CHEM 2410 – Principles of Organic Chemistry I – Summer 2016

Instructor: Paul Bracher

Hour Examination #3

Monday, June 13th, 2016

9:00–10:30 a.m. in Macelwane Hall 342

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 may use one letter-sized sheet of hand-written notes (on "official" paper) and your plastic model kit. No electronic resources are permitted and you may not communicate with others.
- Your exam answer sheet may be photocopied.

Problem	Points Earned	Points Available
I		60
II		7
III		17
IV		16
TOTAL		100

This exam focuses on Chapters 9, 10, and 11 in Janice Smith's *Organic Chemistry*, 4th ed.

Special Instructions

Please Make Sure to Do the Following Before Starting Your Exam

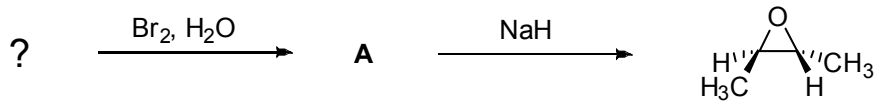
1. Both print your name and sign the front of the answer sheet in the appropriate boxes.
2. Also print your name at the top of the back of the answer sheet.
3. Enter your SLU Banner ID on the front of the answer sheet and bubble the corresponding numbers.
4. Do not check the "Hold for Pick-Up" box on the back of the answer sheet unless you want your graded sheet withheld from the distribution pile and handed back to you privately.

Please Make Sure to Do the Following After Completing Your Exam

1. Ensure that all of your selected circles are darkened completely.
2. Turn in your note sheet with your name and this exam number (#3) in the appropriate space.

Problem I. Multiple choice (60 points total; +5 points for a correct answer, +2 points for answering with the letter "E", 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) _____ What starting material, when subjected to the following sequence of reactions, will form compound **B** as the major product?



B

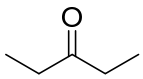
(A) (B) (C) (D)

(2) _____ Which of the following statements is <u>not</u> true regarding the alkynes **C** and **D**?

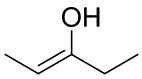
C **D**

(A) compound **D** has a higher pK_a than compound **C**
(B) the hydration of **C** is more difficult than **D** and requires an extra reagent
(C) compound **C** can be used to synthesize pentanal ($CH_3CH_2CH_2CH_2CHO$)
(D) none of the above (i.e., all of the above statements are true)

(3) _____ Which of the following term(s) accurately describes the relationship of **E** and **F**?



E

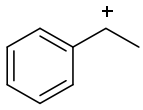


F

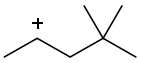
(**I**) constitutional/structural isomers
(**II**) stereoisomers
(**III**) tautomers

(A) only term **II** accurately describes the relationship of **E** and **F**
(B) only terms **I** and **III** accurately describe the relationship of **E** and **F**
(C) only terms **II** and **III** accurately describe the relationship of **E** and **F**
(D) terms **I**, **II**, and **III** all accurately describe the relationship of **E** and **F**

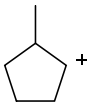
(4) _____ Which of the following carbocations is likely to be observed to rearrange via a hydride shift but <u>not</u> an alkyl shift?



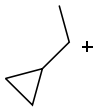
(A)



(B)



(C)

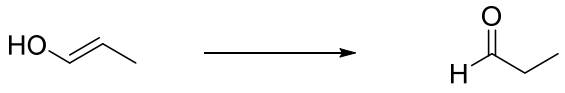


(D)

(5) _____ Compound **G** has no double or triple bonds, and a molecular formula of $C_9H_{13}Br_2N_3O_4$. How many rings does the compound have?

(A) less than two
(B) two
(C) three
(D) more than three

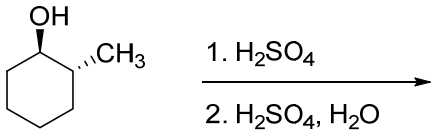
(6) _____ Which of the following term(s) most accurately and completely describe(s) the conversion of **H** and **J**?

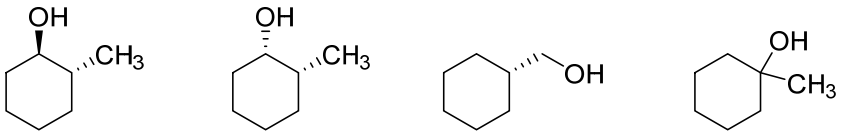


H **J**

(A) the mechanism for this conversion in acidic water proceeds via a resonance-stabilized carbocation
(B) the mechanism for this conversion in basic/alkaline water proceeds via a resonance-stabilized carbocation
(C) both the mechanisms for this conversion in acid and base proceed via resonance-stabilized carbocations
(D) neither the mechanism for this conversion in acid nor base proceeds via a resonance-stabilized carbocation

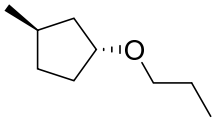
(7) _____ What is the major product expected of the following reaction sequence?



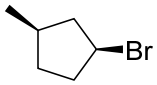


(A) (B) (C) (D)

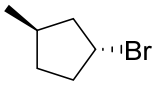
(8) _____ What alkyl bromide would be the best choice to synthesize compound **K** in one step?



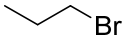
K



(A)



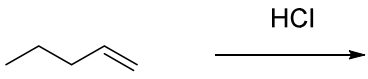
(B)



(C)

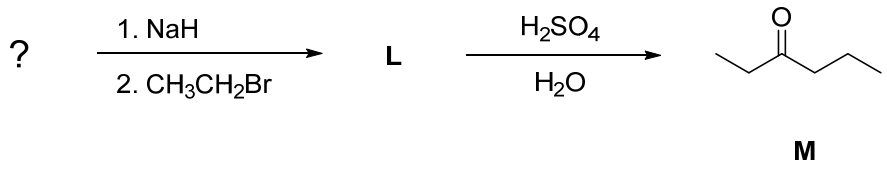
(D)

(9) _____ Which of the following products will be observed for the following reaction?



(A) 1-chloropentane
(B) (*R*)-2-chloropentane
(C) (*S*)-2-chloropentane
(D) both (*R*)-2-chloropentane and (*S*)-2-chloropentane

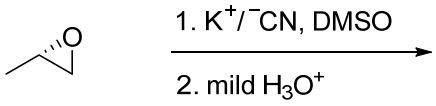
(10) _____ What starting material, when subjected to the following sequence of reactions, will form compound **M** as the major product?

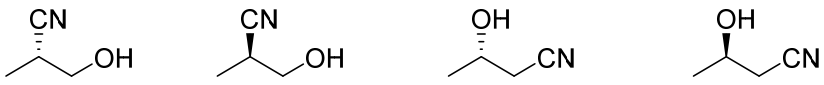


M

(A) (B) (C) (D)

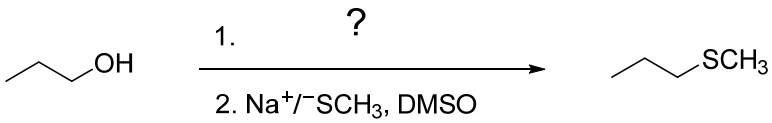
(11) _____ What is the major product expected of the following reaction?





(A) (B) (C) (D)

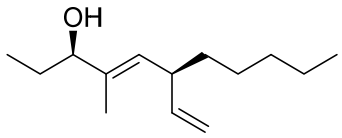
(12) _____ Which of the following reagents <u>cannot</u> be used for the following synthesis, where starting material **N** is converted into **P**?



N **P**

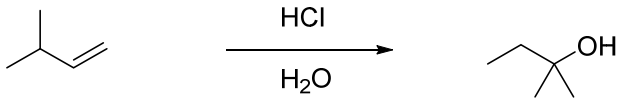
(A) PBr_3
(B) $POCl_3$, pyridine
(C) $SOCl_2$, pyridine
(D) TsCl, pyridine

Problem II. Alkenes (7 points). Provide the systematic IUPAC name for compound **Q**.



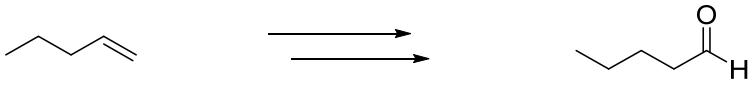
Q

Problem III. Mechanism (17 points). Draw a sensible mechanism for the formation of **S** from **R** in aqueous, acidic solution. Remember to use proper "curved arrow notation" to account for the redistribution of electrons in the making and breaking of bonds. Show all intermediates in the reaction and any significant resonance forms that account for the stability of these intermediates.



R **S**

Problem IV. Synthesis (16 points). Outline a synthesis—i.e, a sequence of reactions—to prepare compound **U** using compound **T** as the starting material. You may use any other reagents and starting materials you wish.



T **U**