MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya.
Tel: +254 (0)799529958, +254 (0)799529959, +254 (0)712524293
Website: www.must.ac.ke Email: info@must.ac.ke

University Examinations 2023/2024

THIRD YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN CHEMISTRY

SCH 3302: CHEMISTRY OF NON-BENZENOID AROMATIC COMPOUNDS

DATE: DECEMBER 2023 **TIME:2 HOURS**

INSTRUCTIONS: *answer question one and any other two questions*

QUESTION ONE (30 MARKS)

a) Define the following terms;

a. Non-aromatic compound (2 Marks)

b. Anti-aromatic compounds (2 Marks)

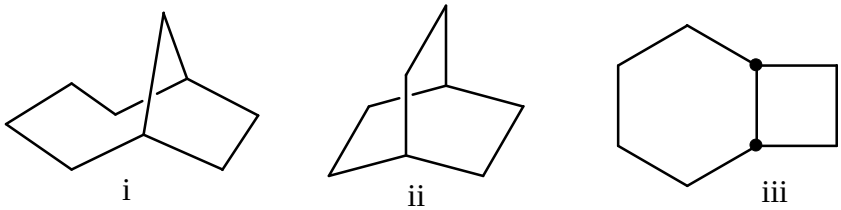
c. Polycyclic aromatic hydrocarbon (2 Marks)

b) b) State two main sources and two uses of naphthalene and phenanthrene (4 Marks)

c) c) State the Huckle 4n+ 2 rule (2 Marks)

d) d) Draw the structure and briefly describe the aromaticity of [10]-annulene (6 Marks)

e) e) Give the IUPAC names for the following compounds (3 Marks)



i ii iii

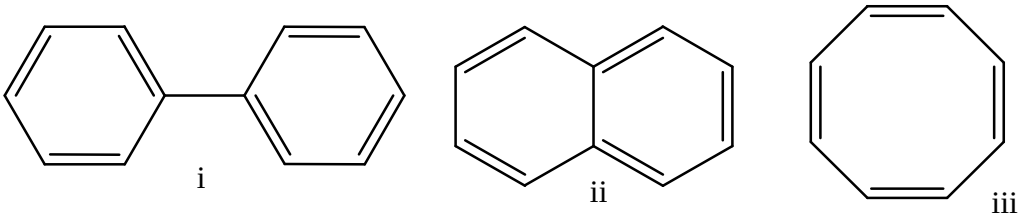
f) 7-Bromocycloheptatriene completely dissociates in water and gives a precipitate of Ag Br with Ag NO_3 , unlike its open chain analogue, 3-bromo-1, 4-pentadiene. Explain. (2 Marks)

g) Draw four resonance structures of anthracene. (4 Marks)

h) Benzene is a versatile compound. Explain the toxicity of benzene (3 Marks)

QUESTION TWO (20 MARKS)

a) Give the IUPAC names for the following compounds. (6 Marks)



i ii iii

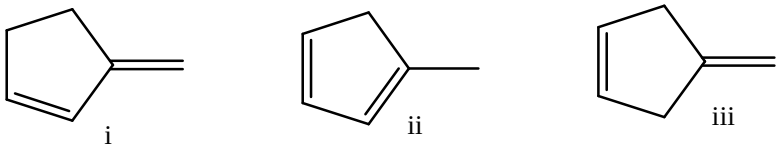
b) Explain the following Stability Order "Aromatic > Non-aromatic > Anti-aromatic"(3Marks)

c) i) Define the term Quasi-aromatic molecules (2 Mark)

ii) By drawing the structure(s), illustrate cyclopropenone is Quasi-aromatic molecules (3 Marks)

iii) state two properties of Quasi-aromatic compounds (2 Marks)

d) Of the three C6H8 isomers shown below,



i ii iii

i) Which has the smallest λmax? (2 Marks)

ii) Which would give off the least energy by hydrogenation? (2 Marks)

QUESTION THREE (20 MARKS)

a) Define polycyclic aromatic hydrocarbons (2 Marks)

b) I) Distinguish between benzenoid and non-benzenoid compounds (2 Marks)

Ii) state two similarities between benzenoid and non-benzenoid compounds (2 Marks)

c) List four conditions that must be satisfied for a compound to be aromatic. (4 Marks)

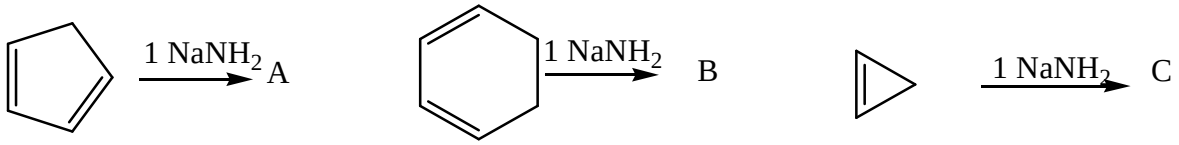
d) State one use of each of the molecule below (3 Marks)

i) benzoic acid

ii) nitrobenzene

iii) aniline

e) Consider the following reactions and answer questions that follows



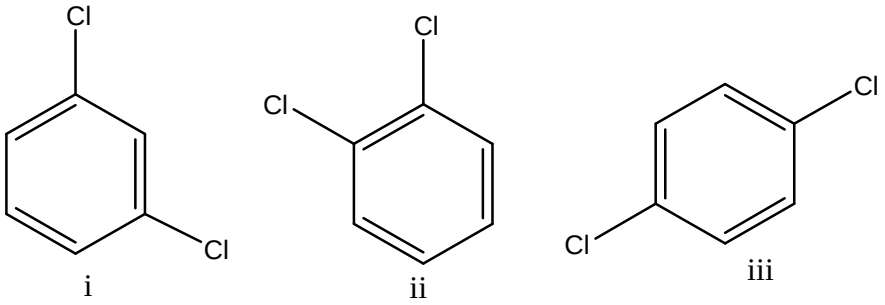
i) identify compounds A, B and C (3 Marks)

ii) Arrange the molecules in order of stability. Support your answer. (4 Marks)

QUESTION FOUR (20 MARKS)

a) Define heterocyclic compounds (1 Mark)

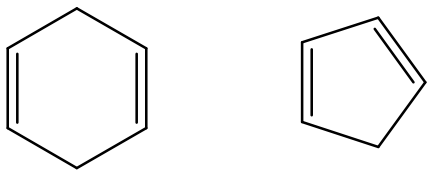
b) Give the IUPAC names for the following compounds. (6 Marks)



c) Azulene, a beautiful blue hydrocarbon, is an isomer of naphthalene. Is azulene aromatic?

Draw a second resonance form of azulene in addition to that shown. (5 Marks)

d) Explain why cyclopentadiene is much more acidic than 1,3 cyclohexadiene. (4 Marks)



d) Label the compounds below as aromatic, nonaromatic or antiaromatic. Explain your answer (4 Marks)