



**TECHNICAL UNIVERSITY OF MOMBASA**

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

**UNIVERSITY EXAMINATION FOR:**

**BACHELOR OF TECHNOLOGY IN ANALYTICAL CHEMISTRY**

**ACH: 4203 : CHEMISTRY OF AROMATIC COMPOUNDS**

**SUPPLEMENTARY/SPECIAL EXAMINATIONS**

**SERIES: SEPTEMBER 2018**

**TIME: 2 HOURS**

**DATE: Pick Date Sep 2018**

**Instructions to Candidates**

You should have the following for this examination

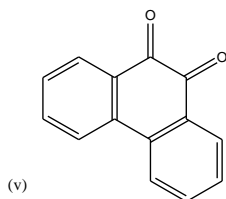
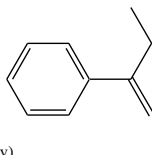
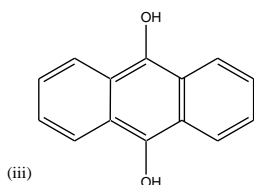
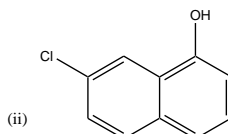
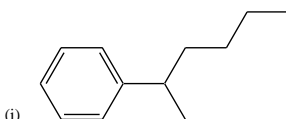
*-Answer Booklet, examination pass and student ID*

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

**Do not write on the question paper.**

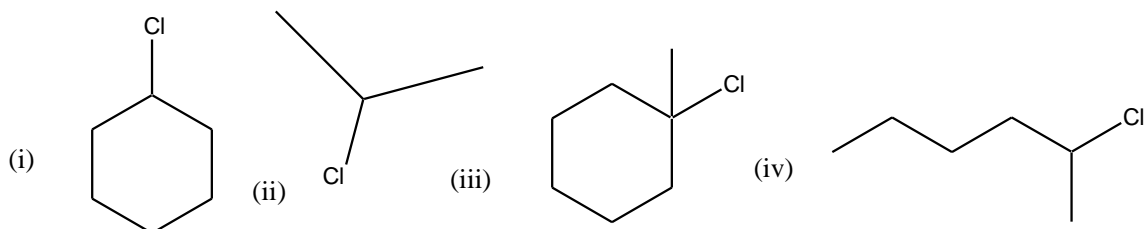
**Question ONE**

(a) Give a systematic names to each of the following compounds;



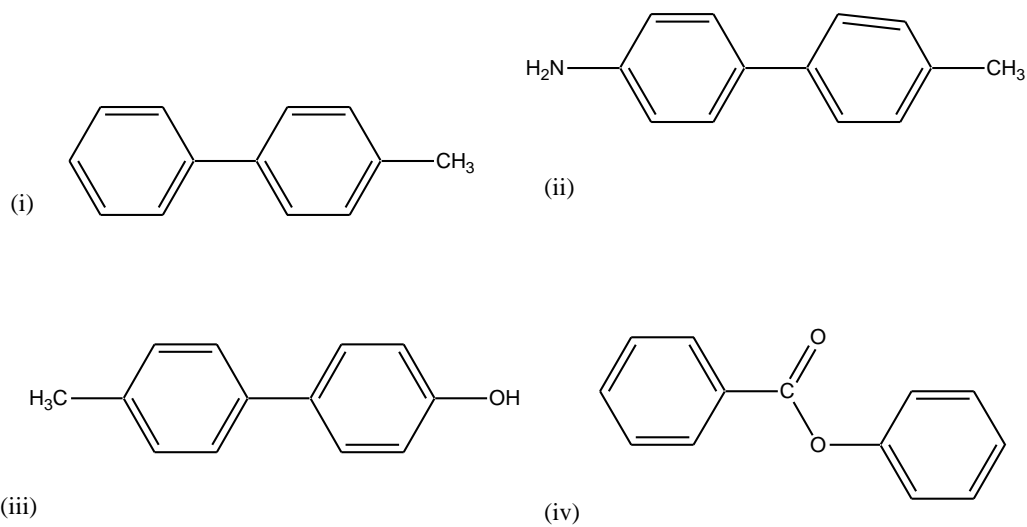
(10mks)

(b) What product is formed when benzene is treated with each of the following organic halides in the presence of  $\text{AlCl}_3$ .



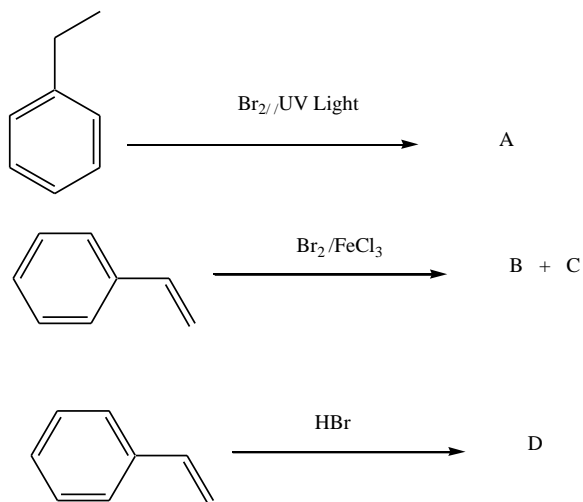
(6mks)

(c) With a reason(s) explain which benzene ring in each of the following compounds is more reactive towards electrophilic aromatic substitution



(8mks)

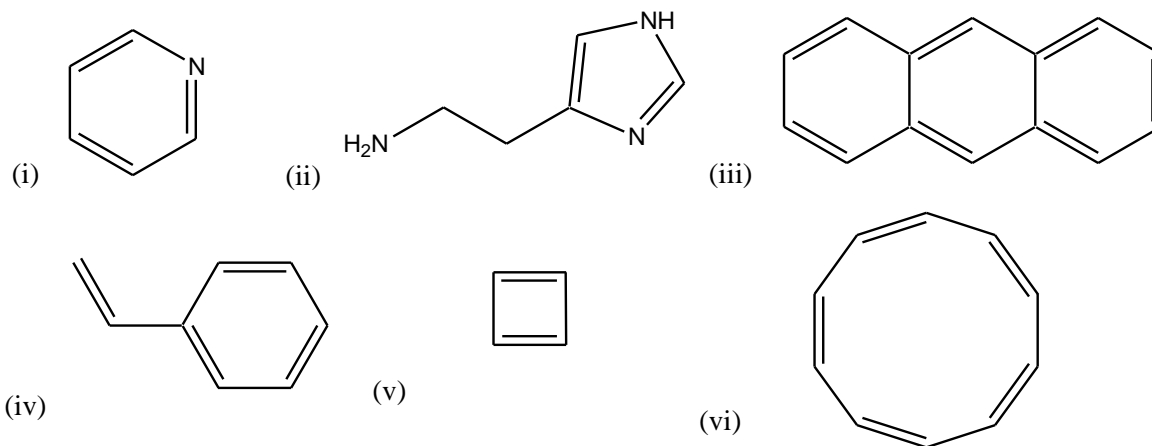
(e) Draw the products of each of the following reactions.



(6mks)

### Question TWO

Study the compound below and answer the questions that follow



(a) Give

I. A heterocyclic aromatic

II. An anti-aromatic compound

III. A benzenoid aromatic compound

IV. An Annulene

V. An arene

VI. An aromatic base

(9mks)

(b) Write equations to represent the following reactions;

(i) The reduction of (v) above in the absence of a Lewis acid

(3mks)

(ii) Reduction of (iii) with Na in EtOH

(3mks)

(c) Explain the following citing an example in each case;

(i) The nitro group  $\text{NO}_2$  is deactivating

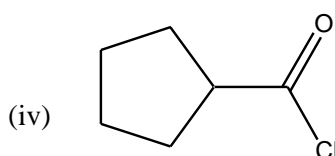
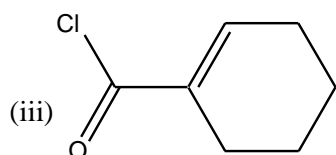
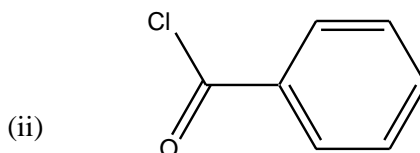
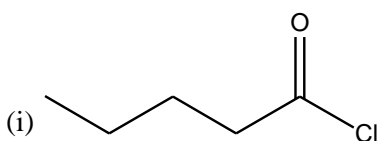
(3mks)

(ii) The methyl group is activating

(2mks)

### Question THREE

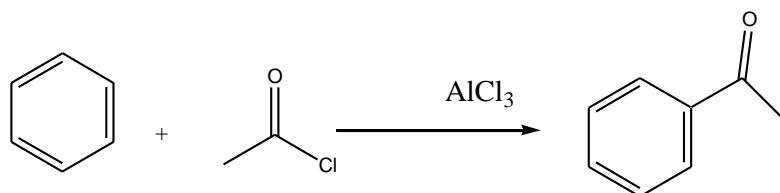
(a) Draw the product formed when each of the following compounds are treated with benzene in the presence of  $\text{AlCl}_3$ .



(8mks)

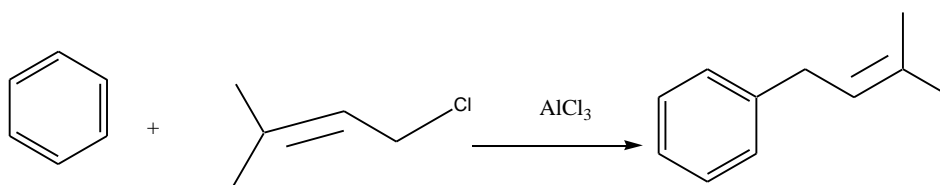
(b) Give a stepwise reaction mechanism for each of the following reactions (use curly arrows);

(i)



(6mks)

(ii)



(6mks)

### Question FOUR

(a) Draw the structures of the following compounds;

(i) 3-methylphenylbenzoate

(ii) 3-bromo-5-nitrobenzenesulphonic acid

(iii) 2-nitrophenol

(iv) Furan

(v) Pyrole

(10mks)

(b) Account for each of the following observation;

(i) Benzene prefers to undergo electrophilic aromatic substitution reactions but may undergo reduction under pressure and in the presence of a metal catalyst.

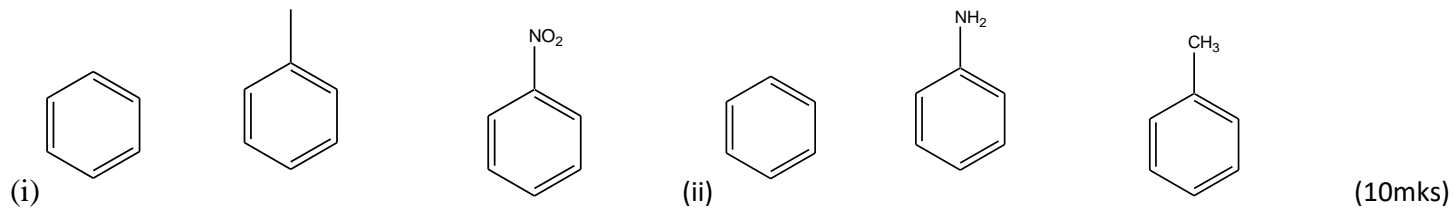
(6mks)

(ii) Cyclopentadienyl anion is aromatic while the radical is anti-aromatic

(4mks)

### Question FIVE

(a) Rank the compounds in each group in order of increasing reactivity towards electrophilic aromatic substitution. Explain your answer in each case.



(b) Outline;

(i) Outline any THREE structural criteria for aromaticity

(6mks)

(ii) State any TWO applications of phenols

(4mks)