KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER
MAIN EXAMINATIONS

FOR THE DEGREE OF BSC (CHEMISTRY)

COURSE CODE: SCH 314

COURSE TITLE: CHEMISTRY OF AROMATIC COMPOUNDS

DATE: 25/05/2022 **TIME: 2:00PM-4:00PM**

INSTRUCTIONS TO CANDIDATES:

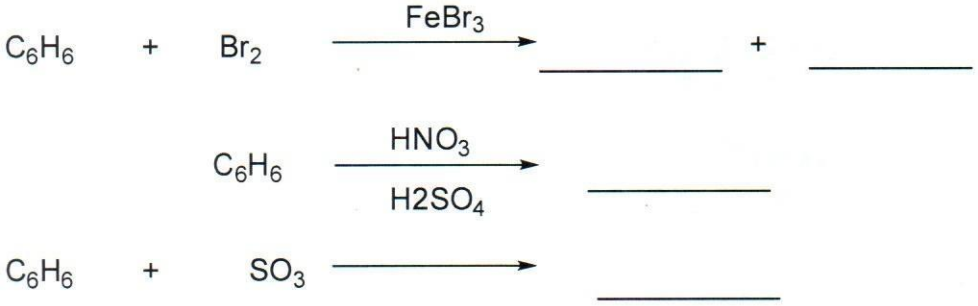
TIME: 2 Hours

Answer question ONE and any TWO of the remaining

QUESTION 1 (30 MARKS)

a) State Huckel's rule. **(1 mark)**

b) Name the products of these reactions **(4 marks)**



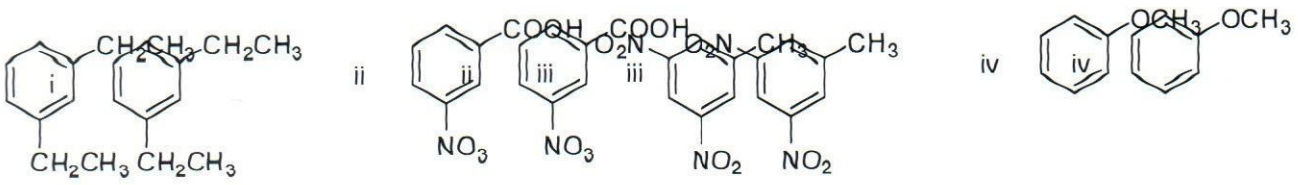
c) State the application of benzene in daily life **(4 marks)**

d) Draw the lowest energy (π_1) and highest energy (π_6) MO's. Indicate the bonding and antibonding MO's and the number of nodes in each case. **(5 marks)**

e) Draw the structures of the following **(4 marks)**

i) Aniline ii) Phenol iii) Benzoic acid iv) Toluene

f) Name the following compounds **(4 marks)**

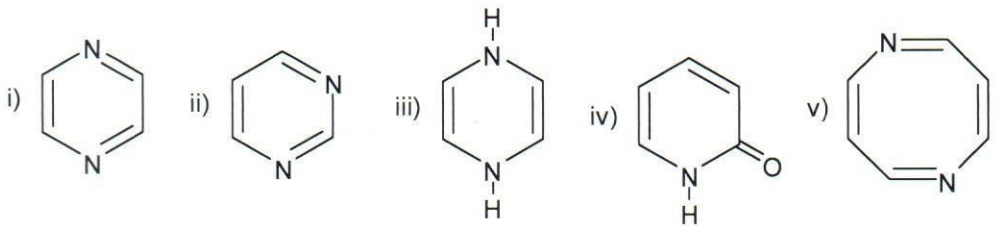


g) State the polygon MO rule **(1 mark)**

h) Basing on the six MO of benzene which of these molecular orbitals has: **(4 marks)**

I II III IV V VI

i) Which of the following compounds are aromatic? **(3 marks)**



QUESTION 2 (20 MARKS)

Use molecular orbital theory to explain stability of benzene **(20 marks)**

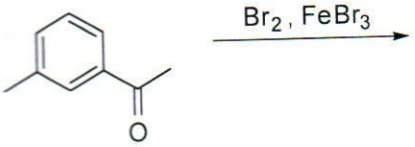
QUESTION 3 (20 MARKS)

a) Draw energy level diagram showing polygons of benzene, cyclobutadiene and cyclooctatetraene. State whether it is an open or closed system. **(6 marks)**

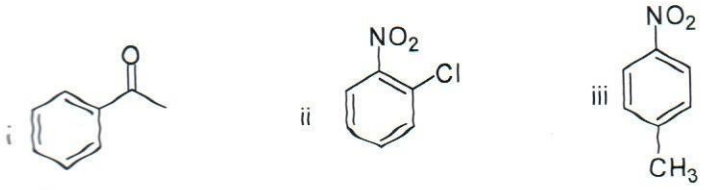
b) Stating reasons which compounds are aromatic, antiaromatic and nonaromatic. **(10 marks)**

i ii iii iv v

c) Draw the major product **(1 mark)**



d) Which of the following is compatible with a Friedel-Crafts reaction. Explain **(3 marks)**



i ii iii

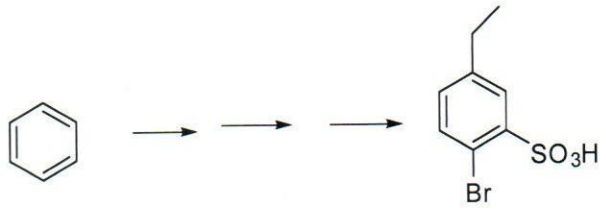
QUESTION 4 (20 MARKS)

a) State for uses of naphthalene **(4 marks)**

b) Name the reaction and draw the products from the reaction of naphthalene in presence of these conditions/ reagents; **(6 marks)**

i. HNO_3, CH_3COOH, 50-70^{O}C
ii. Br_2, CCl_4, heat
iii. H_2/Ni, pressure

c) Starting with benzene show the synthetic route followed to produce the product. **(10 marks)**



QUESTION 5(20 MARKS)

a) State three factors that affect Friedel-Crafts alkylation. **(3 marks)**

b) *P*-nitrophenol is much more acidic than a normal alcohol. Explain and show a mechanism that is consistent with the increased acidity. **(7 marks)**

c) Based on the resonance energies, polycyclic aromatics like naphthalene and phenanthrene are more reactive then benzene. Why? **(3 marks)**

d) Differentiate between anthracene and phenanthrene (diagram added advantage) **(2 marks)**

e) Phenanthrene is more stable than anthracene. Explain **(5 marks)**