



MAASAI MARA UNIVERSITY

**REGULAR UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR
SECOND YEAR FIRST SEMESTER**

**SCHOOL OF SCIENCE & INFORMATION
SCIENCES
BACHELOR OF SCIENCE IN CHEMISTRY AND
BACHELOR OF EDUCATION SCIENCE**

**COURSE CODE: CHE 2112-1
COURSE TITLE: CHEMISTRY OF AROMATIC
COMPOUNDS**

DATE: 15/12/2023

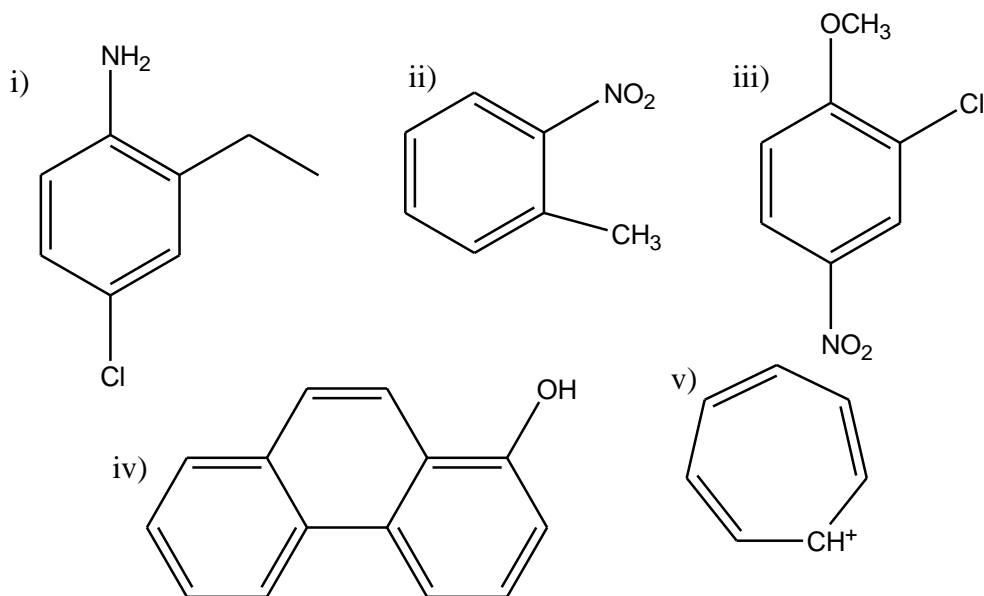
TIME: 1430-1630HRS

INSTRUCTIONS TO CANDIDATES

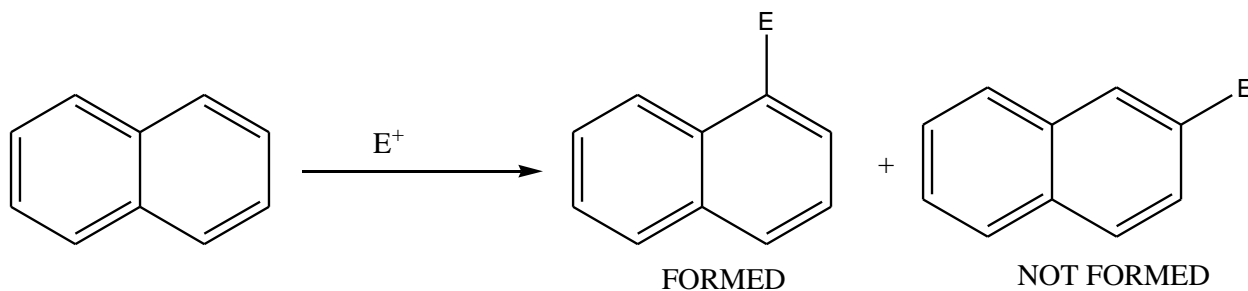
1. Answer Question **ONE** and **ANY** other **TWO** questions.
2. All Examination Rules Apply

QUESTION ONE (20 MARKS)

- a. Define polycyclic aromatic hydrocarbons giving an example **(1 MARK)**
- b. Draw at least **FIVE** resonance structures of cyclopentadienyl anion **(2.5 MARKS)**
- c. Draw the structures of each of the following **(4 MARKS)**
- Isobutyl benzene
 - Cis-1,2 diphenyl cyclohexane
 - m-chloroaniline
 - 2-chloro-4-nitrophenol
- d. Give the IUPAC name for the following compounds **(5 MARKS)**



- e. Although two products are possible when naphthalene undergoes electrophilic aromatic substitution, only one is formed. Draw resonance structure for the intermediate carbocation to explain why this is observed **(4 MARKS)**



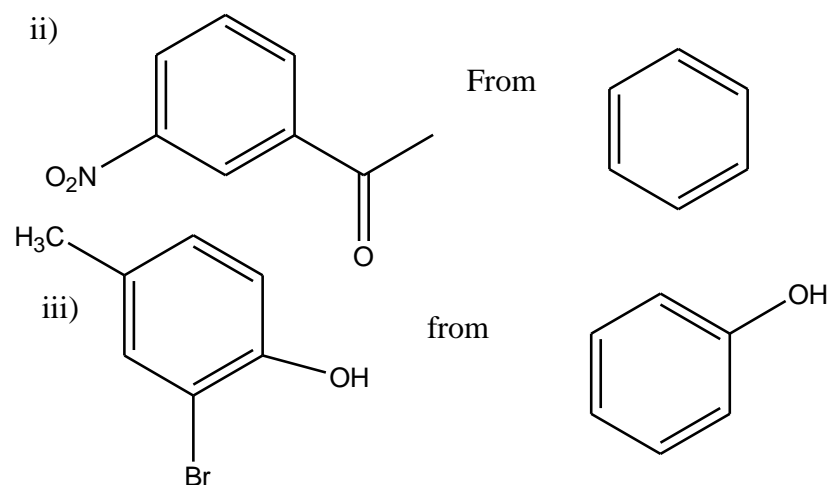
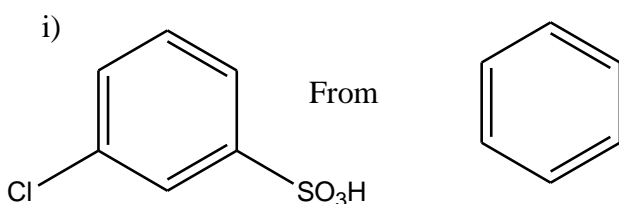
- f. Explain why

- i) Phenols do not undergo substitution of OH group like alcohols **(2 MARKS)**
- ii) Phenols are more acidic than alcohols **(1 MARKS)**
- g. Define aromaticity **(0.5 MARKS)**

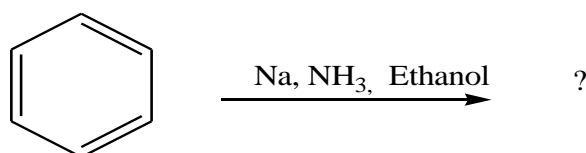
QUESTION TWO (15 MARKS)

a) Devise a synthesis of each compound from the indicated starting material

(6 MARKS)



- b) Explain why benzene is considered to have unusual stability **(2 MARKS)**
- c) Explain why in the hydrogenation of benzene formation of the sigma complexes is the rate determining step. **(2 MARKS)**
- d) Give all the products for the following reaction and suggest a plausible mechanism. Indicate which is the major product **(4 MARKS)**



e) Differentiate between an activating and a deactivating group (1 MARKS)

QUESTION THREE (15 MARKS)

a) By use of resonance structures and reaction mechanism, explain why the acetyl group (COCH₃) to nitrogen reduces the activating properties of aniline (4 MARKS)

b) Explain using structures Why a halogen attached to benzene ring is considered to be an activating group to benzene (2 MARK)

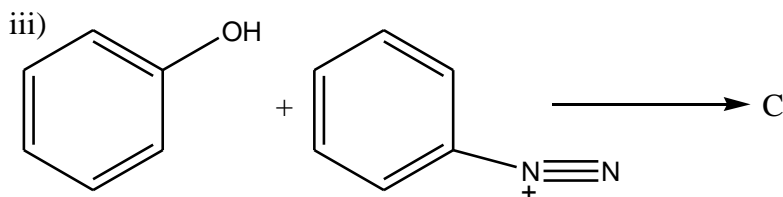
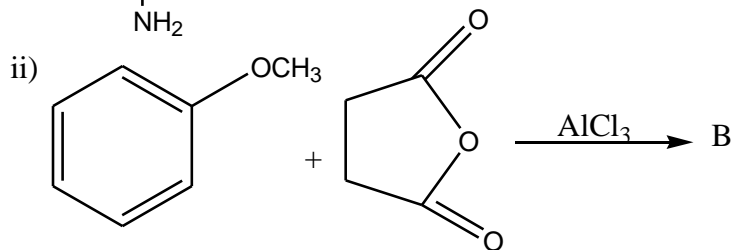
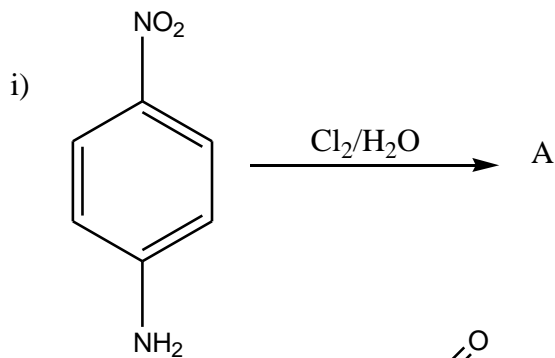
c) Explain why in bromination of C₆H₅CH₂CH₃

i) The product formed is **NOT** C₆H₅CH₂CH₂Br (2 MARKS)

ii) Give the product formed in the above reaction (1 MARKS)

d) Explain why in synthesis alkyl benzenes acylation route is more preferred compared to direct alkylation. (2 MARKS)

e) Give the products for the following reactions (3 MARKS)



f) Give at least **two** uses of phenol

(1 MARK)

QUESTION FOUR (15 MARKS)

- a) Give the major product and the mechanism for the Nitration of aniline in electrophilic aromatic substitution. Include all the possible resonance structures of the intermediates **(4 MARKS)**
- b) Show how you could convert benzene to nitrosobenzene. Include the reagents needed and a reaction mechanism **(3 MARKS)**
- c) Explain how differentiate the following using simple chemical tests
- i) Phenanthrene and anthracene **(2 MARKS)**
 - ii) Phenols and quinones **(2 MARKS)**
- d) Explain using resonance structures why in EAS of anthracene substitution at position 9 and 1 is more preferred as compared to substitution at position 2 **(4 MARKS)**

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