What kind of intermediate is involved in the formation of a bromohydrin from an alkene?

U. carbocation **V.** bromonium ion **W.** radical **X.** carbene **U V W X**

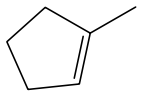
(vii) What is class of product is formed from the reaction between 1-hexene and *m*-chloroperbenzoic acid?

Y. diol **Z.** primary alcohol **AA.** secondary alcohol **BB.** epoxide **Y Z AA BB**

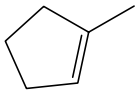
(viii) How many isomers (include regio- and steroisomers) are formed upon Markovnikov addition of water (in the presence of sulfuric acid) to (*E*)-3-methyl-2-hexene ?

CC. 1 **DD.** 2 **EE.** 3 **FF.** 4 **CC DD EE FF**

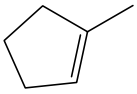
2. (40 points) Provide the structure of the major organic product obtained from the following reactions. Indicate the stereochemistry of the products wherever appropriate (and indicate if a mixture of isomers is formed).



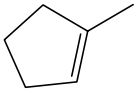
$\xrightarrow[CHCl_3]{Br_2}$



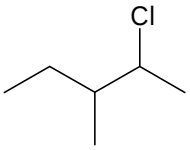
$\xrightarrow[\text{then Zn, AcOH}]{O_3}$



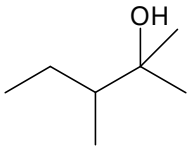
$\xrightarrow[\text{then } H_2O_2, NaOH]{B_2H_6/THF}$



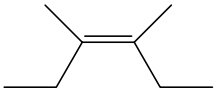
$\xrightarrow[\text{then } NaHSO_3]{OsO_4}$



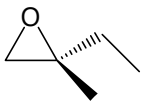
$\xrightarrow{NaOCH_3}$



$\xrightarrow[\text{heat}]{H_3PO_4}$

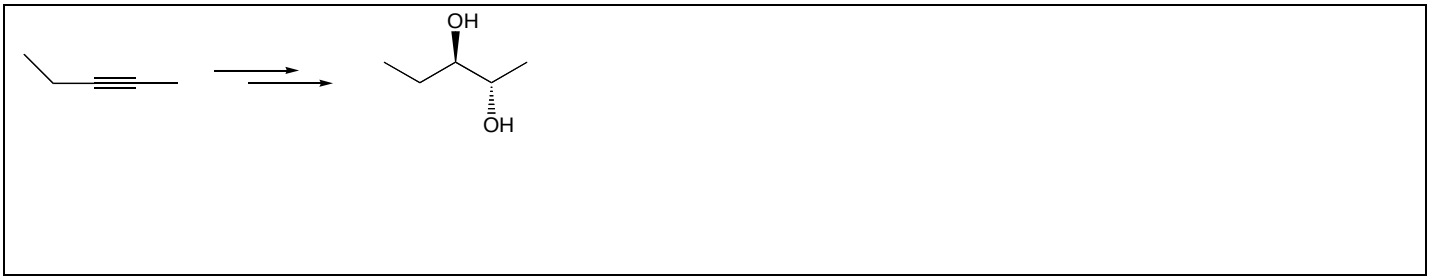


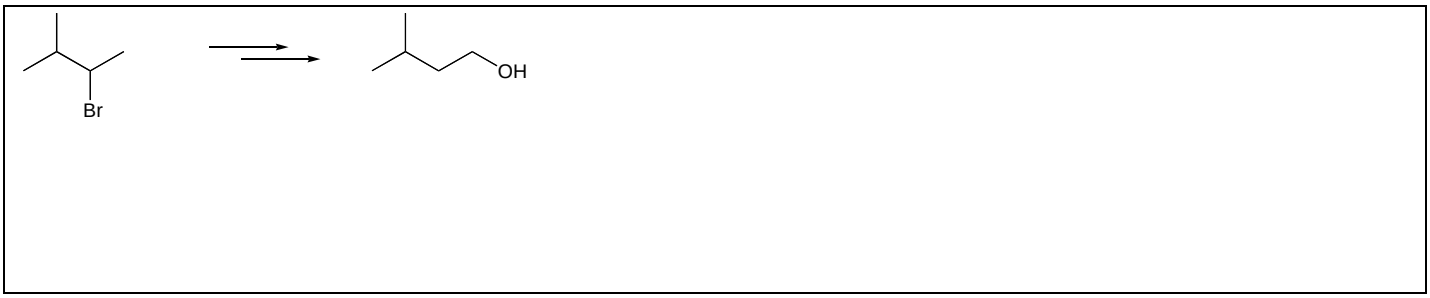
$\xrightarrow[Pt]{H_2}$

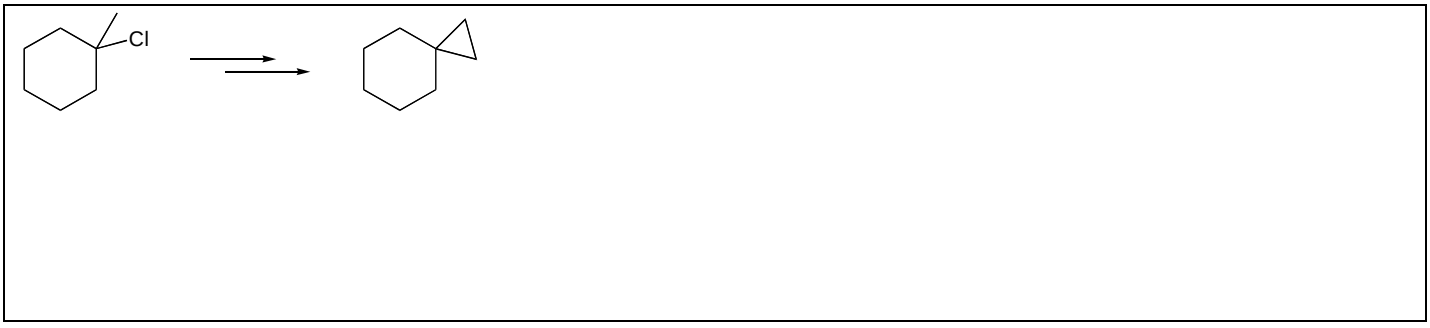


$\xrightarrow[DMF]{NaCN}$

3. (20 points) The following transformations *cannot* be performed in a single step. Provide sequences of reactions, showing reagents and isolated synthetic intermediates, to achieve each transformation. *PROBLEM SOLVING HINTS: Each of these transformations requires 2-3 steps. Approach this type of problem by asking yourself what the final product can, in fact, be made from. Can this compound be prepared from the given starting material?*







4. (8 points)

Provide a mechanism to account for the following reaction. Your mechanism should show valid structures of reactive intermediates, and show the movement of pairs of electrons with curved arrows.