CHEM 347 – Organic Chemistry II – Spring 2015

Instructor: Paul Bracher

Quiz #2

Due: Monday, February 9th, 2015

2:00 p.m. (in class or Monsanto Hall 103)

Student Name (Printed)	
Student Signature	

Instructions & Scoring

- Please write your answers on the official answer sheet. No answers marked in this booklet will be graded. You must submit a hard copy of your answer sheet. Answer sheets submitted electronically will not be graded.
- You may use any resources you wish and collaborate with others.
- Any questions should be posted to the Blackboard discussion board so all students have equal access to the information.
- Your quiz answer sheet may be photocopied.

Problem	Points Earned	Points Available
I		30
II		20
III		12
IV		19
V		19
TOTAL		100

This quiz focuses on Chapters 15, 16, 17, and 18 in Janice Smith's *Organic Chemistry*, 4th ed.

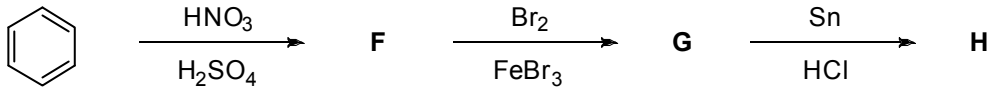
Problem I. Multiple choice (30 points total; +5 points for a correct answer, +2 points for an answer intentionally left blank, and 0 points for an incorrect answer). For each question, select the best answer of the choices given. Write the answer, legibly, in the space provided on the answer sheet.

(1) _____ Which of the following compounds would you expect to undergo the fastest heterolytic cleavage of its C–Br bond?

A **B** **C** **D**

(a) compound **A**
(b) compound **B**
(c) compound **C**
(d) compound **D**
(e) the rates for all four compounds will be exactly the same

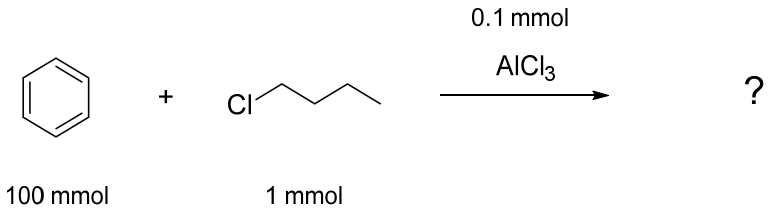
(2) _____ What is the name of the major product (**H**) expected of the following sequence of reactions?

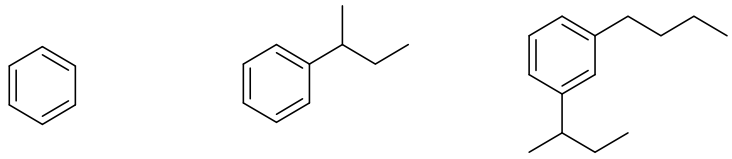


E

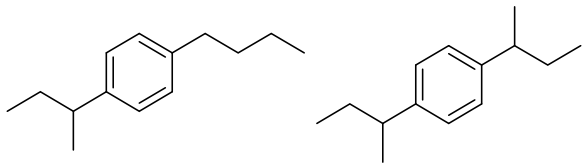
(a) 2-bromoaniline
(b) *m*-bromoaniline
(c) 3-chloroaniline
(d) 1-bromo-3-chlorobenzene
(e) 3-bromo-1-chlorobenzene

(3) _____ Which of the following compounds would you expect to find in the lowest concentration when excess benzene is treated with 1-chlorobutane and aluminum trichloride?



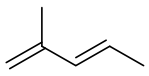


(a) (b) (c)



(d) (e)

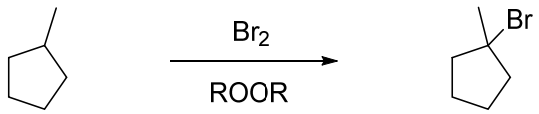
(4) _____ Which of the following statements is not correct regarding compound **J**?



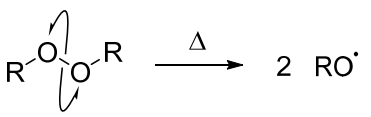
J

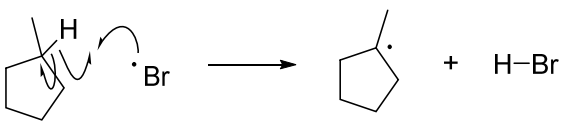
(a) compound **J** is named (3*E*)-2-methyl-1,3-pentadiene
(b) compound **J** has a less negative heat of hydrogenation than 2-methyl-1,4-pentadiene
(c) compound **J** has one other diastereomer
(d) compound **J** is incapable of participating in Diels–Alder reactions
(e) for the addition of HBr to **J**, the yield of 4-bromo-2-methyl-2-pentene relative to 4-bromo-4-methyl-2-pentene will tend to increase with increasing temperature

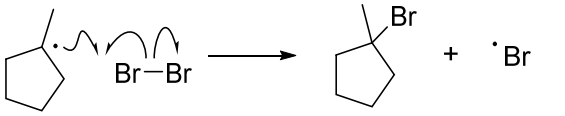
(5) _____ Which of the following steps would be the <u>least</u> reasonable to include when drawing a mechanism for the formation of **L** from **K** in the reaction below?

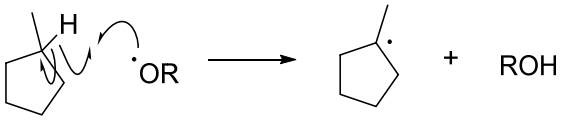


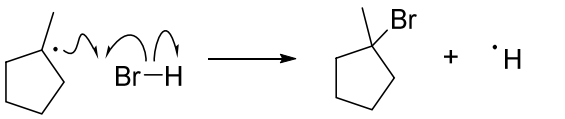
K **L**

(a) 

(b) 

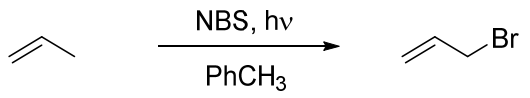
(c) 

(d) 

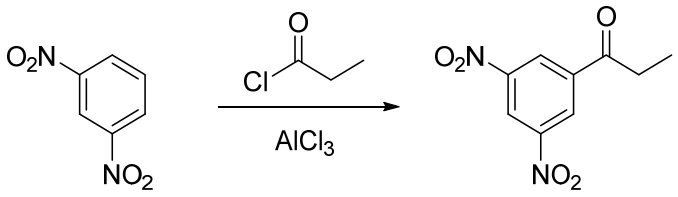
(e) 

(6) _____ Which of the following reactions is <u>not</u> fatally flawed and will proceed as drawn?

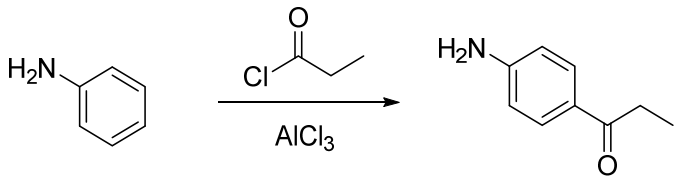
(a)



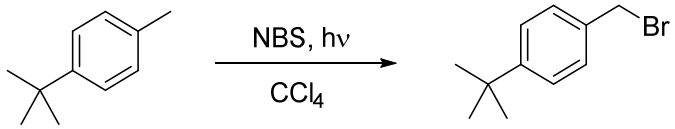
(b)



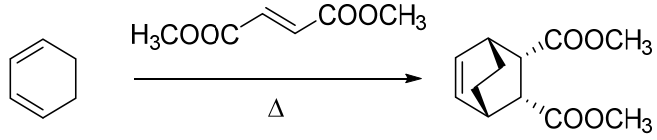
(c)



(d)

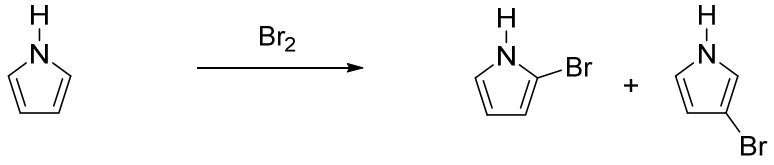


(e)



Problem II. Mechanism (20 points).

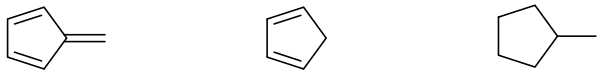
(i) (14 points) Draw sensible mechanisms for the formation of **N** and **P** when **M** is treated with bromine. Remember to use proper "curved arrow notation" to account for the redistribution of electrons in the making and breaking of bonds. Show all significant resonance forms that account for the stability of the intermediates in the reactions.



M **N** **P**

(ii) (6 points) Based on your proposed mechanisms, do you expect **N** or **P** to be produced in higher yield? Write your choice in the box on your answer sheet and briefly explain the reason behind your selection.

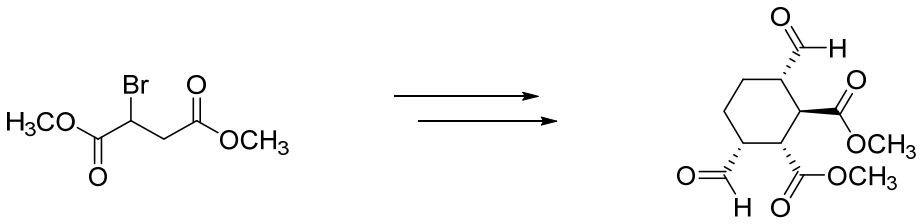
Problem III. Explanation (12 points). Compound **Q** has a remarkably large dipole moment for a hydrocarbon. Provide a brief explanation for this observation using words and structures. The dipole moments of **R** and **S** are provided as a reference for values more typical of hydrocarbons; you do not need to include these compounds in your explanation.



Q **R** **S**

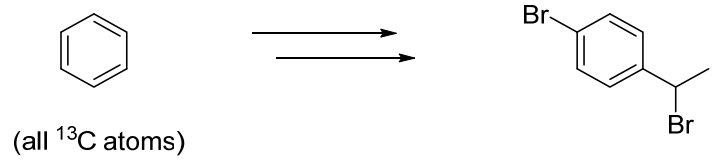
μ = 1.20 D μ = 0.42 D μ < 0.5 D

Problem IV. Synthesis (20 points). Provide a synthetic route—i.e, a sequence of reactions—to produce compound **U** from compound **T** and any reagents you need. Note: You need only account for the relative (not absolute) stereochemistry of the stereocenters. Basically, make sure the substituents on the ring have the indicated *cis*/*trans* relationships, not necessarily the indicated *R*/*S* relationships.



T **U**

Problem V. Synthesis (19 points). Provide a synthetic route—i.e, a sequence of reactions—to produce compound **Y** from ^{13}C-enriched benzene (**X**) and any other reagents you need. Assume that you do not want to waste any of **X** by using it in vast excess in any reaction.



(all ^{13}C atoms) (+/–)

X **Y**