



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2020/2021

**SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE (MEDICAL LABORATORY SCIENCE)**

HML 110: ORGANIC CHEMISTRY FOR MEDICAL LAB SCIENCES

DATE: Wednesday 19th May 2021

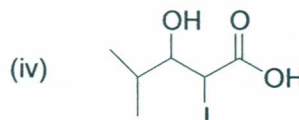
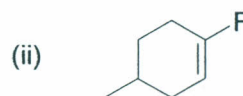
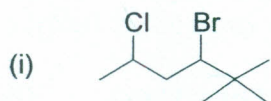
TIME: 11.00a.m. - 1.00p.m.

INSTRUCTIONS

Section A: Attempt All Questions in this section (4 marks each)

1. Give the systematic (IUPAC) names of each of the following compounds.

(4 marks)



2. Draw structures of each of the following compounds.

(4 marks)

- (i) 3,5-Dichloro-3,4-dimethylheptane
- (ii) Trans-3-Bromo-4-methyl-3-hexene
- (iii) 4-Cyclobutyl-3-methylpentan-2-ol
- (iv) 2-Iodo-3-oxobutanal

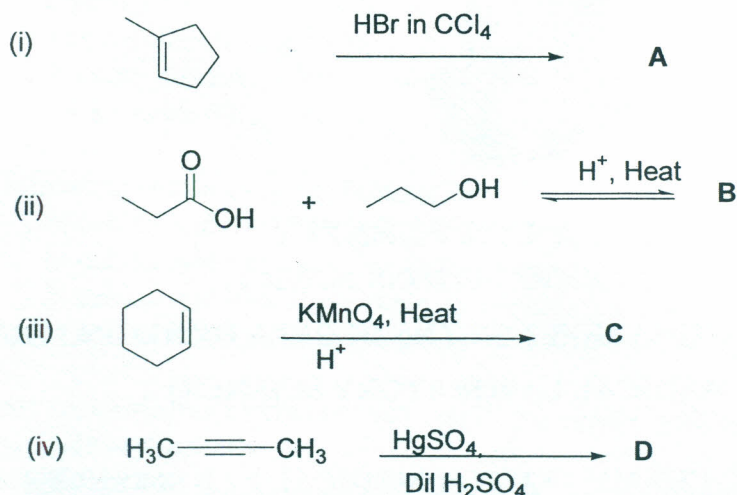
3. By use of appropriate examples, define the following terms as applied in the study of Organic Chemistry;

(4 marks)

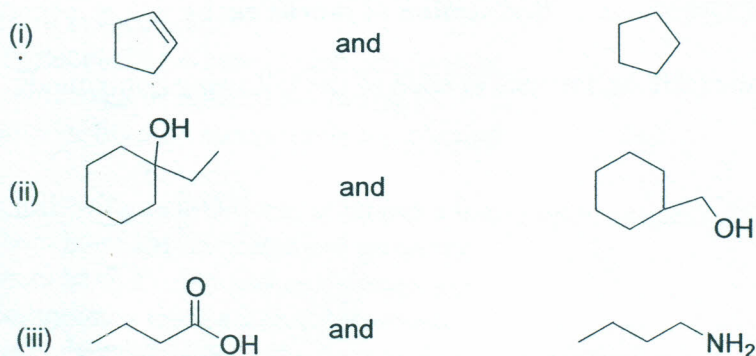
- (i) Markovnikov's rule
- (ii) Lindler's catalyst

4. Draw structures of the major organic product labeled **A-D** in the following transformations.

(4 marks)



5. Give simple visual chemical test that you can use to differentiate the following pairs of compounds; (4 marks)



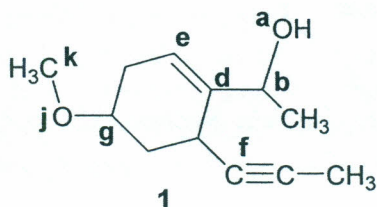
Section B Attempt only One Question in this Section (20 MARKS EACH)

6.

- (a) A reaction of 42.5 ml of ethanoic (density 1.049g/ml) and 87.9 ethanol (density 0.785 g/ml) in a small amount of concentrated acid (1 ml) yielded 43.6 g of ethyl ethanoate (ester).

- State the role of concentrated sulphuric acid in the experiment
 - Which is the limiting reagent and why?
 - Calculate the percentage yield of the ester. [C = 12.01, H = 1.00, O = 16.0]
- [6 marks]

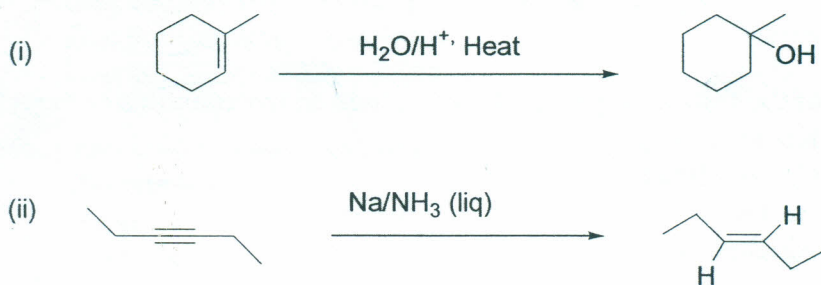
- (a) Use the structure of compound 1 below to answer the questions that follow;



- (i) Draw and name all the functional groups in the compound 1. (4marks)
- (ii) Indicate the type of hybridization of carbons labelled b, d, f and k. (4 marks)
- (iii) Using the letter(s) in compound 1, name one carbon atom each that is 1°, 2°, 3° and 4°. (4 marks)
- (iv) Draw and Indicate by using δ^+ and δ^- the direction of polarity in the bond between a and b. (1mark)
- (v) How many pi (π) bonds does compound 1 have? (1mark)

7.

- (a) By use of appropriate examples and structure, differentiate between the following pairs as applied in the study of Organic Chemistry. (6 marks)
 - (i) Acid (acyl) halides and acid anhydrides
 - (ii) Combustion and pyrolysis
 - (iii) Molecular and structural formula
- (b) Using Curly arrows show the movement of electrons in the following reactions that lead to the products given. (6 marks)



- (c) Monobromination of methylcyclobutane with molecular chlorine in presence of light gives a mixture of monobrominated products.
 - (i) Draw all possible monobrominated isomers of the above reaction. Ignore the cis-trans isomers. (4 marks)
 - (ii) Draw the isomer in 3 (a) (i), above that would be formed in highest quantity and give a reason. (2marks)

- (1) Draw the isomer in 3 (a) (1), above that would be formed in lowest quantity and give a reason. (2 marks)

Section C Attempt All Questions in this Section. Choose the Correct Answer ($\frac{1}{2}$ Each mark each)

1. Alkanes prefer undergoing;
A Addition reactions
B Elimination reactions
C Substitution reactions
D Reduction reactions
2. Which of the following is NOT correct concerning pyrolysis?
A Cracking is the other term used when dealing with petroleum
B A value addition process where alkanes are converted to alkenes and smaller molecules
C Heating an organic compound at high temperatures in presence of air or oxygen
D Heating an organic compound at high temperatures in absence of air or oxygen
3. Isomers are compounds with;
A Same structural formula and same molecular formula
B Same structural formula but different molecular formula
C Different empirical formula but same structures
D Same molecular formula but different structural formula
4. Esters are group of organic compounds that contain;
A One carbonyl group and one hydroxyl group attached to the same carbon atom
B Two alkoxyl groups attached to the same carbon atom
C Two hydroxyl groups attached to the same carbon atom
D One alkoxyl group and one carbonyl group attached to the same carbon atom
5. Which of the following group of compounds do not contain a carbonyl group?
A Ketones
B Carboxylic acids
C Amines
D Aldehydes
6. Alkenes and alkynes prefer undergoing;
A Substitution reactions
B Reduction reactions
C Addition reactions
D Elimination reactions

7. Carboxylic acids are organic compounds;
A With a carbonyl and hydroxyl groups attached to same carbon atom
B Two hydroxyl groups attached to the same carbon atom
C Two alkoxy groups attached to the same carbon atom
D One alkoxy group and one carbonyl group attached to the same carbon atom
8. Which of the following is NOT correct concerning alcohols and ethers?
A Alcohols have lower boiling points than ethers of comparable molecular mass
B Both can be considered as derivatives of water
C They are functional isomers when same number of carbon atoms are involved
D Ethers have lower boiling points than alcohols of comparable molecular mass
9. Aldehydes and ketones can be differentiated by;
A Addition-elimination reactions with amines
B Aldol reactions in presence of NaOH
C Oxidation reaction with mild oxidizing agents
D Reduction with NaBH_4
10. One mole of a given alkyne reacts with;
A One mole of hydrogen in presence of a metal catalyst to form an alkane
B Two mole of hydrogen in presence of a metal catalyst to form an alkane
C Two mole of hydrogen in presence of a metal catalyst to form an alkene
D Chlorine gas to form a less dense clear liquid
11. Alkyl halides are organic compounds;
A Where one or more hydrogen atoms of a hydrocarbon are replaced with halogen atom(s)
B That contain only one halogen atom in the molecule
C That are less dense than water
D That are highly soluble in water
12. Tertiary alcohols to under substitution reactions prefers;
A SN_1 and SN_2
B SN_2 only
C SN_1 only
D None of the above
13. Which of the following is NOT true concerning amides;
A That are more reactive than amines
B That contain C-N bond
C They are termed as derivatives of carboxylic acids
D Nitrogen is directly attached to a carbonyl group

14. When alcohols are heated in presence of a mineral acid;
A Hydrogen gas is released
B The carbon chain is extended
C A corresponding alkene is formed
D Carbon dioxide is released
15. The following is true in sp^2 hybridization;
A 2s orbital and the three 2p orbitals are involved.
B 1s orbital and the three 2p orbitals are involved
C 2s orbital and two of the three 2p orbitals are involved
D 2s orbital and one of the three 2p orbitals are involved
16. Primary alcohols react with ordinary oxidizing agents to form;
A Carboxylic acids
B Aldehydes
C Ketones
D Esters
17. When 2-butene, an alkene, is treated with concentrated $KMnO_4$ in acidic medium;
A 2-butanol is formed
B Two molecules of ethanoic acid are formed
C Two molecules of ethanal are formed
D Mixtures of organic compounds are formed
18. Which of the following is NOT correct about a homologous series?
A Members have similar chemical properties
B Members have similar physical properties
C The compounds have a general formula
D Each member differ from the next higher or lower by a constant amount
19. Hydrolysis of 2-pentyne with dilute H_2SO_4 with some amounts of $HgSO_4$ leads to formation of;
A Equal amounts of 2-pentanone and 3-pentanone
B 3-pentanone only
C 2-pentanone only
D Pentanoic acid
20. When alkynes are hydrogenated with Lindler's catalyst;
A Corresponding alkanes are formed
B Corresponding *Trans* alkenes are formed
C No reaction unless heating is done
D Corresponding *Cis* alkenes are formed