



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)
(A Centre of Excellence)

Faculty of Applied & Health Sciences

DEPARTMENT OF PURE & APPLIED SCIENCES

DIPLOMA IN INDUSTRIAL MICROBIOLOGY & BIOTECHNOLOGY

ACH 2234: ORGANIC CHEMISTRY

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: OCTOBER 2012

TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- Answer Booklet

This paper consists of **FIVE** questions

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

This paper consists of **THREE** printed pages

Question One (COMPULSORY – 30 Marks)

a) Using suitable examples, briefly discuss each of the following:

- i) Lewis base
- ii) Electrophile
- iii) Nucleophile
- iv) Substitution reaction
- v) Constitutional isomers

(2 marks each, total 10 marks)

b)

c) Draw and give the IUPAC name for all the isomer of the compound with the formula



- i) **(4 marks)**
- ii) Explain the variation in melting points for the isomers of the compound named in (a) above. **(2 marks)**

d) Arrange the following compounds in order of increasing boiling points:

- i) Butane, propane, ethane, heptanes. Explain your answer **(4 marks)**
- ii) Pentanol, propanol, octanol, hexanol. Explain your answer **(4 marks)**

Question Two (20 Marks)

a) Uscharidin is a common name of a poisonous natural product having the structure shown below:

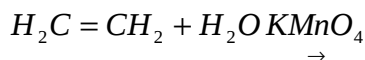
i) Locate the following functional groups in Uscharidin

- (i) Aldehyde **(2 marks)**
- (ii) Ketone **(2 marks)**
- (iii) Ester **(2 marks)**
- (iv) Alcohol **(2 marks)**

ii) How many carbon atoms in uscharidin are:

- (i) Primary **(2 marks)**
- (ii) Secondary **(2 marks)**

b) Draw the structure of the major product in each of the following reactions:

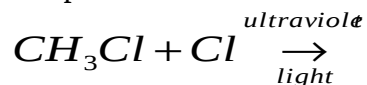


- i) **(2 marks)**
- ii)
- iii)
- iv)

Question Three (20 Marks)

a) Provide the acceptable IUPAC name for each of the following compounds:

b) Give the products in each of the following reactions:



i) (2 marks)



ii) (2 marks)

c) Provide the structure of the major product in each of the following reacts (2 marks)

i)



ii) (2 marks)

d) Ascorbic acid (vitamin C) cures scurvy. It is composed of 40.92% carbon, 4.58% hydrogen and 50.5% oxygen. Determine its empirical formula (Molar mass of C = 12, H = 1 and O = 16)

(4 marks)

Question Four (20 Marks)

a) Consider the following compounds:

i) Among the compounds A, B, C and D which one is:

(i) An ester

(ii) Dibasic acid

(iii) Acid anhydride

(1 mark each, total 3 marks)

ii) Provide the IUPAC name for each of the compounds labeled A, B, C and D.

(2 marks each, total marks 8 marks)

iii) Among the compounds A, B, C and D, which one:-

(i) Would be almost insoluble in water, but would slowly dissolve when boiled with sodium hydroxide solution

(ii) Would be almost insoluble in water, but soluble in cold sodium hydroxide solution

(iii) Would form a pleasant-smelling liquid when warmed with ethanol and concentrated sulphuric acid

(2 marks each, total 6 marks)

b) Suggest explanation for the following observations:

Butane, propanol and ethanoic acid all have approximately the same relative molecular mass, but their boiling points are 273K, 371K and 391K respectively.

(3 marks)

Question Five (20 Marks)

- a) Write structural formulas for all the compounds of molecular formula C_8H_{10} containing one benzene ring **(8 marks)**
- b) For each of the compounds obtained in (a) above, write the structural formulas for the major mononitration product **(8 marks)**
- c) Give **TWO** physical properties of benzene **(4 marks)**