

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATIONS FOR THE AWARD OF DEGREE  
OF BACHELOR OF SCIENCE (BIO)

CHEM 332: ORGANIC CHEMISTRY III

STREAMS: BSC (BIO)

TIME: 2 HOURS

DAY/DATE: MONDAY 08/4/2019

11.30 A.M. – 1.30 P.M.

INSTRUCTIONS: Answer question **One** (Compulsory) and any other **Two** questions

QUESTION ONE [30 MARKS]

(a) Write the IUPAC name of each of the following organic compounds (6 marks)

(b) Draw the structure of the compound corresponding to each of the following names (3 marks)

(i) 6-Bromo-3,5-dichlorohexanoic acid      (ii) 5-Hydroxyhexan-3-one

(iii) 4-Oxopentanal      (iv) Potassium 2-methylbutanoate

(v) 3-Methylheptanenitrile      (vi) N,N-Dimethylcyclopentylamine

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(c) Draw the structure of the major organic product(s) of each of the following reactions (6 marks)

(d) Explain the difference in the boiling points of the following compounds (3 marks)

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(e) Write the stepwise mechanism of the following reaction (4 marks)

(f) Give the reagents needed to accomplish the following transformation (6 marks)

(g) Discuss the physical properties of ketones (2 marks)

### QUESTION TWO [20 MARKS]

(a) Draw the structure of the major organic product(s) of the reaction of propan-3-one with the following reagents (6 marks)

(i)  $(\text{CH}_3)_2\text{NH}$ ,  $\text{H}_3\text{O}^+$     (ii) Excess  $\text{CH}_3\text{OH}$ ,  $\text{H}_3\text{O}^+$     (iii)  $\text{KCN}$ ,  $\text{HCN}$

(iv) Product of (iii) with dilute  $\text{HCl}$ , heat    (v)  $\text{CH}_3\text{NH}_2$ ,  $\text{H}_3\text{O}^+$     (vi)  $(\text{CH}_3)_2\text{NH}$  followed by  $\text{NaBH}_3\text{CN}$

(b) Write the stepwise mechanism of the following reaction (4 marks)

(c) Design a plausible stepwise method for synthesis of the following compound using an enamine reaction (5 marks)

(d) Write the reactions for the synthesis of pentylamine from each of the following starting material (5 marks)

(i) Pentanamide

(ii) Pentanenitrile

(iii) 1-Butene

**QUESTION THREE [20 MARKS]**

(a) Describe with the aid of a suitable example five methods used for laboratory synthesis of carboxylic acids (5 marks)

(b) Draw the structure of the major organic product(s) of the reaction of acetic anhydride with the following reagents (6 marks)

(i) Excess  $\text{NH}_3$

(ii)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$

(iii) Excess  $\text{CH}_3\text{CH}_2\text{NH}_2$

(iv)  $\text{H}_2\text{O}$

(v)  $\text{C}_6\text{H}_6$  and  $\text{AlCl}_3$

(vi) Excess  $(\text{CH}_3\text{CH}_2)_2\text{NH}$

(c) Starting with benzene, outline the synthesis of the following compound through a diazonium salt intermediate (6 marks)

(d) Outline three uses of benzene sulphonic acids (3 marks)

**QUESTION FOUR [20 MARKS]**

(a) Explain the following:

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- (i) Primary alkyl amines are more basic than ammonia (1 mark)
- (ii) Aromatic amines are less basic than corresponding non-aromatic amines (1 mark)
- (iii) Amides are significantly less basic than amines (1 mark)
- (iv) Low molecular weight carboxylic acids are highly soluble in water (1 mark)
- (b) Write the stepwise mechanism of the following reaction (4 marks)
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- (c) Draw the structure of the major organic product(s) of each of the following reactions (12 marks)

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