



**MAASAI MARA UNIVERSITY**

**UNIVERSITY EXAMINATIONS 2017/2018  
SECOND YEAR FIRST SEMESTER EXAMINATION**

**SCHOOL OF SCIENCE**

**DEPARTMENT OF MATHEMATICS AND PHYSICAL SCIENCES**

**DEGREE IN BACHELOR OF SCIENCE AND BACHELOR OF EDUCATION  
SCIENCE**

**COURSE CODE: CHE 1205**

**COURSE TITLE: ORGANIC CHEMISTRY 1**

**DATE: April, 2018**

**2 Hours**

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**INSTRUCTIONS:**

Answer question **ONE** and any other **TWO** questions

### QUESTION ONE (30 Marks)

1. (a) Define the following terms
- (i) Catenation
  - (ii) Electronegativity
  - (iii) Pyrolysis **(3 Marks)**
- (b) (i) Draw and name the two conformations of ethane **(2Marks)**
- (ii) Draw the Lewis-electron dot formula of Sulphur dioxide **(1 Mark)**
  - (iii) State three methods for determining the structural formula of organic molecules and state information provided by the methods **(3 Marks)**
  - (iv) State any six classification of organic compounds (3 Marks)
- (c) Briefly explain the following observations:-
- (i) Cis-isomers have higher boiling points than their trans counterparts **(1Mark)**
  - (ii) Industrial alcohol is denatured **(1Mark)**
- (d) Draw the structural formulae for
- (i) 3,3,4-triethylhexane
  - (ii) 1-phenyl-2-propanol
  - (iii) 6-butyl-3-ethyl-8-methyl-1-decyne **(3 Marks)**
- (e) Classify the following species as a nucleophile or an electrophile:-
- (i)  $\text{CH}_3\text{Cl}$  (ii)  $\text{CH}_3\text{S}$  (iii)  $\text{CH}_3\text{CHO}$  (iv)  $\text{CH}_3\text{NH}_2$  **(2 Marks)**

- (f) (i) Give the general formula of Grignard reagent **(1 Marks)**
- (ii) Identify pairs of cis-trans isomers in the following compounds. Draw, name and indicate:-  
(a)  $\text{CH}_3\text{CH}=\text{CH}_2$  (b)  $\text{CH}_3\text{CH}=\text{CHCH}_3$  (c)  $(\text{CH}_3)_3\text{CH}=\text{CHCH}_3$   
(d)  $\text{Cl}-\text{CH}=\text{CHCl}$  **(2 Marks)**
- (g) Draw two structural isomers for each of the following with different functional groups. In each Case, describe a chemical test and the results obtained which could distinguish between the two structural isomers
- (i)  $\text{C}_2\text{H}_6\text{O}$  (ii)  $\text{C}_2\text{H}_6\text{O}$  **(6 Marks)**

## QUESTION TWO (20 MARKS)

2. (a) (i) A hydrocarbon has the empirical formula  $\text{CH}_2$  and a relative molecular mass of 70. Write the molecular formula of the hydrocarbon. **(1 Marks)**
- (ii) Classify the following organic reactions
- (a)  $\text{C}_2\text{H}_4 + \text{HBr} \rightarrow \text{C}_2\text{H}_5\text{Br}$
- (b)  $\text{C}_2\text{H}_5\text{Br} + \text{CN}^- \rightarrow \text{C}_2\text{H}_5\text{CN} + \text{Br}^-$  **(2 Marks)**
- (c) Explain how you can control chlorination of Methane so that you obtain methyl chloride as the only product **(1 Mark)**
- (c) Describe any one chemical test that distinguishes an aldehyde and a ketone **(2 Marks)**
- (d) Draw the structural formula of organic product of each of the following reactions of propanal. Classify the type of reaction in each case.
- (i) Propanal with Sodium tetrahydridoborate (III) (Sodium borohydride) in water.
- (ii) Propanal with Fehling's solution, followed by acidification of the product
- (iii) Propanal with hydrogen Cyanide **(6 Marks)**
- (e) State any six uses of Aldehydes and Ketones **(3 Marks)**
- (f) (i) State three physical properties of alcohol **(1½ Marks)**  
(ii) State any six uses of alcohol **(3 Marks)**

### QUESTION THREE (20 Marks)

3. (a) (i) Outline four methods of identifying a functional group in a compound **(2 Marks)**
- (ii) What happens when isobutylene is subjected to hydroboration oxidation reaction **(3 Marks)**
- (b) (i) Explain why alkenes are more reactive than alkanes **(2 Marks)**
- (ii) State three properties of Ethers **(1½ Mark)**
- (c) What Products will you get from the following reactions
- (i) Benzoic acid is treated with Phosphorous PentaChloride
- (ii) Butanoic acid is treated with Lithium tetrahydroaluminate
- (iii) Ethanoic acid is treated with NaOH
- (iv) Ethanoic acid with Phosphorous pentachloride **(7½ Marks)**
- (d) (i) Menthene a hydrocarbon found in mint plants has a systematic name, 1-isopropyl-4-methylcyclohexene. Draw its structure **(2½ Marks)**
- (ii) Write the structure of  $C_4H_6O_2$  **(½ Mark)**

### QUESTION FOUR (20 Marks)

4. (a) (i) State the two classes of Hydrocarbons **(2 Marks)**
- (ii) Using a general example show how a carboxylic acid can be converted into and Ester **(2 Marks)**
- (iii) How will you distinguish between: Hexene & Hexane **(3 Mark)**
- (b) Chlorofluorocarbons, CFC's are useful compounds as they are non-flammable and unreactive. In the stratosphere, C-Cl bonds are broken producing radicals.
- (i) Draw the structure of 1,1,2-Trichloro-1,2,2-Trifluoroethane **(1 Marks)**
- (ii) Suggest why C-F bonds are not broken in the stratosphere, whereas C-Cl bonds are **(1 Mark)**
- (iii) What are free radicals and what is needed to produce them from CFC's **(1 Mark)**
- (iv) Outline four methods of identifying a functional group in a compound. **(2 Marks)**
- (c) Using structural formula where possible briefly explain the following:
- (i) Alcohols have higher boiling points than ethers of corresponding molecular weight (both have the general formula  $C_nH_{2n+2}O$ ) **(3 Mark)**
- (ii) Draw the structure of polyvinyl chloride, a polymer made from vinyl chloride **(1 Mark)**
- (d) Classify each of the following reactions as either addition, substitution or elimination
- (i)  $CH_3Br + KOH \rightarrow CH_3OH + KBr$
- (ii)  $CH_3CH_2Br \rightarrow CH_2=CH_2 + HBr$
- (iii)  $CH_2=CH_2 + H_2 \rightarrow CH_3CH_3$  **(1½ Marks)**

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