

**KISII UNIVERSITY**  
**UNIVERSITY EXAMINATIONS**  
**SPECIAL EXAMINATION**

**THIRD YEAR EXAMINATION FOR THE AWARD OF**  
**THE DEGREE OF BACHELOR OF EDUCATION SCIENCE**  
**FIRST SEMESTER 2021/2022**  
**(JULY, 2022)**

**CHEM 312: ALCOHOLS, ETHERS AND CARBONYLS**

**STREAM: Y3 S1**

**TIME: 2 HOURS**

**DAY: FRIDAY, 12.00 PM – 2.00 PM**

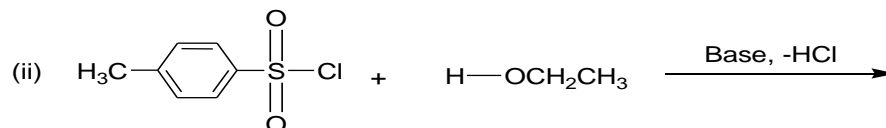
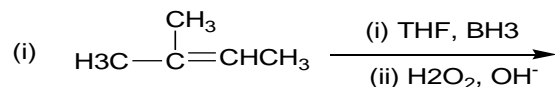
**DATE: 00/07/2022**

**INSTRUCTIONS:**

1. *Do not write anything on this question paper.*
2. *Answer ALL Questions in section A and any TWO Questions in Section B.*

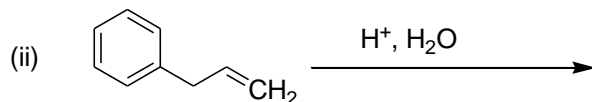
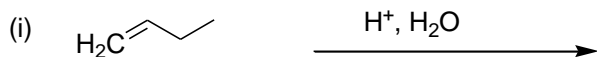
**SECTION A**

1. (a) Explain is meant by hydroboration-oxidation (2 marks)
- (b) Give the structures of the of the products in the following reactions (2 marks)

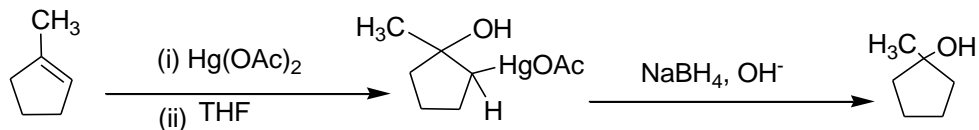


2. Draw the structure and give the IUPAC name of the products in the given reactions

(4 marks)



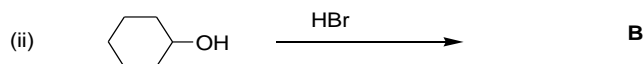
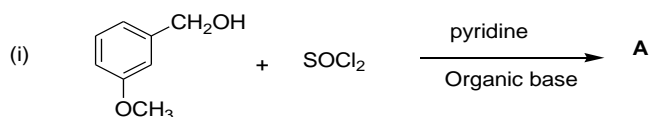
3. Show the mechanism for the reaction below that shows the synthesis of alcohols (6 marks)



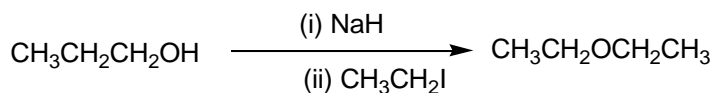
4. (a) Starting with 2-methyl-2-butene, show all the steps involved in the synthesis of 2-methyl-2-butanol (4 marks)

(b) Draw the structures of the major products labeled A and B in the following reactions

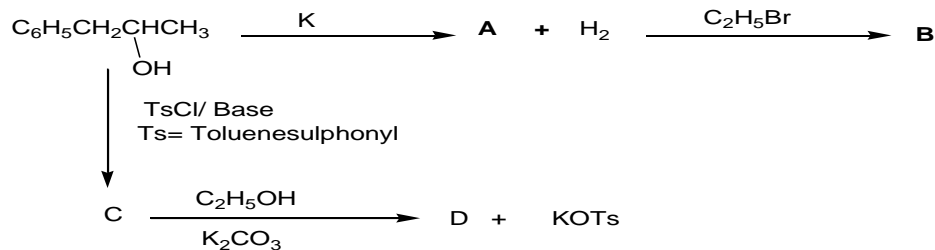
involving alcohols (2 marks)



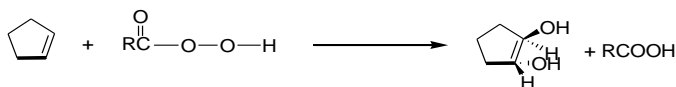
5. Williamson synthesis synthesis of ethers involves a reaction between sodium alkoxide with an alkyl halide, alkyl sulphonate or an alkyl sulphate. Show the reaction mechanism for the synthesis of ethyl propyl ether from propyl alcohol (6 marks)



6. The two synthetic routes for 2-ethoxy-1-phenylpropane is outlined below. Draw the structure of the products shown by letters A, B, C and D (4 marks)



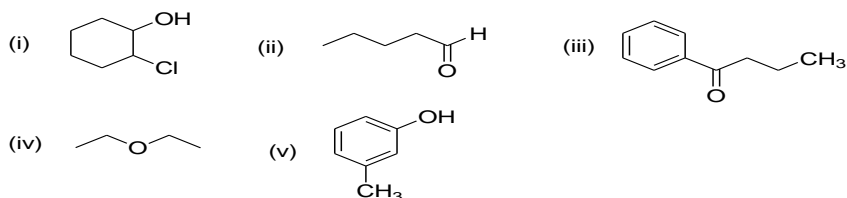
7. Epoxidation of cyclopentene produces 1, 2-epoxycyclopentane. Give the reaction mechanism for this reaction (6 marks)



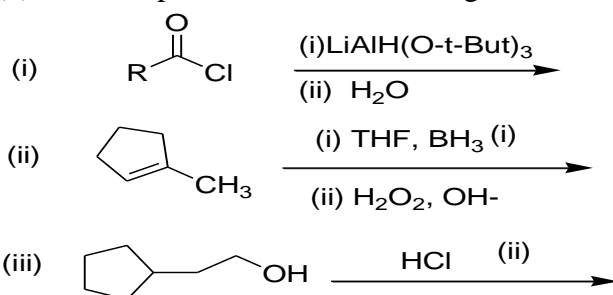
8. Using suitable examples, distinguish between protic and aprotic solvents (4 marks)

### SECTION B

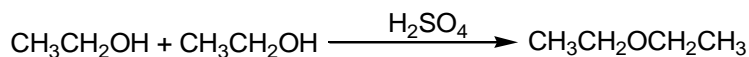
9. (a) Give the IUPAC names for the following organic compounds (5 marks)



- (b) Give the products in the following reactions. (5 marks)



- (c) Show the reaction mechanism in the following reaction (7 marks)



10. (a) The oxo-process provides a synthetic route for primary alcohols. Describe the synthesis of propanol starting with ethene using the oxo-process (9 marks)

- (b) Explain the advantages of the oxo-process over other methods of synthesis (6 marks)

11. (a) Describe the manufacture of the following solvents in the industrially

- i) Diethyl ether (DEE) (5 marks)

- (ii) Ethylene glycol (5 marks)

- (b) Explain any five limitations associated with polar aprotic solvents during in chemical reactions (5 marks)