



THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

MAIN EXAMINATION

JANUARY – APRIL 2015 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF CHEMISTRY

SCHOOL FOCUSED PROGRAMME

SPECIAL EXAMINATION

CHEM 204: REACTION MECHANISM

P.O. Box 62157
00200 Nairobi - KENYA
Telephone: 891601-6
Fax: 254-20-891084
E-mail: academics@cuea.edu

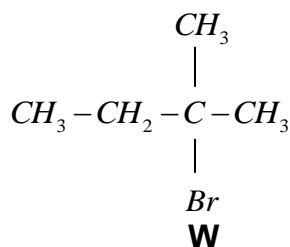
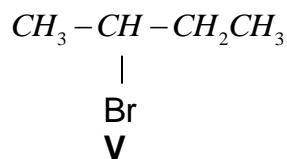
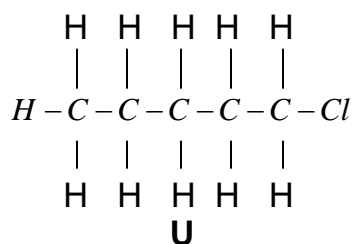
Date: APRIL 2015

Duration: 2 Hours

INSTRUCTIONS: Answer Question ONE and ANY OTHER TWO Questions

- Q1. a) i) An organic compound (A) on analysis gave carbon 40%, hydrogen 6.6% and the rest was oxygen.
- Calculate the empirical formula of compound A.
(C = 12.0 H = 1.0 O = 16.0)
 - Given that the molecular mass of compound A is 90.0 g. Draw and name all the possible isomers of A. **(2 marks)**
- ii) A certain alcohols first oxidized to compound $C_2H_4O(X)$ and then to $C_2H_4O_2(Y)$.
- Write the equation for the reaction. **(2 marks)**
 - Name compound X and Y. **(2 marks)**
- iii) Compound X reacts with hydrogen cyanide to form compound Z.
- Write an equation for the reaction.
 - Name compound Z
 - Write a plausible mechanism for the reaction. **(5 marks)**

- iv) Compound Y reacts with ethanol in the presence of an inorganic acid to form a sweet smelling compound. Write a mechanism for the reaction.
- b) Explain the following observations:
- The general trend in the stability of carbonations is $3^{\circ} > 2^{\circ} > 1^{\circ}$
(1 mark)
 - Benzene undergoes electrophilic substitution whereas alkenes undergo addition reaction.
(2 marks)
- c) Define the following terms giving examples in each case:
- Homolytic bond fission
 - Electrophiles
 - Nucleophiles
 - Elimination
(3 marks)
- d) Which of the following alkyl halides would you expect to undergo unimolecular substitution reaction. Explain your answer.



(2 marks)

- e) Predict the necessary information (products or reagents to complete the following:
- Benzene $\xrightarrow{?}$ Bromobenzene
 - Propanone + hydrazine $\longrightarrow ?$

Write a plausible mechanism for each reaction. **(7 marks)**

Q2. Discuss **FIVE** major organic reactions given specific examples in each case. **(20 marks)**

- Q3. Compare and contrast the mechanism of substitution reactions in:
a) alkanes
b) alkylhalides
Give mechanisms in each case. **(20 marks)**
- Q4. Discuss the reduction and oxidation of organic compounds containing oxygen. Give specific examples and mechanisms in each case. **(20 marks)**
- Q5. Describe the reactions of benzene given the mechanism of each reaction described. **(20 marks)**

END