

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: SESSION IV & V

DAY: FRIDAY

TIME: 9.00 – 11.00 A.M.

DATE: 15/04/2011

INSTRUCTIONS:

- Attempt ALL questions

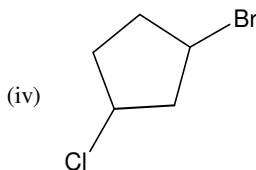
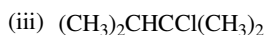
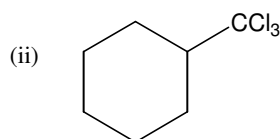
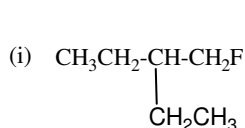
PLEASE TURN OVER

QUESTION ONE

- (a) Define the following terms and give examples where applicable: (i) Geometrical isomers
(ii) Optical activity (iii) Meso- compound (iv) Diastereomers (7mks)
- (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 mks)
- (c) (i) Draw and name using R/S notation all possible stereoisomers of 2-chloro-3-bromo-4-methylpentane. (2 mks)
(ii) Identify the enantiomers and diastereomers or meso compounds in the stereoisomers in question (c) (i). (2 mks)
(iii) Draw Fischer projection of the stereoisomer (2S,3R)-2-bromo-3-chlorobutane (2 mks)

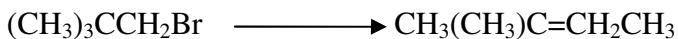
QUESTION TWO

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



- b) Tert-butylchloride reacts with NaOH to give Tert-butanol. Rate = $k[\text{Tertbutylchloride}]$.
- i) What is the overall reaction order (1mk)
(ii) Outline the mechanism of reaction between Tert-butylchloride with aqueous solution of NaOH, giving reasons (6mks)
(iii) Identify the type of reaction taking place in (b) (ii) above. (1mk)
iv) The following reaction has been carried out:



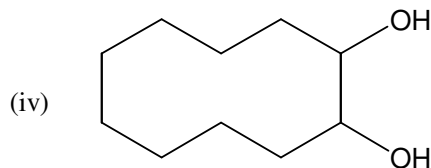
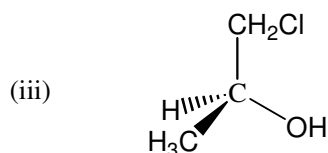
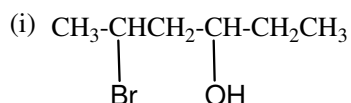


Draw a plausible mechanism for reaction leading to the formation of the product, giving the reasons why the product is preferred. (4mks)

QUESTION THREE

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

Possible: (4 mks)

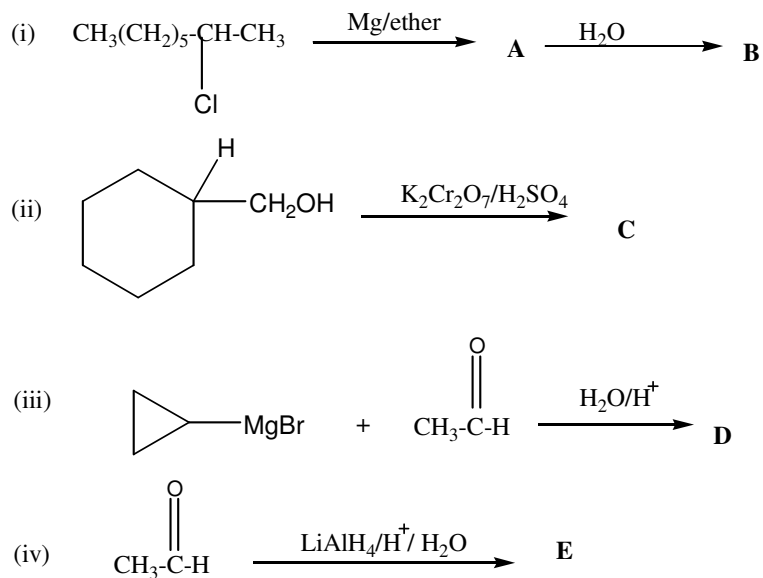


(b) (i) Arrange the following set of compounds in order of increasing solubility and explain the order (ethane, ethanol, chloroethane) and (1-propanol, methanol, ethanol). (2 mks)

(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 mks)

(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 mks)

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



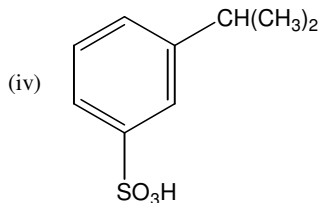
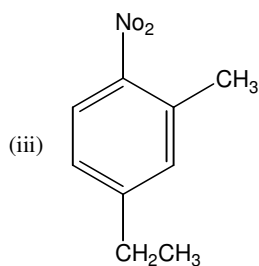
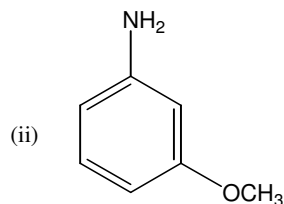
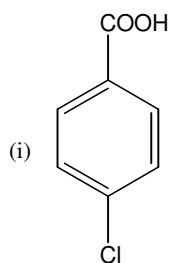
(d) Devise a synthesis of 3-octanol starting from an aldehyde and any other reagents.

(3 mks)

QUESTION FOUR

(a) Name the following compounds:

(4 mks)



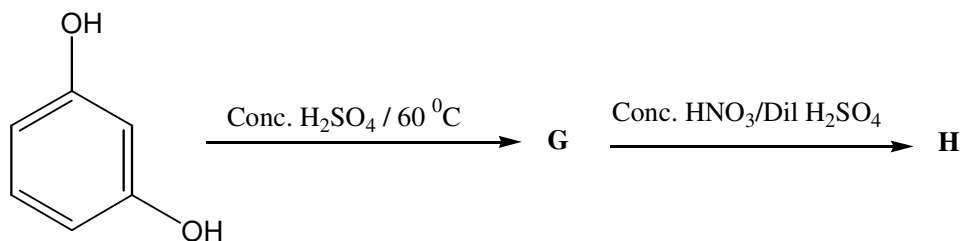
(b) Draw the structures of the following compounds: (i) 3,4-dibromoaniline

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

(4 mks)

(c) (i) Outline all steps in a reasonable mechanism for the formation of isopropylbenzene from 1-chloropropane and benzene in presence of FeCl_3 . (4 mks)

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



(iii) Outline the synthesis of phenols from cumene hydroperoxide (3 mks)

(d) Explain why the hydroxyl group of phenol is a ring activating and ortho-para director. (4 mks)