

CHEM 346 – Organic Chemistry I (for Majors)

Instructor: Paul J. Bracher

Practice Hour Examination #3

Problem Booklet

| | |
|------------------------|--|
| Student Name (Printed) | |
| Student Signature | |

Please also write your name on the back of the exam

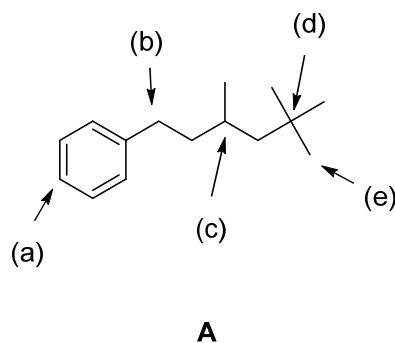
Scoring

| Problem | Points Earned | Points Available |
|---------|---------------|------------------|
| I | | 25 |
| II | | 15 |
| III | | 20 |
| IV | | 20 |
| V | | 20 |
| TOTAL | | 100 |

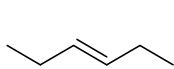
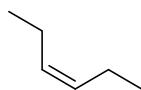
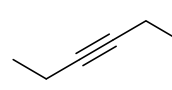
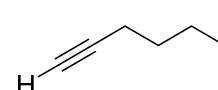
Original Problems, **Required Information in Answers**, and **Supplementary Explanation**

Problem I. (25 points total, 5 points each) For each question, select the best answer of the choices given. Write the answer, legibly, in the space provided.

- (1) _____ Which of the following arrows points to the easiest hydrogen atom(s) for a bromine radical (Br^\bullet) to abstract from compound **A**?

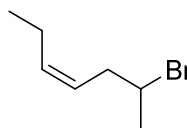


- (2) _____ Rank the following compounds in descending order of enthalpy (ΔH) of hydrogenation (i.e., least exothermic to most exothermic when hydrogenated completely).

**B****C****D****E**

- (a) **B > C > D > E**
 (b) **E > D > C > B**
 (c) **E > D > B > C**
 (d) **D > E > B > C**
 (e) none of the above

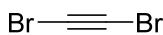
(3) _____ Which of the following reagents will not oxidize compound F?



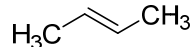
F

- (a) Br₂
- (b) mCPBA
- (c) OsO₄
- (d) LiAlH₄
- (e) 1. O₃, 2. Zn, CH₃COOH

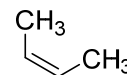
(4) _____ Which of the following compounds has the highest net dipole moment?



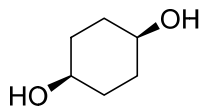
(a)



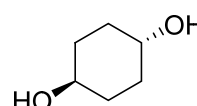
(b)



(c)

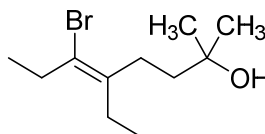


(d)



(e)

(5) _____ What is the IUPAC name of compound G?

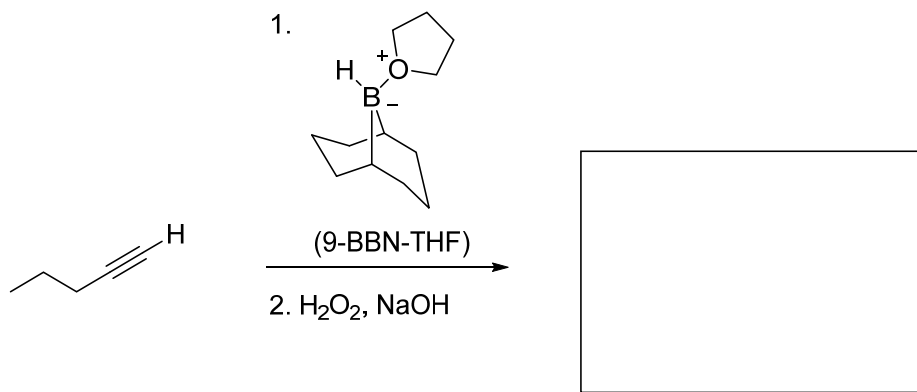


G

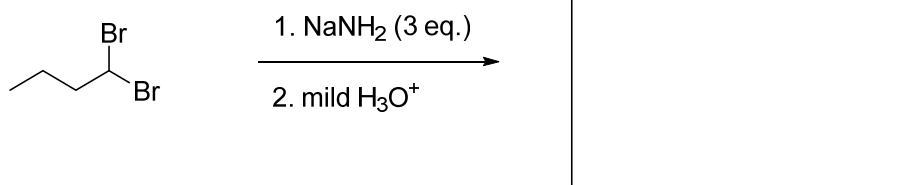
- (a) (Z)-6-bromo-5-ethyl-2-methyl-5-octen-2-ol
- (b) (Z)-3-bromo-4-ethyl-7-hydroxyl-7,7-dimethylheptene
- (c) (E)-3-bromo-4-ethyl-7-hydroxyl-7,7-dimethylheptene
- (d) (Z)-5-bromo-4-ethyl-1,1-dimethyl-4-hepten-1-ol
- (e) (E)-5-bromo-4-ethyl-1,1-dimethyl-4-hepten-1-ol

Problem II. (15 points total, 5 points each) Reactions. The following chemical reactions are missing their starting materials, reagents, or products. Write the missing compounds into the empty boxes below, as appropriate. In some cases, there will be more than one correct answer that will merit full credit.

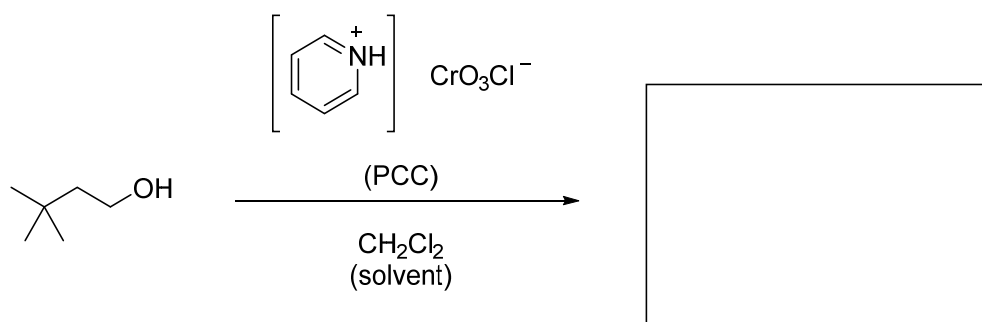
(1) (5 points)



(2) (5 points)

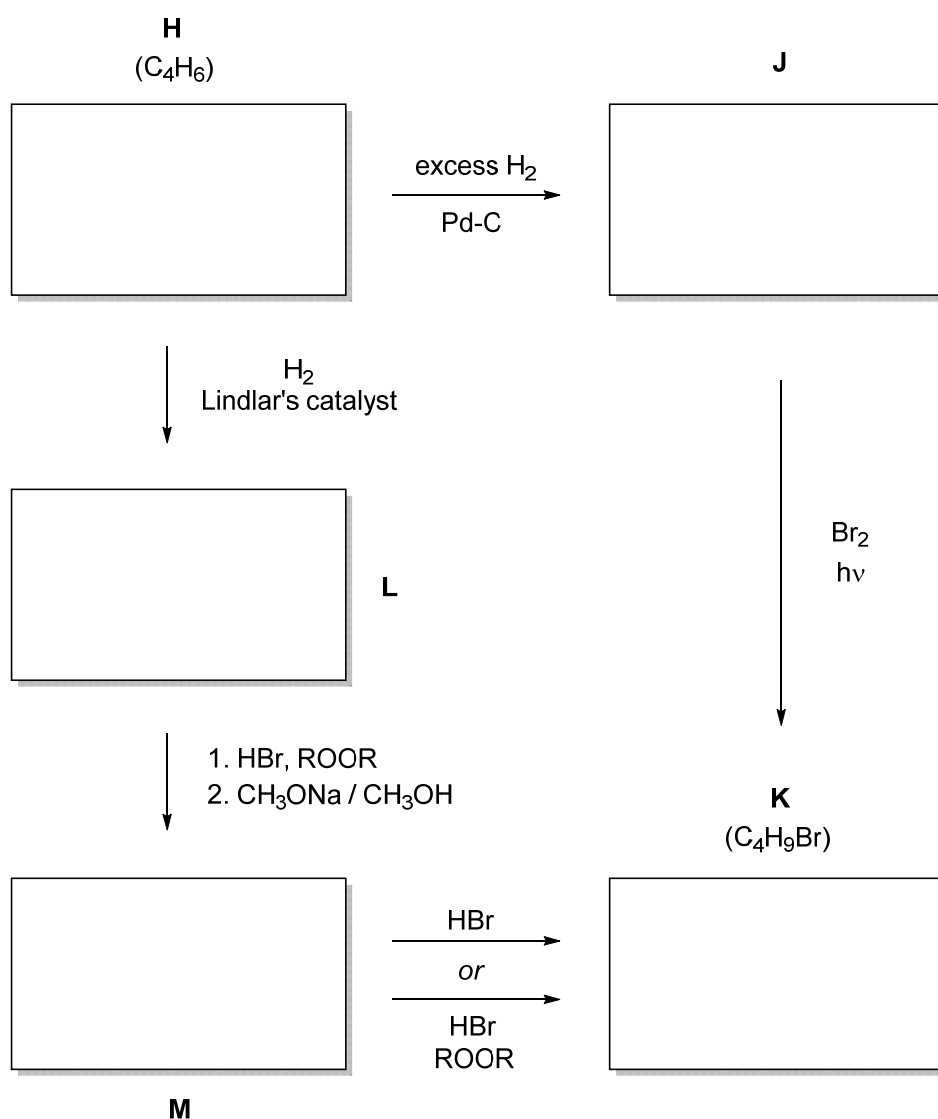


(3) (5 points)

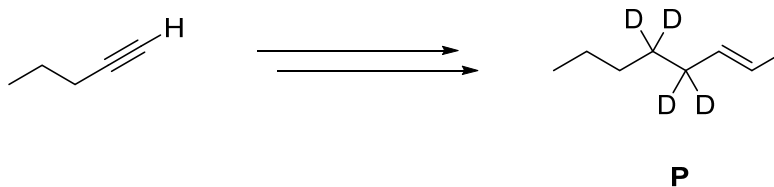


Problem III. (20 points total) Roadmap. Provide structures for compounds **H**, **J**, **K**, **L**, and **M** given the clues listed below.

Compound **H** has the molecular formula C_4H_6 . When **H** is treated with excess H_2 in the presence of palladium on carbon, compound **J** is formed. Photobromination of **J** yields the major product **K**, with molecular formula C_4H_9Br . When compound **H** is hydrogenated in the presence of Lindlar's catalyst, compound **L** is the major product. Treatment of **L** with HBr in the presence of peroxides, followed by reaction with methoxide in methanol, yields **M**. The reaction of **M** with HBr —either in the presence of peroxide or not—yields compound **K**. Provide structures for compounds **H**, **J**, **K**, **L**, and **M**. All five compounds have different structures, but not necessarily different molecular formulas.



Problem IV. (20 points total) Synthesis. Write out an efficient synthetic route for the preparation of compound **P** from the indicated starting material and any other reagents you wish.



Problem V. (20 points total) Mechanism. Write out a sensible mechanism for the following transformation.

