

DIPLOMA IN SCIENCE LABORATORY TECHNOLOGY

LEVEL 6 YEAR II EXAMINATIONS

FINAL INTEGRATED SUMMATIVE EXAMINATIONS

SITTING: NOVEMBER/DECEMBER 2025

SUBJECT: ORGANIC AND STEREOCHEMISTRY (THEORY)

TIME: THREE (3) HOURS **TOTAL MARKS: 100**

PASS MARK: 50

INSTRUCTIONS TO CANDIDATE

1. Write your Examination number and National Registration Card (NRC) number on the answer booklet provided. Ensure you append your signature in the space provided on the answer booklet.
2. Write the ANSWER SCRIPT SERIAL NUMBER on the examination register and on the entry slip.
3. This paper has SEVEN (7) questions. Question ONE (1) is COMPULSORY answer FOUR (4) questions from the remaining SIX (6) questions.
4. Diagrams may be used where necessary to clarify your answer.
5. Cellphones and programmable calculators are not allowed in the examination room.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

QUESTION ONE (COMPULSORY)

(a) Define the following terms:

i. Stereoisomers. (2 marks)

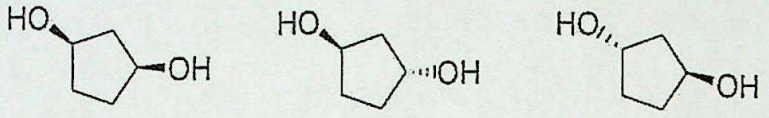
ii. Enantiomers. (2 marks)

iii. Diastereomers. (2 marks)

iv. Geometrical isomers. (2 marks)

v. Conformational isomers. (2 marks)

(b) Consider the molecules below.



A B C

List a pair of compounds that are: -

i. Constitutional isomers. (2 marks)

ii. Enantiomer. (2 marks)

iii. Diastereomers. (2 marks)

(c) Differentiate between 'Chirality' and 'Achirality'. (2 marks)

(d) Identify the chiral molecule in the following pair (2 marks)



A B

TOTAL 20 MARKS

QUESTION TWO

(a) State IUPAC names of the following compounds

i. $CH_3 - O - C_2H_5$. (2 marks)

ii. $CH_3\text{-}O\text{-}C_6H_5$. (2 marks)

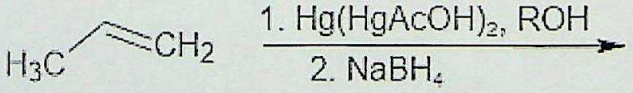
(b) State two (2) compounds that will be formed when dimethyl ether react with hydrogen bromide (2 marks)

$$CH_3 - O - CH_3 + HBr \longrightarrow$$

(c) Write the condensed formula of ethyl propyl ether (2 marks)

(d) State two (2) uses of ethers. (4 marks)

(e) Predict the product



(2 marks)

(f) Draw Fisher projections for a- (2R, 3S)-2-bromo-3-chlorobutane and (2S, 3R)-2-bromo3-chlorobutane, with the carbon chain on the vertical line.
Label each structure as (2R, 3S) or (2S, 3R). (6 marks)

TOTAL 20 MARKS

QUESTION THREE

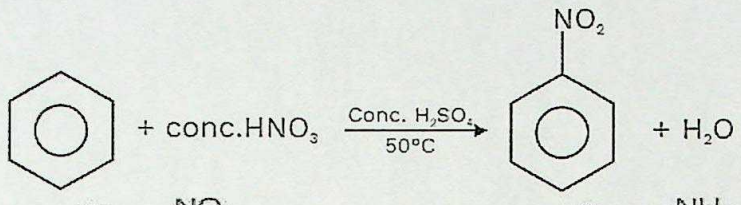
(a) Identify the amines below:

i. $CH_3CH_2NHCH_3$. (2 marks)

ii. $C_6H_5\text{-}CH_2CH_2NH_2$. (2 marks)

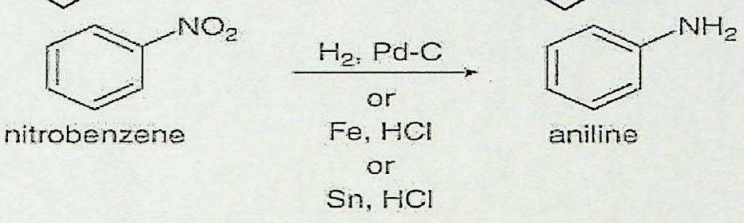
(b) State the type of reaction below

i)



(2 marks)

ii)



(2 marks)

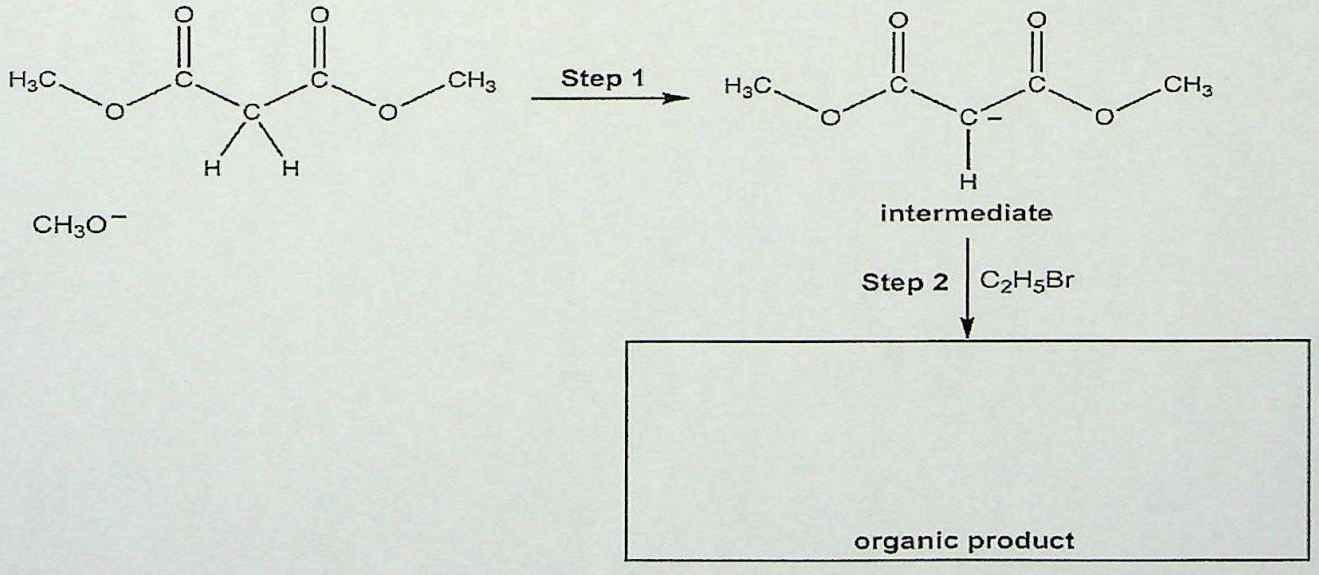
iii) Explain the reason benzene diazonium chloride not stored and is used immediately after its preparation. (4 marks)

iv) Describe the processes of converting 4- nitrotoulene to 2-bromobenzonic acid include all the necessary conditions and structures (8 marks)

TOTAL 20 MARKS

QUESTION FOUR

In organic reactions, alkoxide ions can also act as a base. The diagram below shows an incomplete mechanism for the reaction of a diester with methoxide ions, CH_3O^- (Step 1), followed by reaction of the intermediate with bromoethane (Step 2).



(a) For Step 1, add curly arrows to show how CH_3O^- reacts with the diester to form the intermediate (reaction mechanism) . (6 Marks)

(b) In the box, draw the structure of the organic product formed in Step 2. (4 Marks)

(c) Explain five (5) uses of ethers in industry. (10 Marks)

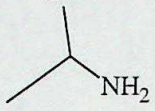
TOTAL 20 MARKS

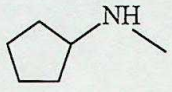
QUESTION FIVE

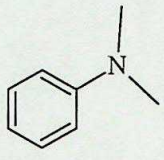
(a) Define amines. (2 marks)

(b) State classes of amines. (6 marks)

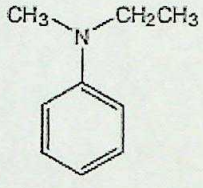
(c) The following show structures of amines, state the class to each one belongs:

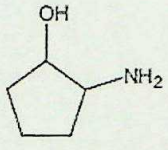
i.  (2 marks)

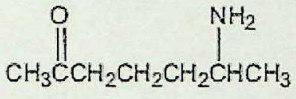
ii.  (2 marks)

iii.  (2 marks)

(d) State the common names for the following amines; (6 marks)

i 

ii 

iii 

TOTAL 20 MARKS

QUESTION SIX

(a) State Huckel's rule of aromaticity. (3 marks)

(b) With the aid of an example, explain antiaromatic compounds. (6 marks)

(c) Describe:

i. Homo-aromatic compounds. (3 marks)

ii. Quasi-aromatic compounds with one (1) example. (6 marks)

iii. The bromine test (2 marks)

TOTAL 20 MARKS

QUESTION SEVEN

(a) Define:

i. Dextrorotatory. (2 marks)

ii. Laevorotatory. (2 marks)

(b) State the reagents used in the following reactions of benzene diazonium salt to give the products shown below:

i. Nitrobenzene. (2 marks)

ii. Phenol. (2 marks)

iii. Chlorobenzene. (2 marks)

(c) The formation of ether is a nucleophilic bimolecular reaction (S_N2) involving the attack of alcohol molecule on a protonated alcohol, write the mechanism for the reaction below

$CH_3-CH_2-OH + H^+ + CH_3-CH_2-OH \rightarrow CH_3-CH_2-O- CH_2-CH_3$ (4 marks)

(d) Explain aryl diazonium salts are more stable than alkyl diazonium salts. (3 marks)

(e) Write an equation for the reaction between sodium benzoate and hydrochloric acid to form benzonoic and sodium chloride (3 marks)

TOTAL 20 MARKS