



**NATIONAL OPEN UNIVERSITY OF NIGERIA**  
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA  
**FACULTY OF SCIENCES**  
**DEPARTMENT OF PURE & APPLIED SCIENCES**  
**2020\_2 EXAMINATION™**

**COURSE TITLE: ORGANIC CHEMISTRY III**                      **COURSE CODE CHM 305**  
**TIME ALLOWED 3 HOURS**    **CREDIT UNIT: 3**  
**INSTRUCTIONS: ANSWER QUESTION 1 AND ANY OTHER 4 QUESTIONS**

**QUESTION 1**

a. Using appropriate reaction equations explain the process of preparation of an alcohol by

- i. Hydration of alkene (**2 marks**)
- ii. Fermentation of carbohydrates (**3Marks**)

b. Draw the chemical structure of the following compounds (**3 marks**)

- i. 2, 2-dimethyl propan-1-ol
- ii. 3-ethyl pentan-2-ol
- iii. 2-methyl pentan-1-ol

1c. Briefly explain the following terms with respect to the properties of an alcohol (**6 marks**)

- i. Density
- ii. Solubility
- iii. Melting and boiling point

1di. State the characteristics of monosaccharides (**3 marks**)

- ii. Mention the uses of cellulose (**3 marks**)
- iii. Explain the action of iodine solution on starch (**2 marks**)

**QUESTION 2**

a. Explain the bromination of an ethanol using- (**3 marks**)

- i. Using NaBr
- ii. Phosphorus (III) bromide

- iii. Phosphorus tribromide
- 2b. Explain the following processes stating the reaction conditions
- i. Dehydration of an alcohol **(2 marks)**
  - ii. Formation of ether from ethanol **(1 marks)**
  - iii. Esterification reaction **(3 marks)**
- 2c. Distinguish between a primary, secondary and tertiary alcohols by a detailed reaction equation of oxidation of an alcohol. **(3 Marks)**

### QUESTION 3

- ai. Differentiate between functional group isomerism and metamerism **(3 marks)**  
example
  - ii. State the four physical properties of an ether **(3Marks)**
- 3b. Discuss the following methods of preparation of ether showing suitable reactions **(6 marks)**
- i. Dehydration of alcohols
  - ii. Williamson synthesis
  - iii. Heating alkyl halides with dry silver oxide
- 4ai. What are epoxides? **(1 marks)**
- ii. List two methods of preparation of epoxides and explain them. **(5 marks)**
- 4b. Discuss the reactions of epoxides with
- i. Methanol under pressure **(2 marks)**
  - ii. Grignard reagent **(2 marks)**
  - iii. Lithium aluminum hydride **(2 marks)**
- 5a. Give the chemical structure of the following compounds **(6 marks)**
- i. 2,3- dichloro propanoic acid
  - ii. 2-methyl propanoic acid
  - iii. Methyl ethanoate
- 5b. Discuss the following physical properties of carboxylic acids **(4 marks)**
- i. Boiling points
  - ii. Solubility in water

- 5c. Explain the preparation of carboxylic acids from Hydrolysis of esters (**2 mark**)
- 6a. Explain the reactions of carboxylic acids under these headings (**6 marks**)
- i. Oxidation of methanoic acid
  - ii. Decarboxylation
  - iii.** Formation of aldehyde
- 6bi. State the properties of acyl chlorides (**2 marks**)
- ii State and briefly discuss the general methods for formation of acyl chlorides (**3 marks**)
  - iii. Using an equation explain the ester formation of acid anhydrides (**1 mark**)