



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

**SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR
OF SCIENCE**

SCH 102 : ORGANIC CHEMISTRY I

DATE: FRIDAY 30TH MARCH 2012

TIME: 8.00 A.M. – 10.00 A.M.

INSTRUCTIONS

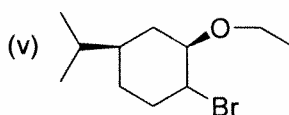
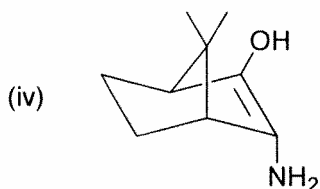
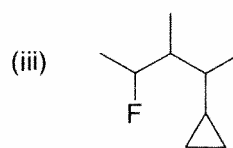
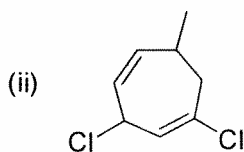
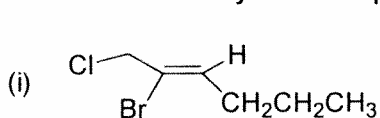
Answer ALL questions

Question 1 (15 marks)

(a) Draw the structure of each of the following compounds including the stereochemistry where appropriate. 5 mks

- 5-Bromo-2-methyl-3-heptyne
- 5-Chloro-1-methylcyclohex-2-en-1-ol
- 2,7-Dimethylbicyclo[4.3.0]nonane
- 8-Bromo-3-Ethyl-2,3-dimethylundecane
- (E)-2-Methyl-1,5-octadiene

(b) Provide systematic (IUPAC) names for the following compounds, indicating stereochemistry where appropriate. 5mks



(c) (i) Draw all the possible structures of monobromination products that would be obtained from the free radical bromination methylpropane 3 mks

(ii) Which one would be obtained in greatest yield? Give a reason(s) for your answer 2 mks

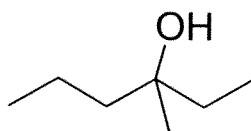
Question 2 (23 marks)

(a) (i) Give all the four isomeric structures of a compound (except ethers) with a molecular formula $C_4H_{10}O$. 4 mks

(ii) Give two simple visual chemical test you would perform to differentiate between the isomers in **a (i)**. Explain what happens in each case. 4 mks

(iii) For the tertiary isomer, draw the Lewis structure 1 mk

(b) Draw the possible dehydration products of the following compound. 3 mks



(c) (c) A sample of aspirin was prepared by reacting 2.20 g of salicylic acid with 4.20 ml of ethanoic anhydride in a conical flask. The crystals were collected and dried to constant mass and yielded 2.25g. Use the following data to answer question below

[Aspirin: Molar mass is 180 g/mol; Ethanoic anhydride : molar mass is 102 g/mol and density = 1.08g/ml: Reaction ratio is 1:1].

Salicylic acid + Ethanoic anhydride $\longrightarrow$ Aspirin + Ethanoic acid

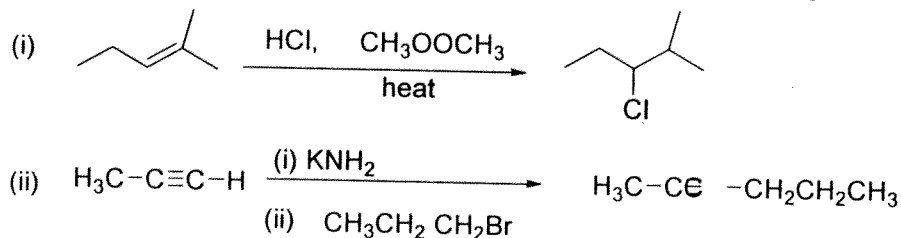
(a) Calculate the initial amount in moles of salicylic acid used in the preparation 1 mk

(b) What initial amounts in moles of ethanoic anhydride was used? 2 mks

(c) what is the maximum mass of aspirin that can be theoretically produced from these reagents? 2 mks

(d) Determine the % yield of aspirin in this preparation 2 mks

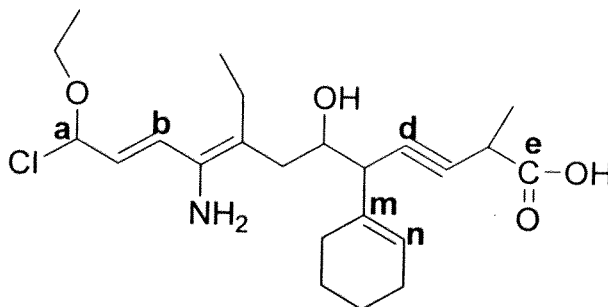
(b) By using curly arrows, show how the transformation in the following reactions occur. 7 mks



Question 3

(14 marks)

(a) You are provided with the structure of a hypothetical organic compound **1**



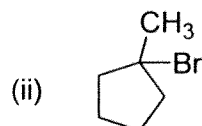
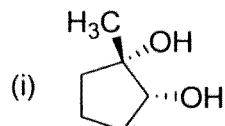
- (i) Indicate type of hybridization present on the carbon labeled **a** and **d**. 2 mks
 - (ii) Draw and label all the non-carbon functional groups in compound **1**. 2 mks
 - (iii) State type of bonds in $-\text{C}\equiv\text{C}-$ the above compound. 2 mk
 - (iv) Show by drawing, the bonding orbital's that form bonds between carbon **m** and **n** and use s and p notation to label them. 3 mks
- (b) Combustion of 5.17 mg sample of a compound gave 54.5 % C and 9.1 % H by mass. Calculate its molecular formula if its molecular mass was 88 (C = 12.011, H = 1.008, O = 15.999) 4 mks

Question 4

(18 marks)

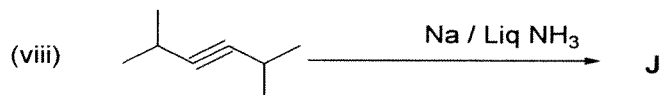
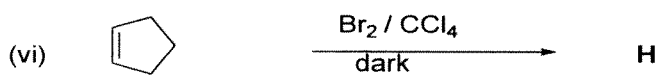
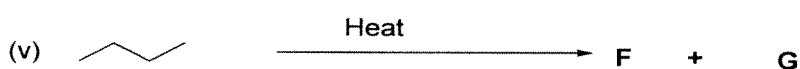
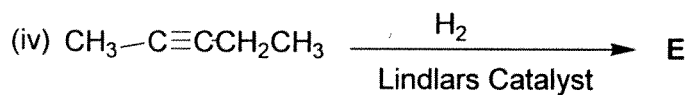
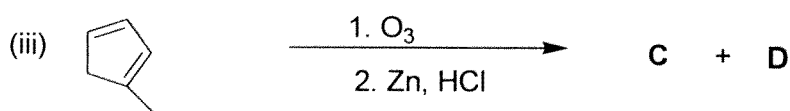
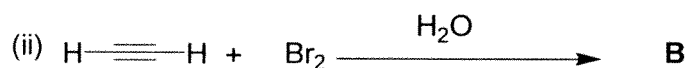
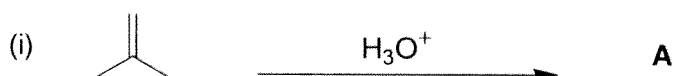
- (a) Define the following terms and give an example to illustrate. 4 mks
- (i) Homologous series
 - ii) Pyrolysis

b) Show using chemical equation how the following compounds can be prepared from given 1-methylcyclopentene. 4 mks



(c) Provide the structures of the major organic compounds **A-D** expected in the following reactions. Indicate the stereochemistry where appropriate.

10 marks



END