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University Examinations 2024/2025

FIRST YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN PUBLIC HEALTH

SCS 3103/HML 3113: ORGANIC CHEMISTRY

DATE: DECEMBER 2024 **TIME: 2 HOURS**

INSTRUCTIONS: *Answer question **one** and any other **two** questions*

QUESTION ONE (30 MARKS)

a) Define the following terms (4 marks)

(i) Isomers

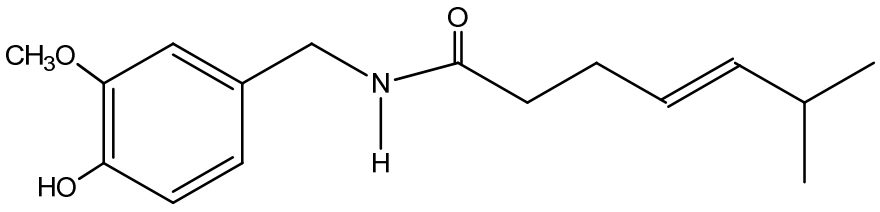
(ii) Hybridization

(iii) Functional group

(iv) Electrophilic substitution reaction

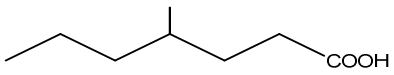
b) Draw and name two positional isomers of C_4H_8 (4 marks)

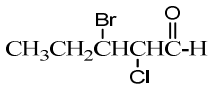
c) Capsaicin is a molecule responsible for spiciness in chilli peppers. Identify the functional groups in it (5 marks)

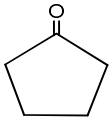


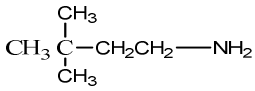
d) Describe hybridization of carbon in alkanes (3 marks)

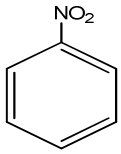
e) Provide IUPAC names for the following compounds (5 marks)

(i) 

(ii) 

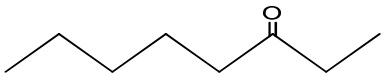
(iii) 

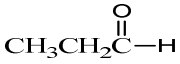
(iv) 

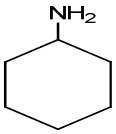
(v) 

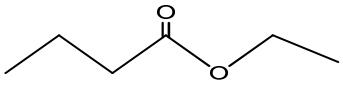
f) To which homologous series do the following molecules belong (5 marks)

(i) 

(ii) 

(iii) 

(iv) 

(v) 

g) Describe a chemical test that can be used to distinguish between an aldehyde and a ketone. Justify your answer with an equation (4 marks)

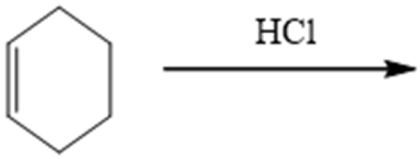
QUESTION TWO (20 MARKS)

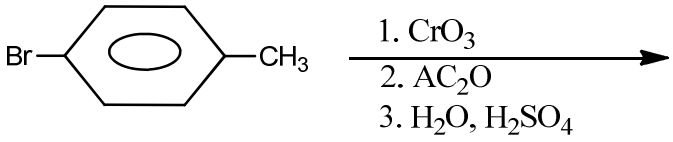
a) Write the electron configuration of the following elements using spdf notation (2 marks)

(i) Carbon

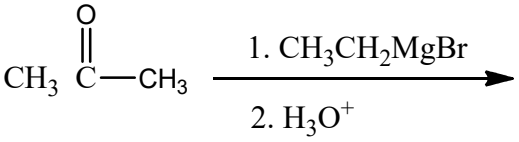
(ii) Oxygen

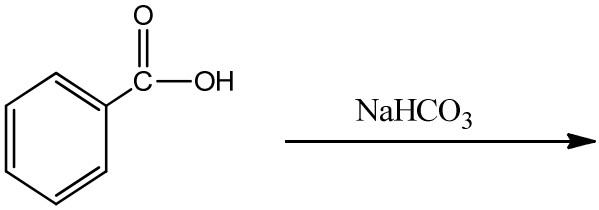
b) Deduce the products of each of the following reactions and show stereochemistry where applicable (10 marks)

(i) 

(ii) 

(iii) $CH_3CCH \xrightarrow[2.\ Ni\ Catalyst]{1.\ 2H_2}$

(iv) 

(v) 

c) By use of suitable illustrations explain structural differences between

(i) Aldehydes and ketones (3 marks)

(ii) Alcohols and carboxylic acids (3 marks)

d) What is a carbonation. Give an example (2 marks)

QUESTION THREE (20 MARKS)

a) State two ways in which the carbonyl group (-C=O) influences chemical reactions (2 marks)

b) Explain two reasons why carbon element is unique (4 marks)

c) Draw the structures of the following organic compounds (10 marks)

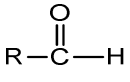
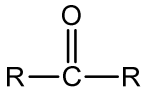
(i) 2-methy1pentanol

(ii) 3-bromo-3-methylpentanol

(iii) Nitrobenzene

(iv) 1,4-butanediamine

(v) 3,3-dimethylpentanoic acid

d) A certain compound contains both  and  functional groups. Explain how you would distinguish them using

(i) IR spectroscopy (2 marks)

(ii) IVMR spectroscopy (2 marks)

QUESTION FOUR (20 MARKS)

a) Benzene is treated with a mixture of concentrated nitric and sulphuric acids keeping the temperature below $50^{o}C$. by use of curly curves show the reaction mechanism (10 marks)

b) By use of suitable equations describe methods used to synthesize carboxylic acids (8 marks)

c) Ethanoic acid has higher boiling point than ethanol. Explain (2 marks)