CHEM 343 –Principles of Organic Chemistry II – Summer 2014

Instructor: Paul J. Bracher

Quiz #1

Monday, July 7th, 2014

10:30 a.m. (in class)

Student Name (Printed)	Solutions
Student Signature	N/A

Instructions & Scoring

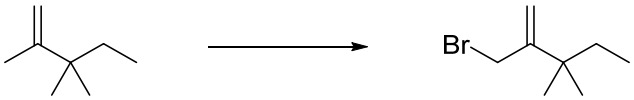
- Please write your answers on the official answer sheet. No answers marked in this booklet will be graded.
- You may use any resources you wish and collaborate with others.
- Your quiz answer sheet may be photocopied.

Problem	Points Earned	Points Available
I		28
II		21
III		21
IV		30
TOTAL		100

Questions, Required Information, Supplementary Information

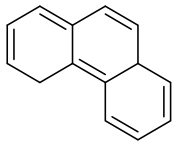
Problem I. Multiple choice (28 points total; +4 points for a correct answer, +1 point for an answer intentionally left blank, and 0 points for an incorrect answer). For each question, select the best answer of the choices given. Write the answer, legibly, in the space provided on the answer sheet.

(1) E What are the best conditions to carry out the following transformation?



(a) HBr
(b) HBr, ROOR
(c) Br_2, heat
(d) Br_2, light
(e) NBS, light

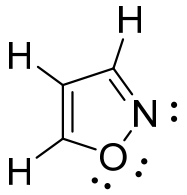
(2) C Which of the following adjectives best describes the electronic structure of compound **A**?



A

(a) aromatic
(b) antiaromatic
(c) nonaromatic
(d) radical
(e) awesome

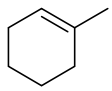
(3) C Isoxazole (**B**) is the parent compound of a class of heterocycles. Which of the following statements about isoxazole is true?



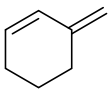
B

(a) the compound is antiaromatic
(b) the oxygen atom is sp^3 hybridized
(c) one of the lone pairs on oxygen is in an sp^2-hybridized orbital
(d) the nitrogen atom is *sp* hybridized
(e) all of the above statements are false

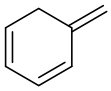
(4) E Which of the following compounds will have the most exothermic reaction per double bond with H_2 in the presence of Pd-C? That is to say, which compound will have the most negative heat of hydrogenation per double bond?



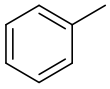
(a)



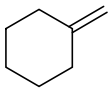
(b)



(c)

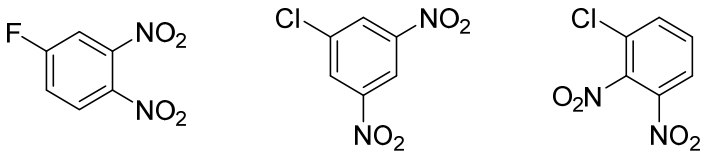


(d)

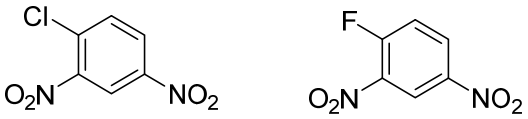


(e)

(5) B Which of the following compounds will react slowest with potassium hydroxide (KOH) in a nucleophilic aromatic substitution reaction?

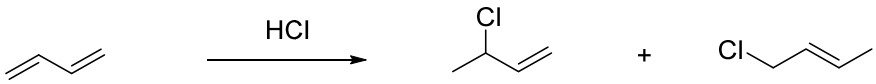


(a) (b) (c)



(d) (e)

(6) D Which statement best describes the following reaction?



C **D**

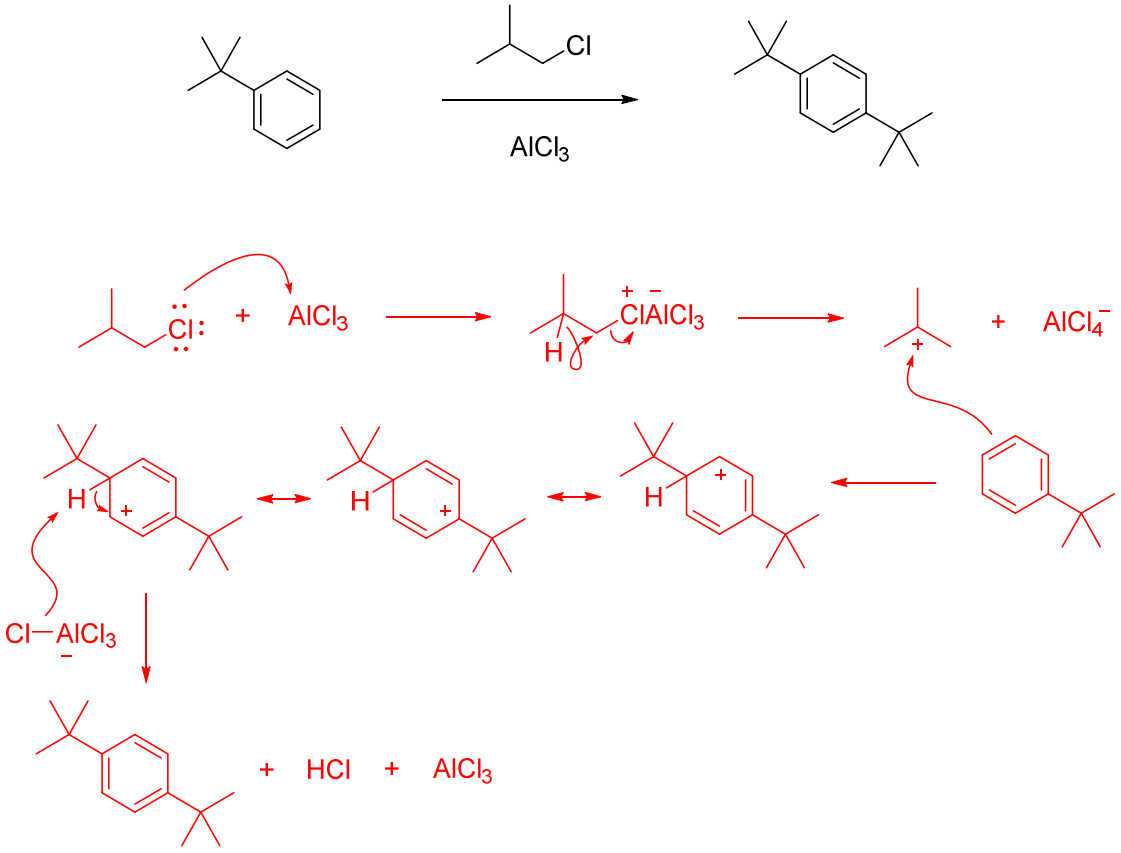
(a) product **D** is more stable than product **C**
(b) product **C** tends to predominate over **D** at lower temperatures
(c) product **C** will be a mixture of two enantiomers
(d) all of the above
(e) none of the above

(7) A How many signals/peaks appear in the ^{1}H NMR spectrum of *p*-dibromobenzene?

(a) one
(b) two
(c) three
(d) four
(e) six

Problem II. Mechanism (21 points).

(1) (15 points) Draw a sensible mechanism for the following reaction. Remember to use proper "curved arrow notation" to account for the movement of electrons in the making and breaking of bonds. Show all significant resonance forms that account for the stability of the intermediates in the reaction.

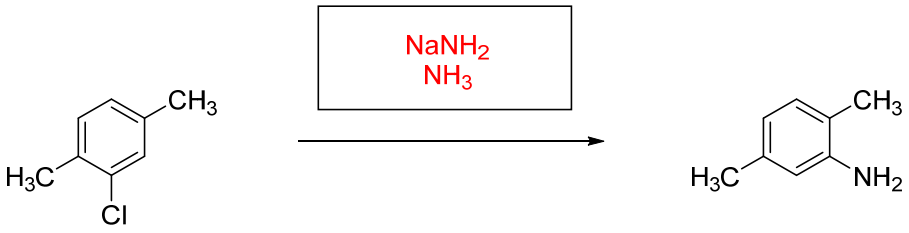


(2) (6 points) If you only had benzene, toluene, and nitrobenzene available in your laboratory's chemical stockroom, which of the three would you choose as a solvent to run the reaction in part (1)? Explain your choice in one or two sentences.

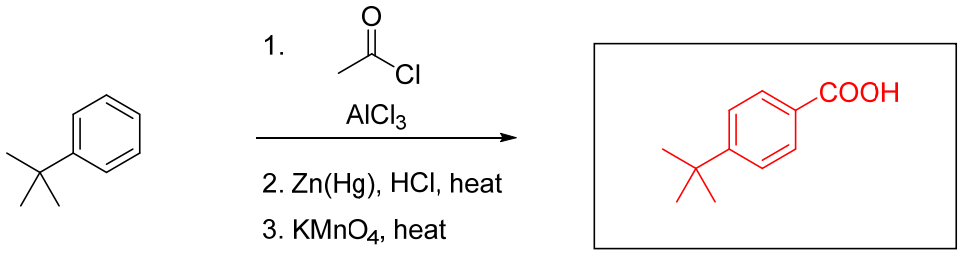
Of the three compounds available, nitrobenzene would make the best solvent. All three compounds are aromatic and capable of reacting with the reagents present in an undesired, competing Friedel–Crafts alkylation; however, the nitro group on nitrobenzene is electron withdrawing, which deactivates its ring and will make the competing side reaction slower than for the other two possible solvents.

Problem III. Reactions (21 points). The following chemical reactions are missing their starting materials, products, or reagents. Write the missing compounds into the empty boxes below, as appropriate. For missing products, draw the single organic product that you expect to be produced in the highest yield among all of the possibilities. In some cases, there will be more than one correct answer that will merit full credit.

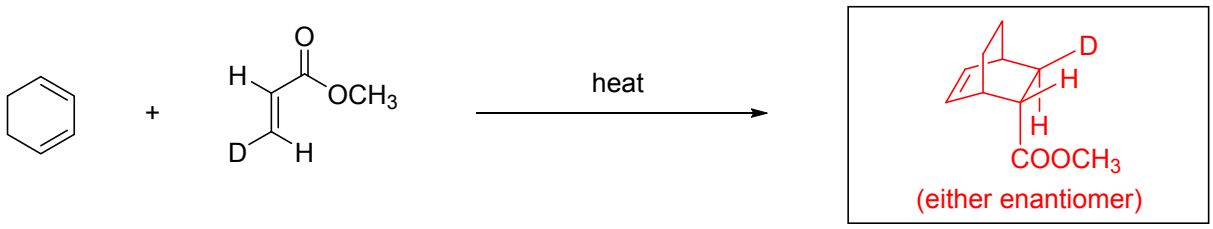
(1) (7 points)



(2) (7 points)



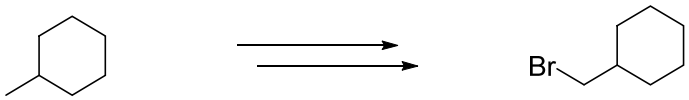
(3) (7 points)



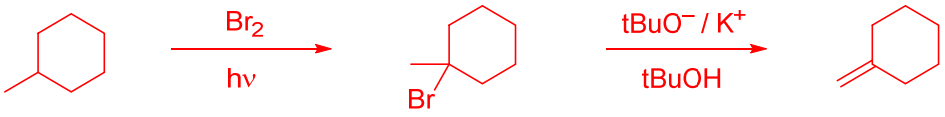
(major product, use 3D structure)

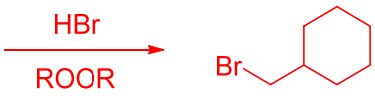
Problem IV. Synthesis (30 points). Design efficient synthetic routes to compounds **E** and **F** from the indicated starting materials and any other reagents you wish.

(1) (15 points)

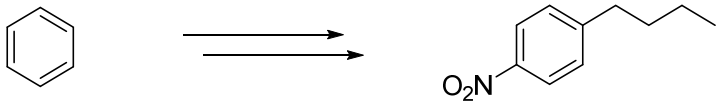


E





(2) (15 points)



F