



NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES
DEPARTMENT OF PURE & APPLIED SCIENCES
2021_1 EXAMINATION

COURSE TITLE: ORGANIC CHEMISTRY III **COURSE CODE: CHM305**
TIME ALLOWED 3 HOURS **CREDIT UNIT: 3**
INSTRUCTIONS: ANSWER QUESTION 1 AND ANY OTHER 4 QUESTIONS

QUESTION 1

- 1a. Discuss any four general methods for the preparation of esters. **(8Marks)**
- 1bi. List three physical properties of esters **(3 marks)**
- ii. State the products formed from the reaction between ethyl methanoate and any three of the following compounds:
- CH_3MgCl
 - NaOH
 - NH_3
 - $\text{LiAlH}_4, \text{H}_2\text{O}$ **(3 Marks)**
- 1ci. List five uses of carboxylic acids and their derivatives **(4 marks)**
- ii. Explain Hofmann degradation in respect to reaction of amide with an equation **(4Marks)**

QUESTION 2

- a. Using equation, explain the preparation of aldehydes and ketones from **(6 marks)**
- i. Ozonolysis
 - ii. Dehydration of alcohols
 - iii. Decarboxylation of calcium salts
- b. Draw the structure of the following compounds:
- i. Benzaldehyde

- ii. 2- methylbutanal
- iii. Phenyl ethanoate
- iv. Diphenyl ketone
- v. 3- hydroxypropanal **(6Marks)**

QUESTION 3

- a. Explain the following physical properties of aldehydes and ketones
 - i. Boiling point
 - ii. Solubility
 - iii. Density **(3 Marks)**
- b. Discuss the reactions of aldehydes and ketones under the following headings: **(4 marks)**
 - i. Addition of alcohol
 - ii. Addition of NaHSO₃
Reaction with hydroxylamine (NH₂OH)
- c. Distinguish between aldehydes and ketones using: **(5 marks)**
 - i. Fehling's reaction
 - ii. Schiff reaction
 - iii. Silver mirror test

QUESTION 4

- ai. Define carbanion **(2 marks)**
- ii. Explain Aldol condensation as a nucleophilic addition to carbonyl compounds **(4Marks)**
- b. Give the structural formula of the products from the reaction of Na⁺ ⁻OC₂H₅ with CH₃COOC₂H₅. **(2 marks)**
- c. Using a definite example distinguish between cross Aldol condensation and witting reaction **(4Marks)**

QUESTION 5

- 5ai. Describe diels- alder reaction using 1,3- butadiene as a starting material **(2 marks)**
- ii. What are heterocyclic compounds? **(2 marks)**
- iii. List classes of heterocyclic compounds giving two examples of each **(2 Marks)**

- 5bi. Using 1,4- dicarbonyl compounds describe the methods of formation of five membered heterocyclics. **(2 marks)**
- ii. State the physical properties of five membered heterocyclic compounds **(2 marks)**
- iii. State and explain a distinguishing test for thiophene **(2Marks)**

QUESTION 6

- 6ai. Explain the two reasons for the weak acidic character of pyrrole **(3marks)**
- ii. Explain the molecular orbital concept of pyrrole **(4Marks)**
- 6b. During electrophilic substitution reactions what are the products liberated when pyrrole undergo?
- i. Reimer Teimann reaction
- ii. Kolbe reaction
- iii. Chlorination /S₂Cl **(3Marks)**
- 6ci. Why is pyrrole more reactive towards electrophilic substitution reaction?
- ii. What is test for pyrrole?
- iii. State the reasons why the electrophilic substitution reactions of furan are not of practical importance. **(2Marks)**