MURANGA UNIVERSITY COLLEGE

(A Constituent college of Jomo Kenyatta University of Agriculture & Technology)

SCHOOL OF PURE AND APPLIED SCIENCE

TERM II EXAM JULY 2015

CLASS: DIPLOMA ANALYTICAL CHEMISTRY AS/CHEM/13D

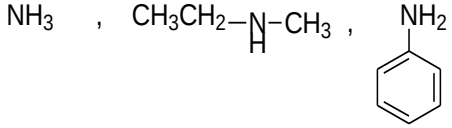
ORGANIC CHEMISTRY ASC 1301

DATE; 28th JULY 2015 TIME: 3HRS

INSTRUCTIONS; Answer all questions in section A and any three from section B

SECTION A (40 marks)

1. (a) Arrange the following nitrogen compounds in the order of increasing basicity.



[1mk]

(b) Explain the preferred sequence in (a) above. [3mks]

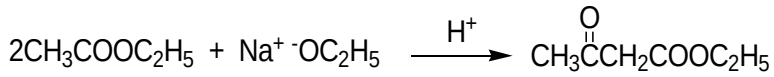
2. Explain the following observations:

(a) The carbon-carbon bond lengths in benzene  are all equal and are intermediate in length between single and double bonds. 2mks

(b) Chlorobenzene undergoes electrophilic substitution reactions at a lower speed than toluene. [2mks]

3. Name the following compounds [4mks]

4. Show the mechanism of the following reaction. [4 mks]



5. (a)Give chemical test to distinguish between:4mks

(i) CH_3CH_2CHO and CH_3COCH_3

(ii) $C_6H_5NH_2$ and $C_6H_5CH_2NH_2$

6. Between the compounds in figure 1and figure 2 which is more basic than the other, explain.

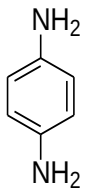


Figure1

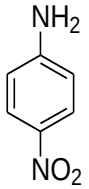
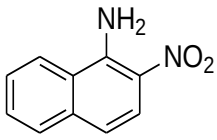


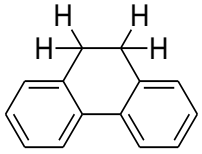
Figure 2

[4mks]

7. Give the IUPAC names of the following;



(i)



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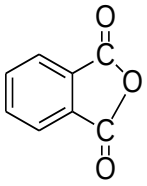

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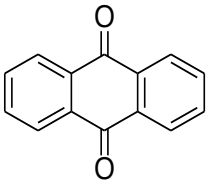


(iv)

4mks

8. Draw the molecular structures of the following compounds:

(a) 2- Naphthol

(b) 1,4- Naphthoquinone

(c) 3- Nitronaphthalene

(d) 2- Napthalenesulfonic acid 4mk

9. When synthesizing azo compounds the solution should not be very alkaline or very acidic, explain. [4mks]

10. Explain why the compound in (figure 1) is less basic than the compound (figure 2)

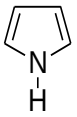


Figure1 **Figure 2** [4 marks]

SECTION B

11. (a) Given the following pairs of monosubstituted aromatic amines and carboxylic acids, compare their relative base and acid strengths, respectively. Suggest explanation for the preferred orders.

(i) 2- methylaniline and 2- chloroaniline

(ii) 2-methylbenzoic acid and 2- chlorobenzoic acid [10mks]

(b) Show with equations the preparation of aniline from benzene

4mks

(c) Explain factors which contribute to the following chemical properties of alcohols:

(i) acidity

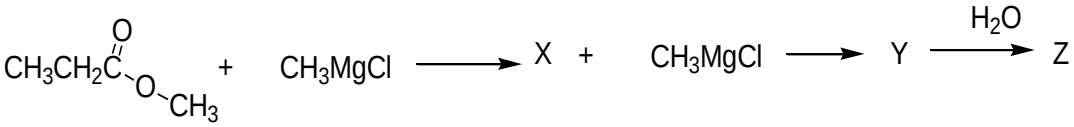
(ii) basicity [4mks]

(e) Give the structure of the following compound;

(i) o- Toluenediazonium hydrogen sulphate

(ii) *N*,*N*-Dimethyl aniline [2mks]

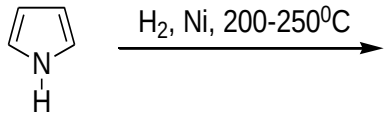
12. (a) Draw the structures X, Y, and Z in the following reaction

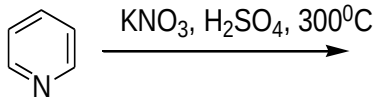


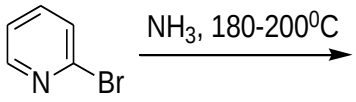
[6mks]

(b) What is crossed claisen condensation? [2mks]

(c) Complete the following reactions and name the products:

(i) 

(ii) 

(iii) 

[7mks]

(d) Which is more acidic between $NH_2CH_2CH_2COOH$ and $ClCH_2CH_2COOH$ explain? 3mks

(e) Complete the following reaction;

$$CH_3CH_2CH_2OH + CH_3COOH \overset{H^+}{\rightleftharpoons}$$

[2mks]

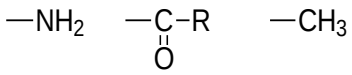
13 (a) Methylbenzene reacts with bromine in the presence of iron to yield a mixture of three monobromic products. If the reaction takes place in the presence of light a fouthmonobromic product is isolated. Name and draw the structures four the products. 8mks.

(b) In replacement of diazonium group with -CN, how is the loss of cyanide group prevented? [2mks]

(c) Explain why methanal is soluble in water while methane is not. [3mks]

(d) Explain how you would differentiate n-butanol from tert-butanol. [3mks]

(e) Explain the directing influence of the following groups on the electrophilic substitution of an aromatic ring.



(i) (ii) (iii) [6 mks]

14. (a) Using equations and relevant reagents, show how the following compounds can be synthesized from n-$C_{12}H_{25}COOH$:

(i) $C_{14}H_{29}NH_2$ (7mks)

(ii) $C_{13}H_{27}NH_2$ [[6mks]

(b) How would you distinguish an alkyl halide from an alkane?

[3mks]

(c) Why do carboxylic acids boil at a higher temperatures than alcohols of comparable molecular weight? [4mks]

15(a) Write equations for the following chemical reactions and name the products using the IUPAC system:

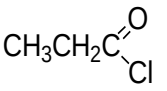
(i) Oxidation of anthracene using potassium dichromate in the presence of sulphuric acid

(ii) Reduction of anthracene using sodium and ethanol

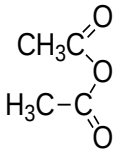
(iii) Bromination of naphthalene

9mks

(c) Name the following compounds using IUPAC system



(i)



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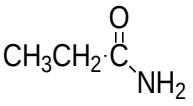

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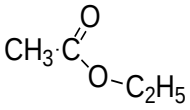

(iv)

[4mks]

(d) Explain the following observations:

(i) functional derivatives of carboxylic acids are polar [2mks]

(ii) acid chlorides, acid anhydrides, and esters have boiling points that are about the same as those of aldehydes or ketones of comparable molecular weight. [2mks]

(iii) of the functional derivatives of carboxylic acids, amines boil at higher temperatures than acid chlorides, acid anhydrides or esters of comparable molecular weight. [3mks]