350 Organic Chemistry I
Exam #3a, November 17, 2017

Winona State University
Professor T. Nalli

Name_____

General Instructions: Write your name in the space provided above and on the provided Scan-tron form. ***Do not put your name anywhere else in this exam book.***

Make sure that you read each question carefully and provide **complete** answers. For the sake of fairness, you will be limited to a maximum of 55 min. Exams must be turned in immediately upon my call of time up.

Grading is be on the basis of a highest possible score of 100 points.

I. Multiple Choice – 2 points each, 30 points total

II. Naming – 2.5 points each, 10 points total

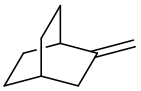
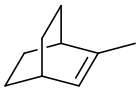
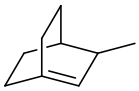
III. Mass Spectra – 3 points each, 9 points total

IV. Reaction Products – 4 points each, 40 points total

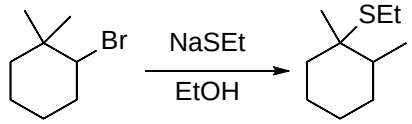
V. Mechanism - 4 points each, 12 points total

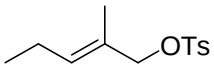
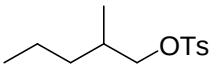
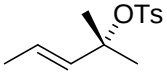
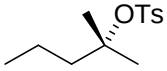
I. Multiple Choice

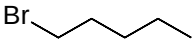
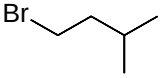
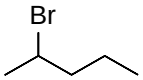
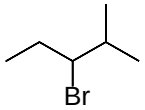
1. What is the order of stability of the compounds listed (from most stable to least stable)?
   I. 2-methyl-2-butene II. 2-methyl-1-butene III. 3-methyl-1-butene
   A. II > I > III B. I > II > III C. II > III > I D. III > II > I

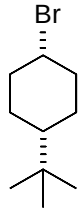
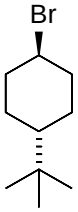
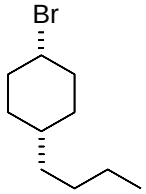
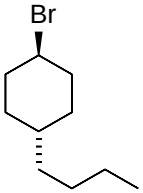
2. What is the order of stability of the compounds listed (from most stable to least stable)?
   I.  II.  III. 
   A. III > II > I B. II > III > I C. I > II > III D. II > I > III

3. Which alkene does not have *E* and *Z* isomers?
   A. 4-octene B. 3-octene C. 2-octene D. 1-octene

4. What is the mechanism for the reaction shown at right?
   A. E2 B. E1 C. $E1_{cb}$ D. S_N2 E. S_N1
   

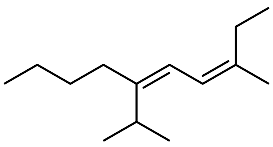
5. Which of these is the most reactive toward an E1/S_N1 solvolysis reaction?
   A.  B.  C.  D. 

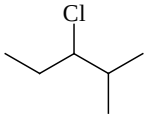
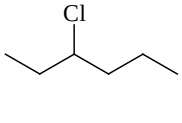
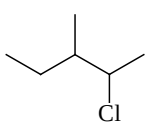
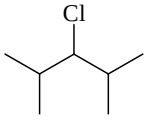
6. Which of the following compounds is **most** reactive toward E2 dehydrohalogenation?
   A.  B.  C.  D. 

7. Which of the following compounds is **least** reactive toward E2 dehydrohalogenation?
   A.  B.  C.  D. 

8. Whose rule is used to predict the major product of an elimination reaction?
   A. Zaitsev's B. Volk's C. Weiss's D. Hofmeister's

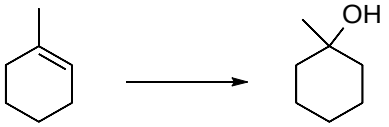
9. Which of the following solvents would allow the E2 reaction of a primary alkyl halide to proceed at the fastest rate?
   A. CH_3OH B. $(CH_3)_2SO$ C. $(CH_3)_3COH$ D. $(CH_3CH_2)_2NH$

10. What is the correct stereochemical designation of the diene shown at right?
    A. 3*Z*, 5*Z* B. 3*E*, 5*E* C. 3*E*, 5*Z* D. 3*Z*, 5*E*
    

11. Which of the following compounds would give the greatest percentage of substitution product as compared to elimination product when treated with sodium ethoxide?
    A.  B.  C.  D. 

12. Which of the following reactions does **not** accomplish the following transformation?

A. 1. BH_3/THF 2. HO^-/H_2O_2
B. 1. HBr 2. H_2O
C. 1. $Hg(OAc)_2/H_2O$/THF 2. $NaBH_4$
D. dilute H_2SO_4

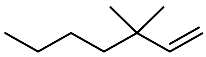


13. What is the expected % intensity of the M^++1 peak as compared to the M^+ peak in the mass spectrum of 3,3-dimethyl-1-heptene?

A. 100% B. 30% C. 25% D. 10%

14. What is the m/z value of the M – CH_3 peak in the mass spectrum of 3,3-dimethyl-1-heptene?

A. 126 B. 111 C. 113 D. 115

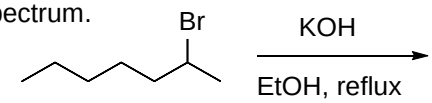


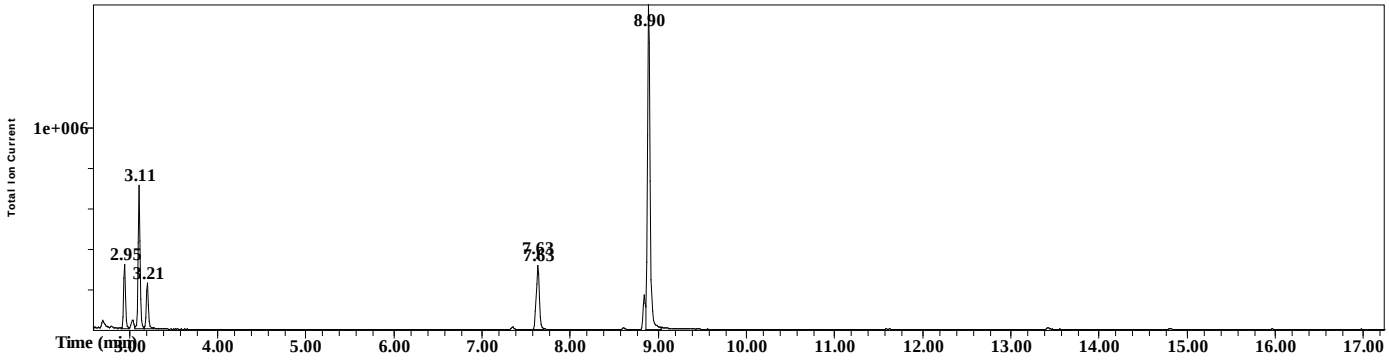
15. In mass spectrometry the x-axis is in units of *m/z*. What does the "*z*' represent?

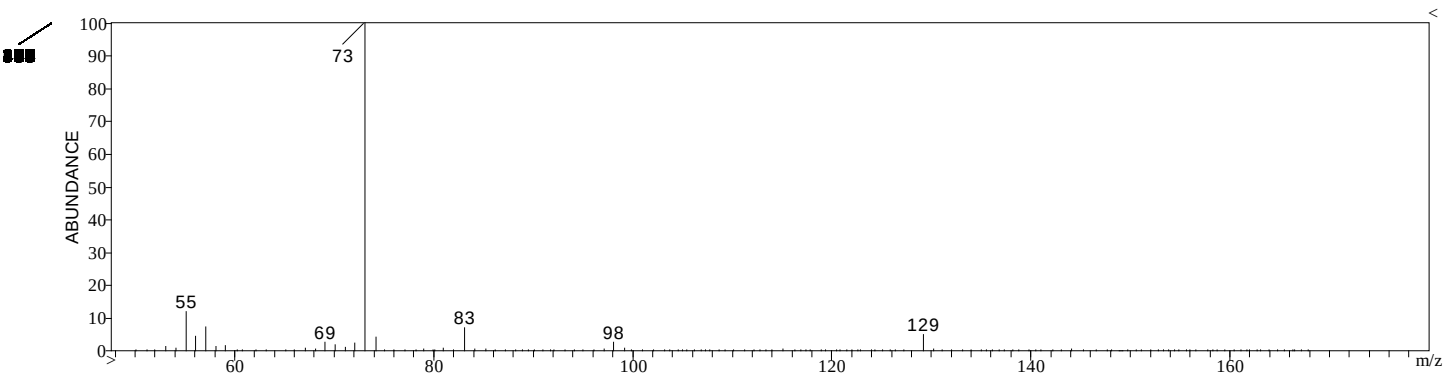
A. time B. charge C. energy D. frequency E. abundance

IIa. Give the standard abbreviated name used for each of these structures	**IIb. Give the structure of each of these compounds.**
	*Z*-2,3-dimethyl-2-heptene BH_3/THF

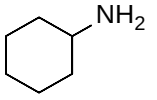
Lab Quiz for Expt 4 – The reaction shown below was carried out and a typical GC-MS chromatogram is shown below. (a) Label the five major peaks on the chromatogram with the compound structures. (b) Below the chromatogram appears the mass spectrum of the peak at 7.63 min. The molecular ion is barely visible at m/z = 144. Label the peaks at m/z = 129 and 73 with the structure of the cation and the identity of the neutral fragment lost. Bonus points wil be given for correctly labeling additionial peaks in the mass spectrum.

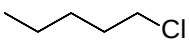


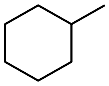


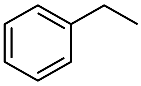


III. For each mass spectrum shown choose the compound below that is most consistent with it. Label the base peak in each spectrum and propose a structure for it. Explain your reasoning by labeling other key peaks (including M^+).

A. 

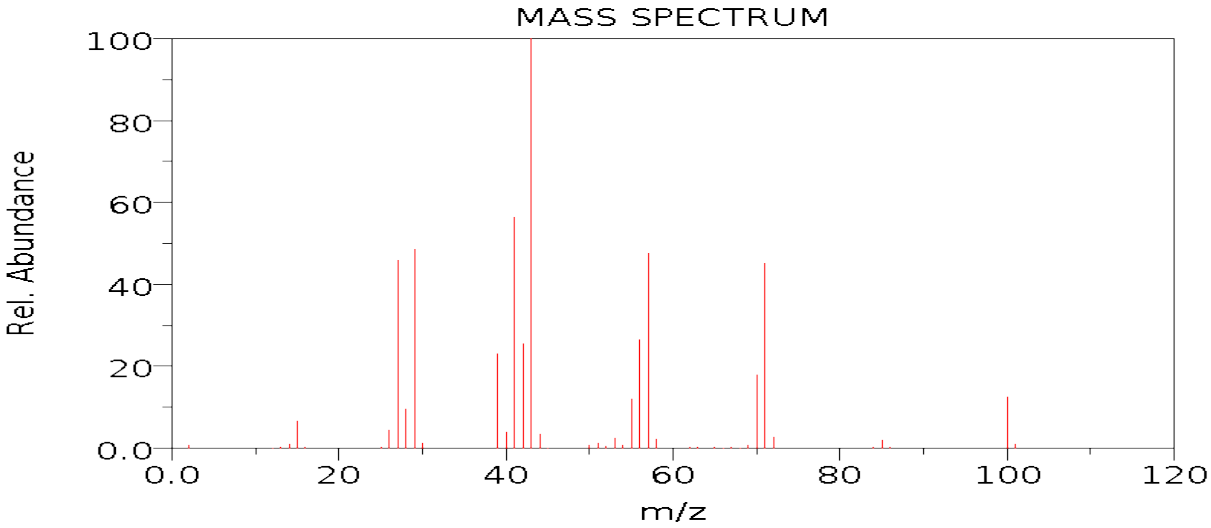
B. 

C. 

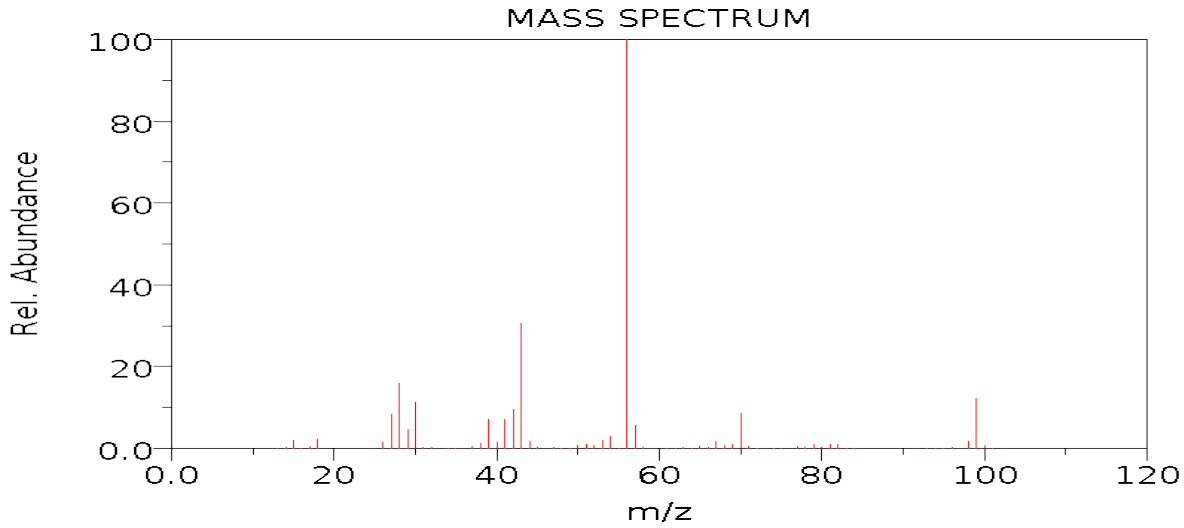
D. 

E. 

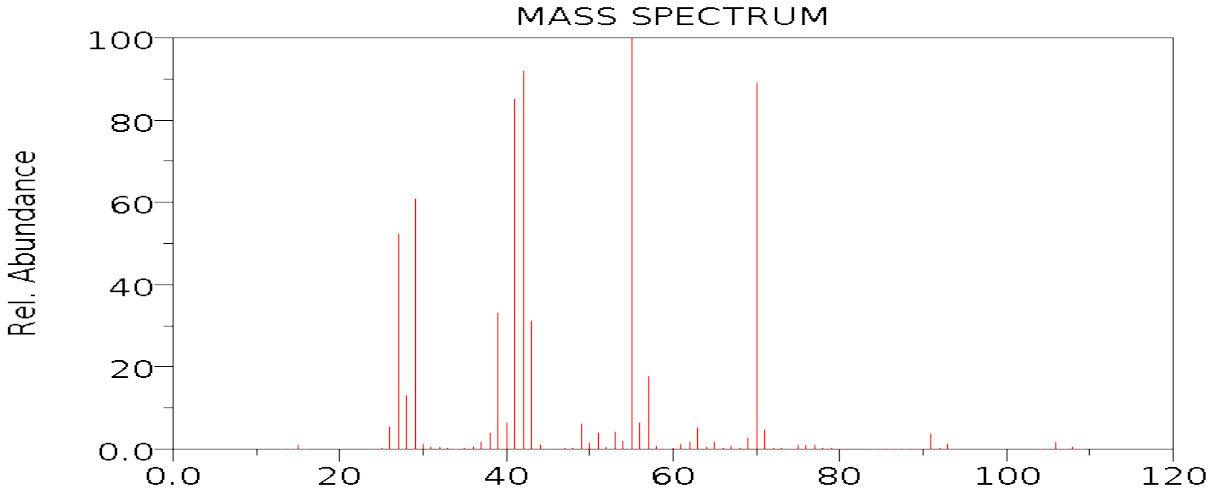
1.



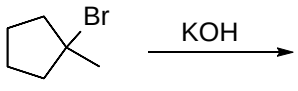
2.

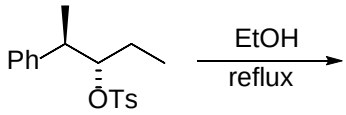


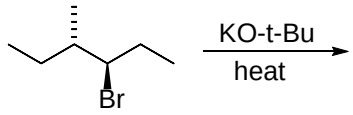
3.

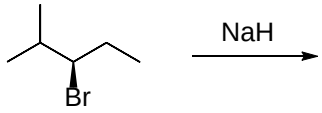


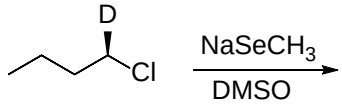
IV. Give the structure(s) of the main organic product(s) of each of the following reactions.

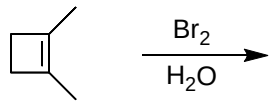
1. 

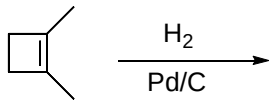
2. 

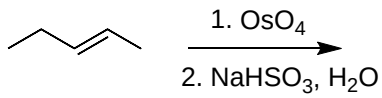
3. 

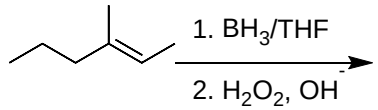
4. 

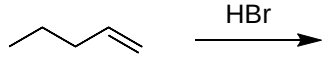
5. 

6. 

7. 

8. 

9. 

10. 

V. Pick three reactions in part IV above and write out the mechanisms making sure to show curved arrows..