

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

Chemistry Department



CHEM 201: Organic Chemistry I (Term 151)

Major Exam # 2

Monday, November 16, 2015

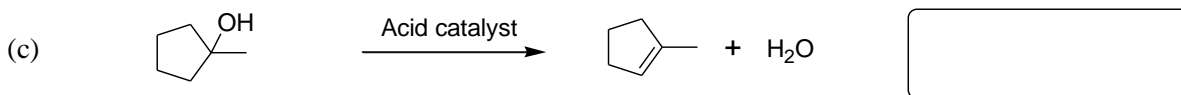
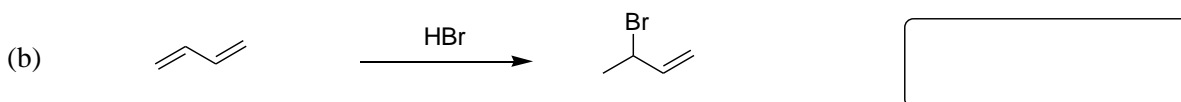
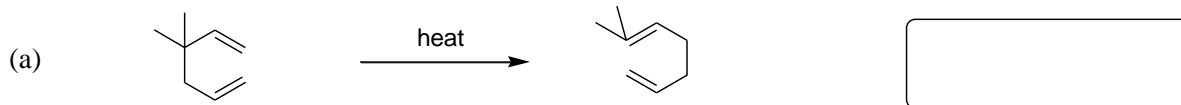
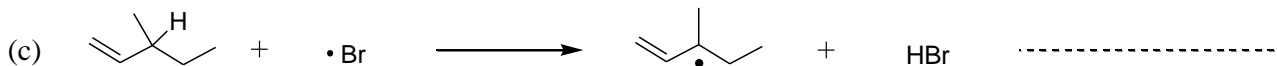
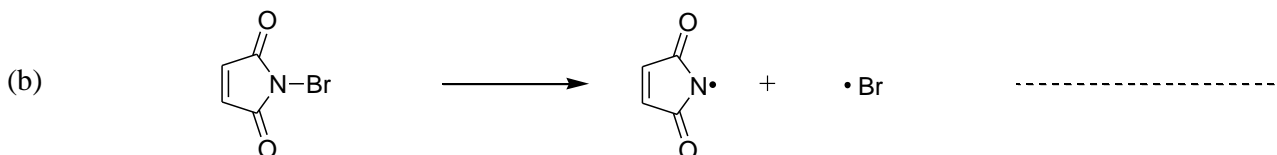
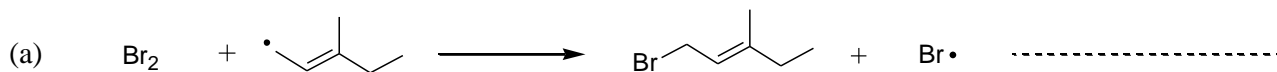
Duration: 120 minutes

Dr. Abdullah J. Hamdan (Sec. 1)
Dr. Ahsanul Haq Qureshi (Sec. 2)
Dr. Shaikh A. Ali (Sec. 3)
Dr. Mohammad R. Imam (Sec. 4)
Dr. Othman Al Hamouz (Sec. 5)

NAME _____ ID _____ SEC. _____

Question	Value	Score
1 - 2	10	
3 - 6	16	
7 - 13	42	
14 - 18	32	
Total	100	

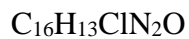
¹ H							² He
³ Li	⁴ Be	⁵ B	⁶ C	⁷ N	⁸ O	⁹ F	¹⁰ Ne
¹¹ Na	¹² Mg	¹³ Al	¹⁴ Si	¹⁵ P	¹⁶ S	¹⁷ Cl	¹⁸ Ar
						³⁵ Br	
						⁵³ I	

(3 + 3 points)**Q1.****(A)** Identify the following reactions as additions, eliminations, substitutions, or rearrangements:**(B)** Identify each of the following free radical reaction steps as **initiation**, **propagation**, or **termination**:**(4 points)****Q2.** Sketch an **energy diagram** for a two-step reaction in which both steps are exergonic and in which the second step has higher-energy transition state than the first. Label the parts of the diagram corresponding to reactants, products, intermediate, overall ΔG° , and overall ΔG^\ddagger .

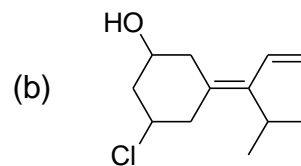
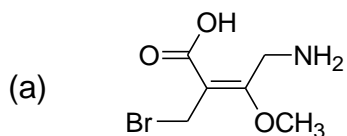
(2 + 4 points)

Q3.

(A) Calculate the degree of unsaturation for the following formula of Diazepam:



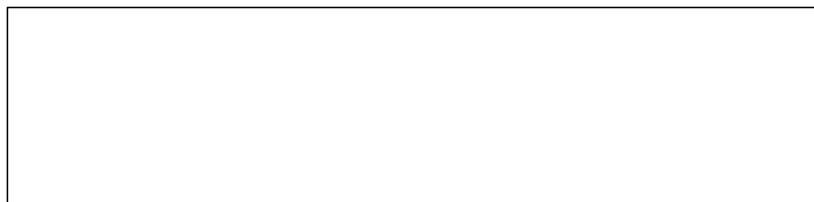
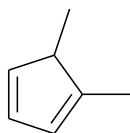
(B) Assign *E* or *Z* configuration to each of the following compounds.



(2 + 2 points)

Q4.

(A) Give the **IUPAC** name for the following compound.



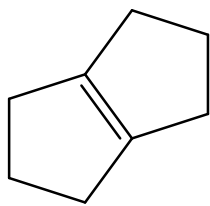
(B) Draw the **structure** corresponding to the following **IUPAC** name.

(2*E*,4*E*)-5-ethyl-6-methyl-2,4-heptadiene

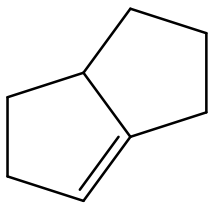


(3 points)

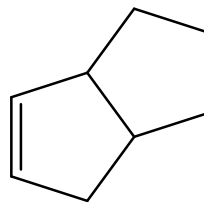
Q5. Arrange the following **alkenes** in order of increasing stability.



A



B

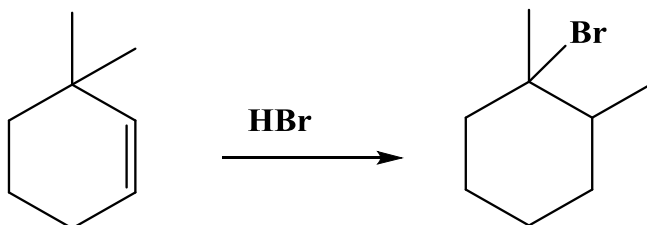


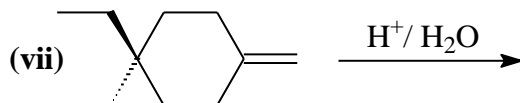
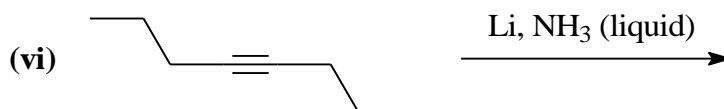
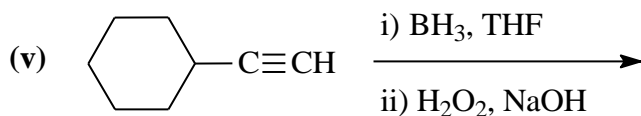
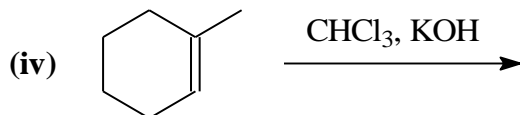
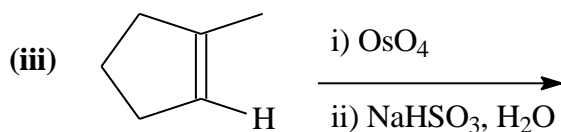
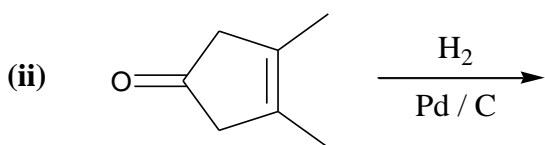
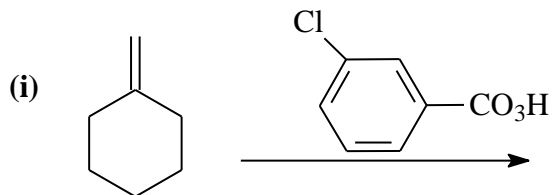
C

Least stable	←	Most Stable

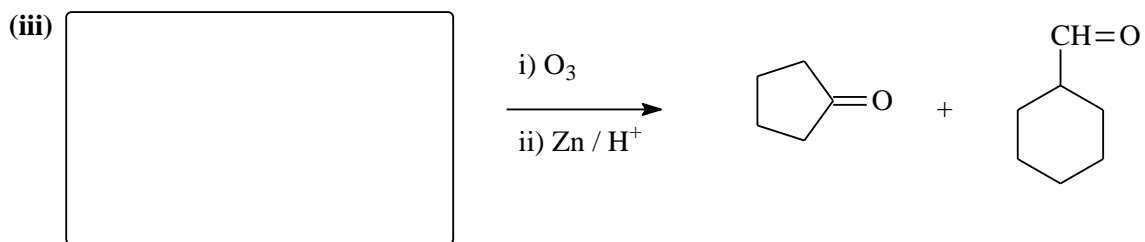
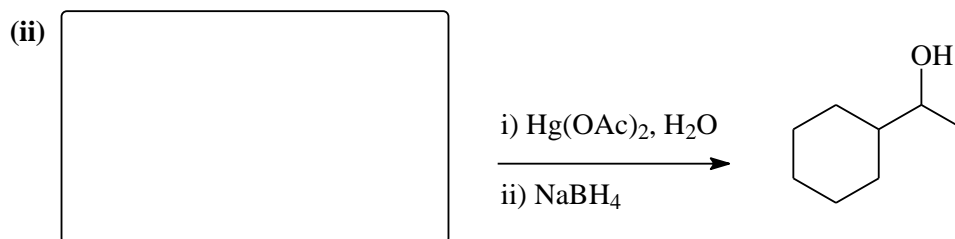
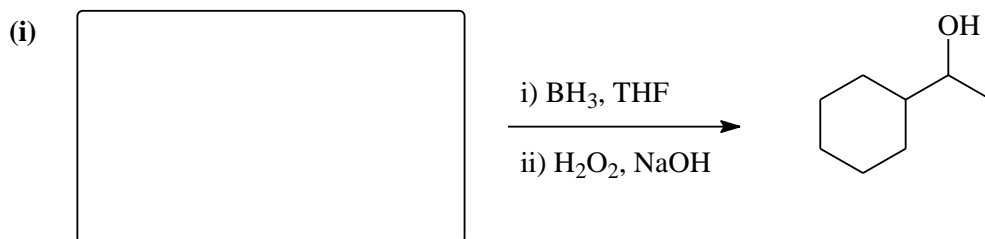
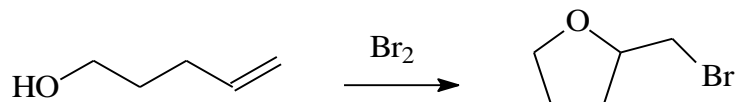
(3 points)

Q6. Propose a **mechanism** for the following reaction showing structures of all the intermediates. Use *curved arrows to indicate electron flow*.



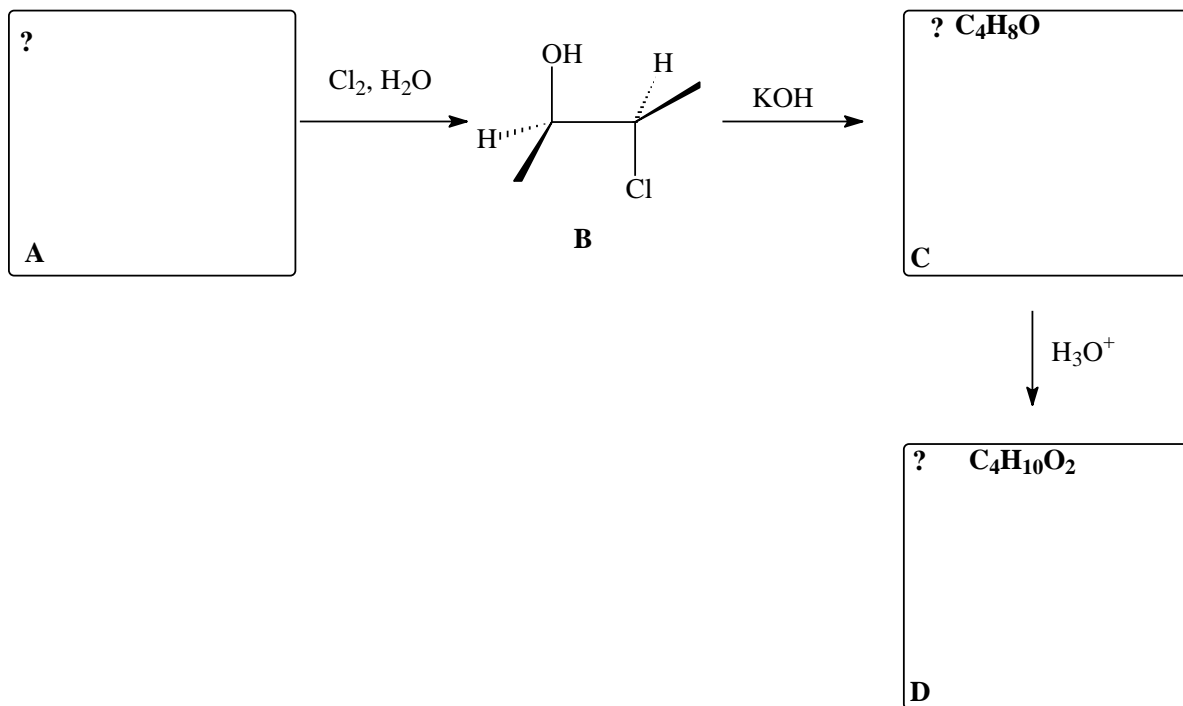
(14 Points)**Q7.** Predict the **major product(s)** of the following reactions. Show **stereochemistry** where appropriate.

Two Markovnikov products

(6 Points)**Q8.** Draw the structure of **alkene** for each of the following reactions.**(4 points)****Q9.** Propose a **mechanism** for the following reaction showing structures of all possible intermediates. *Use curved arrows to indicate the electron flow.*

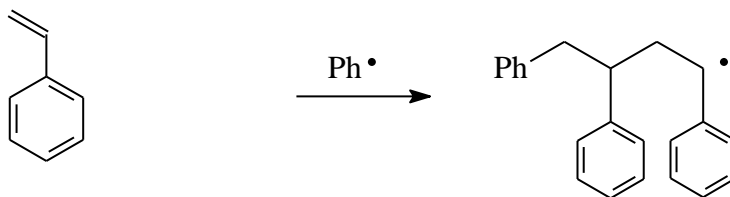
(6 Points)

Q10. An alkene **A** on reacting with $\text{Cl}_2/\text{H}_2\text{O}$ gave **B**, which on treatment with KOH gave **C** with a molecular formula $\text{C}_4\text{H}_8\text{O}$. When reacted with H_3O^+ , Compound **C** afforded **D** with a molecular formula $\text{C}_4\text{H}_{10}\text{O}_2$. Predict the structure of **A**, **C** and **D** with **correct stereochemistry**.



(4 points)

Q11. Styrene undergoes propagation to give polystyrene. Showing *electron-flow* using *half-headed (fishhook) arrows*, account for the formation of the radical on the right hand side. Draw the structure of **polystyrene** in terms of several **repeating units**.

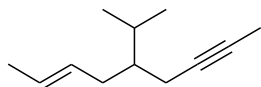


styrene

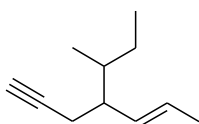
(4 points)

Q12. Provide the **IUPAC** name for the following structures.

(a)

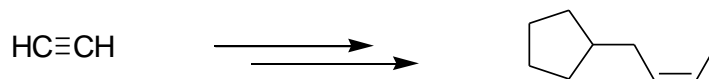


(b)



(4 points)

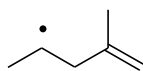
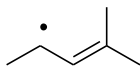
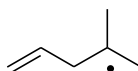
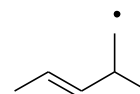
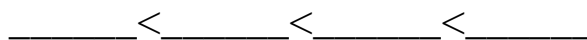
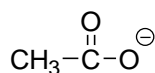
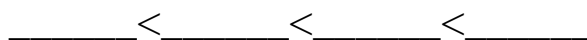
Q13. The following **synthesis** requires more than one-step. How would you carry out the conversion?



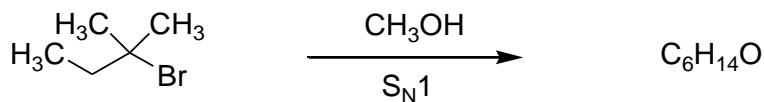
(2 + 2 points)

Q14.

(A) Arrange the following free radicals in order of increasing stability:

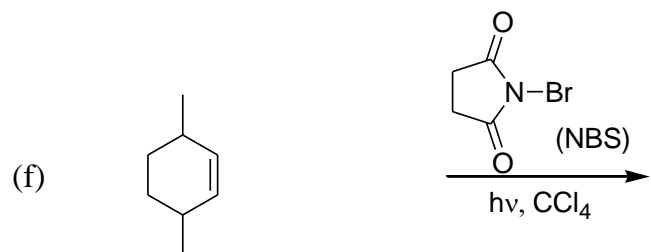
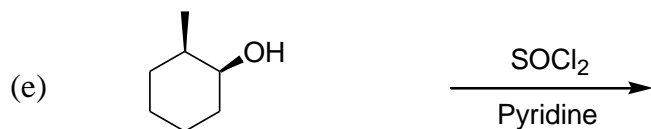
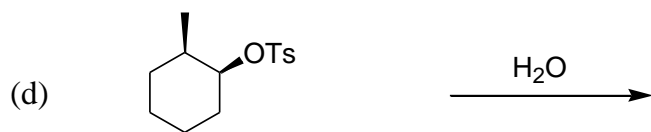
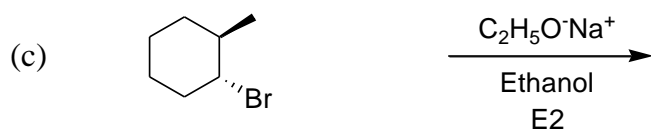
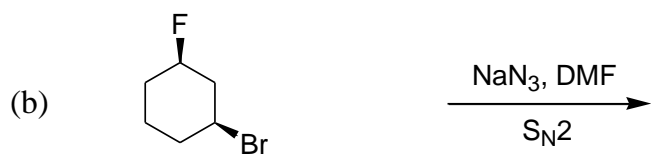
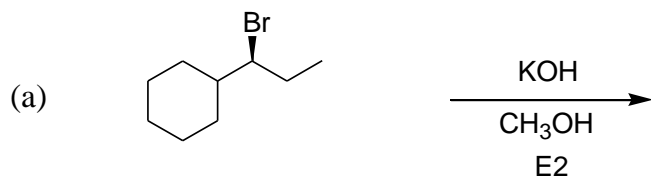
**I****II****III****IV**(B) Arrange the following nucleophiles in order of increasing reactivity towards S_N2 reaction:**I****II****III****IV**

(4 points)

Q15. Draw the **energy diagram** of the following S_N1 reaction. Show **structures** of product and intermediate (*if any*) in the diagram.

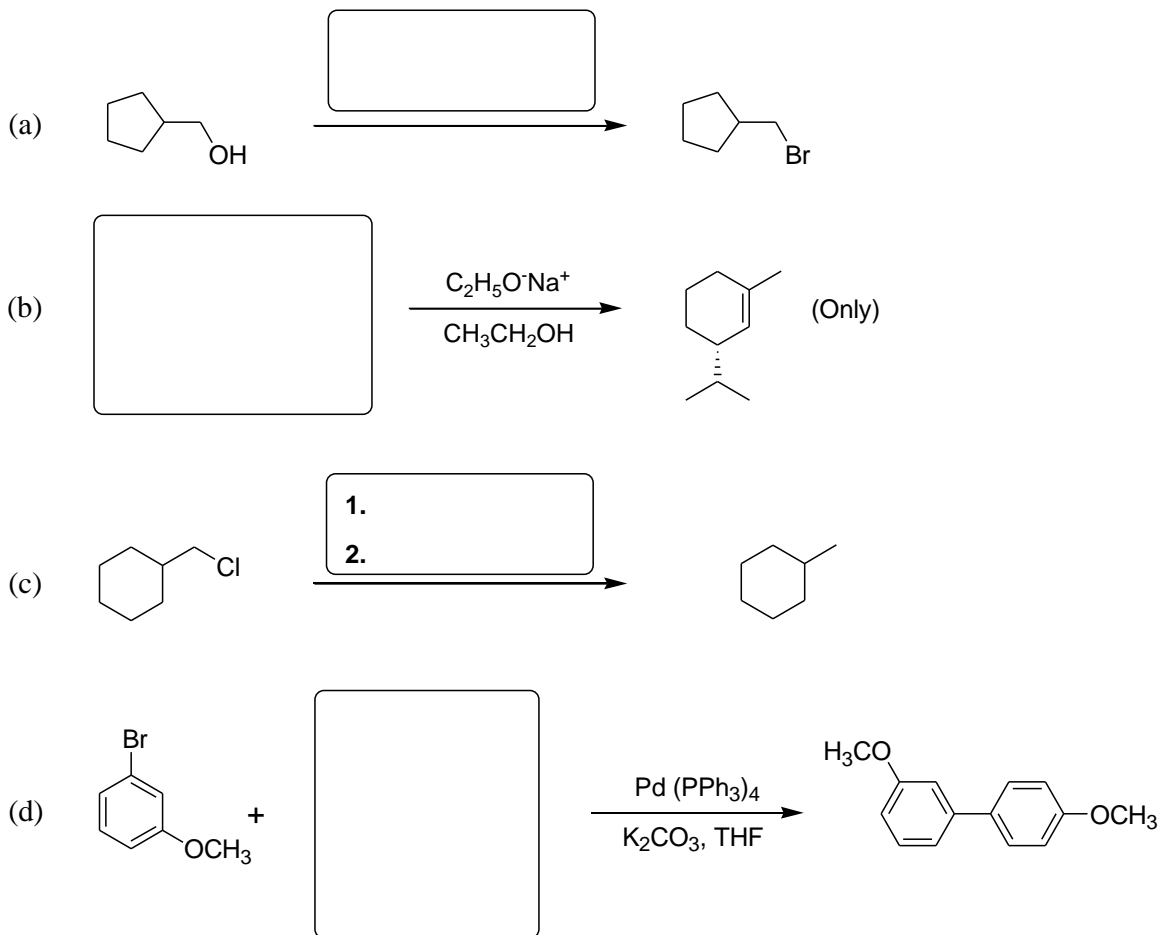
(12 points)

Q16. Predict the **major product(s)** of the following reactions. Indicate the **stereochemistry** of the product(s) when it is applicable.



(8 points)

Q17. Provide necessary **reagents** and **reactants** to complete the following conversions.



(4 points)

Q18. How would you accomplish the following conversion? In **each step** of the synthesis, show all the necessary **reactants/ reagents** and draw the structure of the product formed.

