

KABARAK



UNIVERSITY

**UNIVERSITY EXAMINATIONS
2010/2011 ACADEMIC YEAR
FOR THE DEGREE OF BACHELOR OF EDUCATION
SCIENCE**

COURSE CODE: CHEM 212

COURSE TITLE: ORGANIC CHEMISTRY II

STREAM: Y2 S1

DAY: FRIDAY

TIME: 2.00 – 4.00 P.M

DATE: 26/11/2010

INSTRUCTIONS:

- Attempt all questions
- Each question = 17.5 Marks, Total marks = 70 %

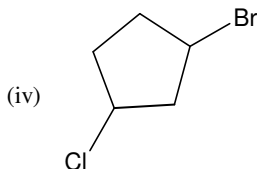
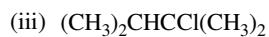
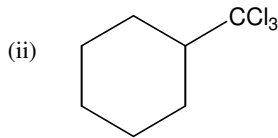
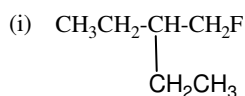
PLEASE TURNOVER

QUESTION ONE

- (a) Define the following terms and give examples: (i) Geometrical isomers (ii) Optical isomers (iii) Meso- compound (iv) Diastereomers (4 marks)
- (b) Draw the structures of the following compounds: (i) (Z)-4-bromo-2-iodo-2-pentene (ii) (E)-3-methoxy-2-methyl-2-buten-1-ol (iii) (s)-2-methyl-3-bromohexane (iv) (R)-2-chloro-1,1,1-trifluoro-3-methylbutane (v) (2R, 3S)-2-bromo-3-methylpentane (5 marks)
- (c) (i) Draw and name using R/S notation all possible stereoisomers of 2-chloro-3-bromo-4-methylpentane. (2 marks)
- (ii) Identify the enantiomers and diastereomers or meso compounds in the stereoisomers in question (c) (i). (2 marks)
- (iii) Draw Fischer projection of the stereoisomer (2S,3R)-2-bromo-3-chlorobutane (2 marks)
- (iv) Draw all possible conformational isomers of 2,3-dichlorobutane using Newman's Projection (2.5 marks)

QUESTION TWO

- (a) Name the following compounds: (4 marks)

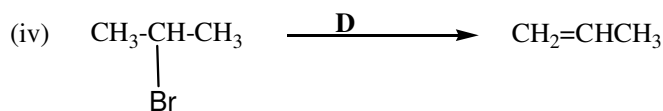
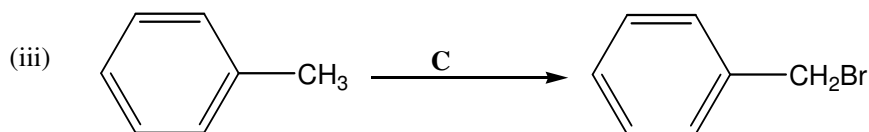
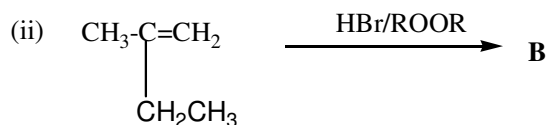
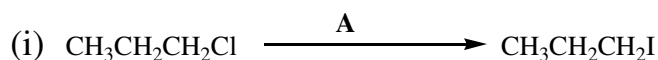


- (b) Explain using examples, what is meant by the following reactions: (4 marks)
- (i) $\text{S}_{\text{N}}1$ (ii) $\text{S}_{\text{N}}2$ (iii) E_1 (iv) E_2

(c) (i) Outline the mechanism of reaction between Tert-butylchloride with aqueous solution of NaOH. **(4 marks)**

(ii) Identify the type of reaction taking place in (c) (i) above. **(1.5 marks)**

(iii) Identify the missing reactants/products/reagents in the following reactions. **(4 marks)**

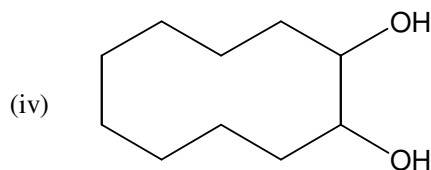
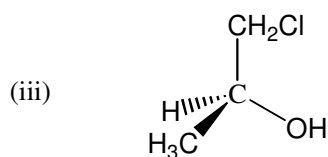
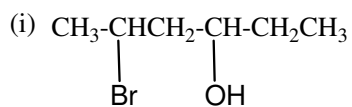


QUESTION THREE

(a) Classify and name the following alcohols, include orientation nomenclature where

Possible:

(4 marks)

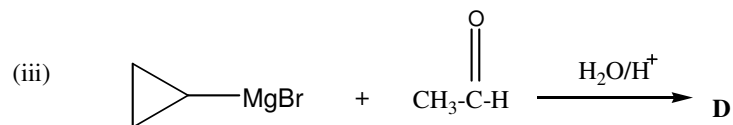
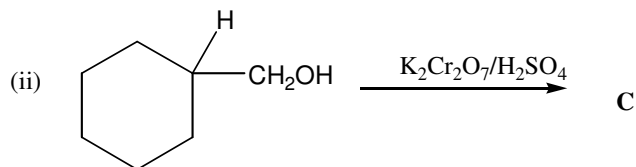
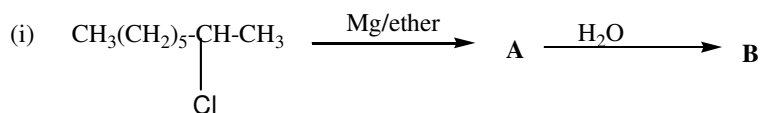


(b) (i) Arrange the following set of compounds in order of increasing solubility and explain the order (ethane, ethanol, chloroethane) and (1-propanol, methanol, ethanol). **(2 marks)**

(ii) Arrange the following compounds in order of increasing boiling point; 2,3-dimethyl-2-pentanol, 2-methyl-2-hexanol and 2-heptanol. Give reasons. **(2 marks)**

(iii) Treatment of 3-methyl-2-butanol with HBr acid yields 2-bromo-2-methylbutane as the sole product. Outline the mechanism of the reaction. **(2 marks)**

(c) Give the major product in each of the following reactions: **(5 marks)**

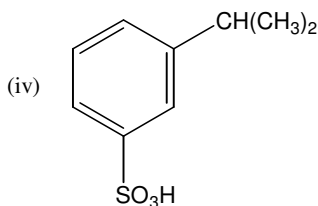
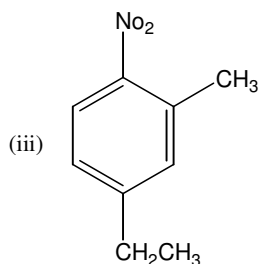
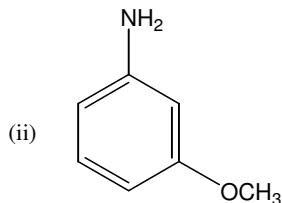
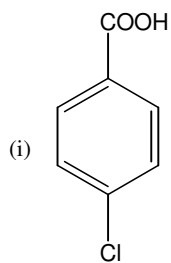


(d) Devise a synthesis of 3-octanol starting from an aldehyde and any other reagents. **(2.5 marks)**

QUESTION FOUR

(a) Name the following compounds:

(4 marks)



(b) Draw the structures of the following compounds: (i) 3,4-dibromoaniline

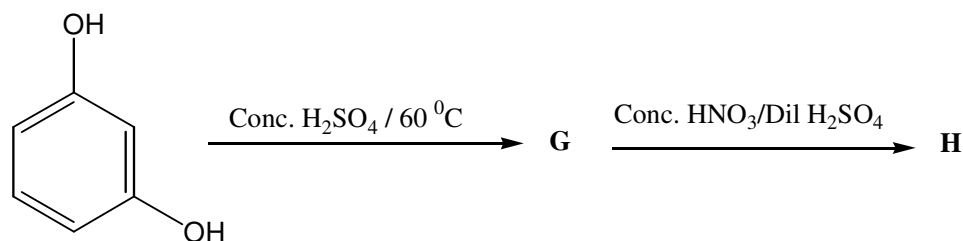
(ii) *p*-methoxy-*m*-nitrotoluene (iii) *m*-isopropylbenzoic acid (iv) 2,4,6-trihydroxybenzene sulphonic acid.

(4 marks)

(c) (i) Outline all steps in a reasonable mechanism for the formation of isopropylbenzene from propene and benzene in presence of an HF acid.

(2.5 marks)

(ii) Propose structures for compound G and H in the following reactions: (2 marks)



(iii) Starting with benzene and any other reagent, outline the synthesis of the following

Compounds, *o*-chloronitrobenzene and *m*-methylbenzene sulphonic acid. (3 marks)

(d) Explain why the hydroxyl group of phenol is a ring activating and ortho-para director.

(2 marks)