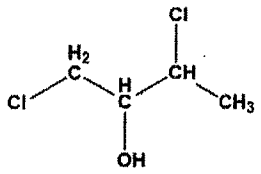
Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
200 Level Second Semester Examination – Dec. /Jan. 2017
SCT 232-2 Organic Chemistry

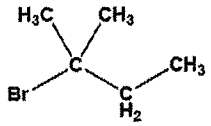
Uva Wellassa University

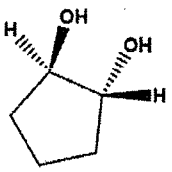
Instructions to candidates
Duration: Two (02) hours
Number of questions: Four (04)
Answer All Questions
Mark allocation: 100 mark

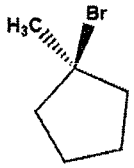
1. a. Define following terms. (5 marks)
   i. Enantiomers
   ii. Isomers
   iii. Diastereoisomers
   iv. Meso compounds
   v. Racemic mixtures

b. In following molecules, mark if a chiral centre is present with an asterisk (*) and indicate if these molecules can show optical activity. (5 marks)

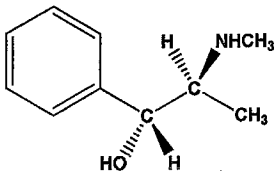
i. 

ii. 

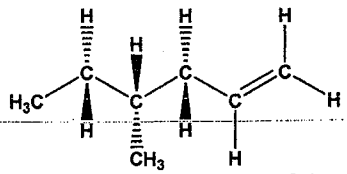
iii. 

iv. 

c. State chiral centres of the following molecule are ***R*** or ***S***? Show work leading to your conclusion. (5 marks)



d. i. Name following compound according to IUPAC nomenclature. (2 marks)



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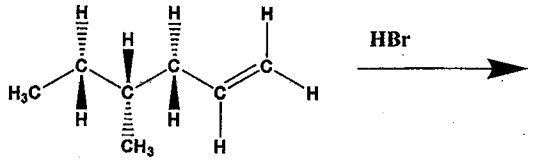
ii. Identify the product formed in this reaction and state stereochemistry of the chiral centres according to ***R*** and ***S*** nomenclature. (3 marks)



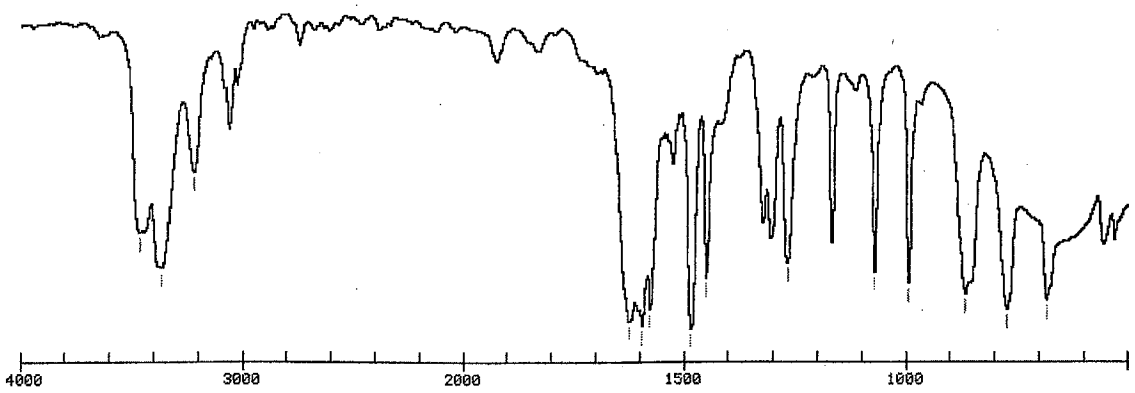
iii. If the above reaction proceeds via a carbocation intermediate, state whether products will form a racemic mixture or not. Support your answer with reaction mechanism. (5 marks)

2. A student is provided with a brown colour solid organic compound with chemical formula, C_6H_6NBr. He has performed several chemical and spectroscopic tests to identify the structure of the compound.

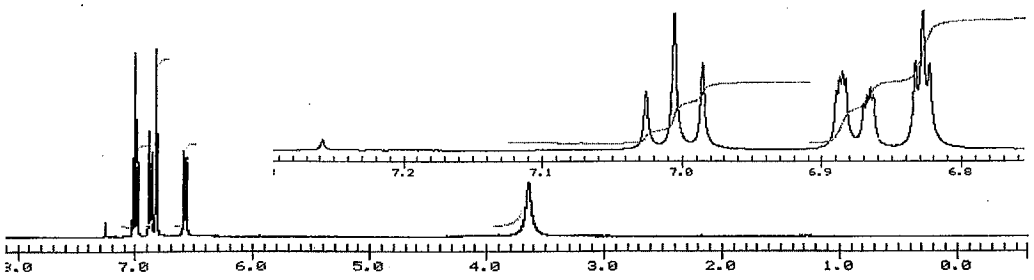
a. Following is a list of chemical tests conducted and corresponding observations. Indicate inferences that can be made according to observations in each test. (6 marks)

	Test	**Observation**	**Inferences**
i.	To a small amount of solid sample, dil.HCl was added and resulting solution was warmed	Soluble, no gas evolved	
ii.	To a small amount of solid sample, dil.NaOH was added and resulting solution was warmed	Insoluble, no gas evolved	
iii.	To a small amount of sample, add Brady reagent	No precipitate	
iv.	Add $AgNO_3$ to a small amount of sample	No precipitate	
v.	To a small amount of sample dissolved in $CHCl_3$, alcoholic KOH was added and warmed. Then small portion of the resulting solution was poured in to a boiling tube with water.	Characteristic foul smell was observed	
vi.	Neutral $FeCl_3$ was added to a small amount of the sample	Small amount of brown colour precipitate	

b. Following is the FTIR spectrum of the compound (C_6H_6NBr) mentioned above. Identify functional groups present stating specific frequency for functional group. (7 marks)



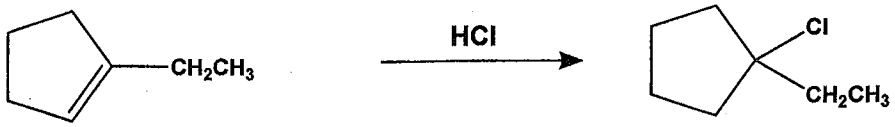
c. i. ^{1}HNMR spectrum of the above mentioned compound (C_6H_6NBr) is given below. Identify the structure of the compound and label all protons in the structure. (2 marks)

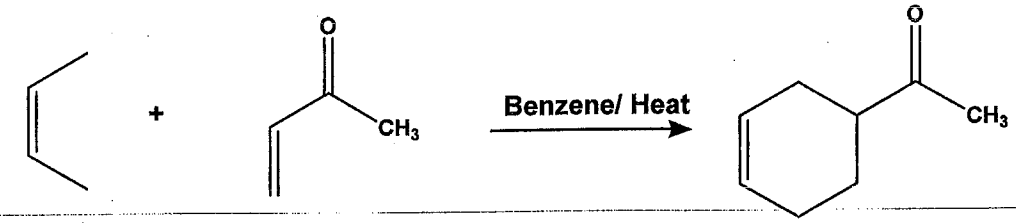


ii. Identify the peaks present in the spectrum by filling the table below. Clearly mention how multiplicity for each proton is obtained. (10 marks)

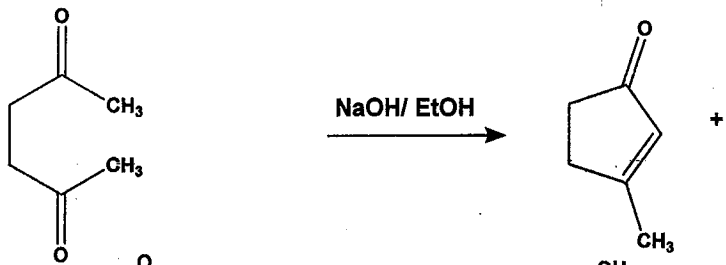
Label of the proton	Chemical shift (δ) /ppm	No. of protons	multiplicity

3. a. Identify following as addition, substitution, elimination, or rearrangement reactions. (4 marks)

i. 

ii. 

iii.



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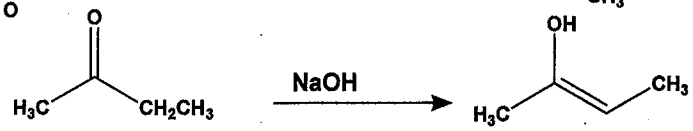

b. Draw the structures of products you would expect from reaction of 1-bromobutane with following reagents. (6 marks)

i. NaI ii. KOH iii. LiC_2H iv. NH_3

c. Explain why 3-bromo-1-butene and 1-bromo-2-butene undergo substitution reaction with H_2O at almost same rate? State mechanism and corresponding sketch of energy profile of the reaction to explain your answer. (7 marks)

d. i. Compare elimination reactions via E1 and E2 mechanism using a generalized reaction. (4 marks)

ii. State which pathway is preferred for elimination reactions of primary alkanehalides versus tertiary alkanehalides. (4 marks)

4. a. Draw the experimental setup and give an example where each distillation method listed below is used. (8 marks)

i. Simple distillation ii. Fractional Distillation

iii. Steam Distillation iv. Vacuum Distillation

b. Compare simple distillation method versus fractional distillation using a suitable phase diagram. (4 marks)

c. List three characteristics of a good solvent system that can be used to recrystallize crude organic compounds. (3 marks)

d. i. You are provided with a sample of salicylic acid mixed with naphthalene. Design an experiment to purify the above sample to obtain pure salicylic acid. (6 marks)

ii. List experimental techniques that can be used to evaluate the purity of the salicylic acid isolated. (4 marks)