KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER
MAIN EXAMINATIONS

FOR THE DEGREE OF BSC (CHEMISTRY)

COURSE CODE: SCH 222

COURSE TITLE: ORGANIC CHEMISTRY II

DATE: 13/05/2022 **TIME: 2:00PM-4:00PM**

INSTRUCTIONS TO CANDIDATES:

TIME: 2 Hours

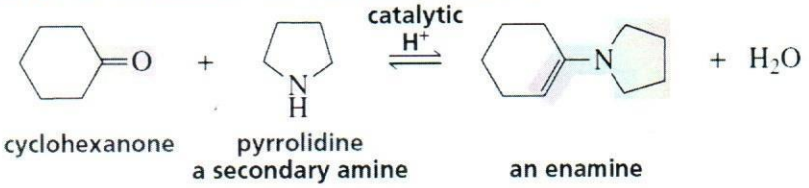
Answer question ONE and any TWO of the remaining

Question One (30 Marks)

a) Give the general formula of the following: **(5 marks)**

i) Amine ii) Aldehyde iii) Nitrile iv) Ketone v) Amide

b) Give the mechanism for the reaction below **(7 marks)**



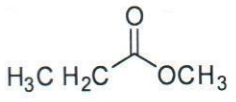
c) Give reasons for the following observations in organic reactions;

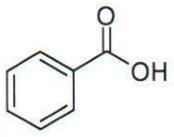
i) Aldehydes more reactive than a ketones **(2 marks)**

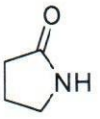
ii) The melting points and boiling points of carboxylic acids are higher than those of hydrocarbons of comparable size and shape.
(2 marks)

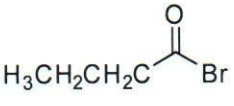
iii) Amides do not react with halide ions or carboxylate ions **(1 mark)**

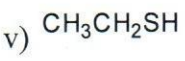
d) Give the IUPAC names of the following compounds **(5 marks)**

i) 

ii) 

iii) 

iv) 

v) 

e) Draw the structures of the following compounds **(5 marks)**

i) Methylbenzoate ii) Ethylthioethane iii) Propenenitrile iv) Ethanamide

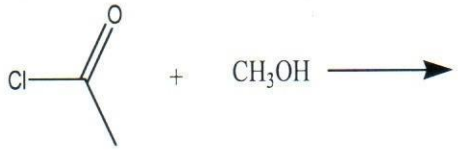
v) Ethanoic anhydride

f) Carboxylic acids and amides have relatively high boiling points. Uses a diagram to show this phenomenon **(3 marks)**

Question Two (20 Marks)

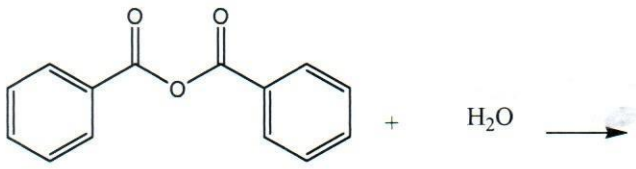
a) Give the products and reagents of the following reactions;

i)



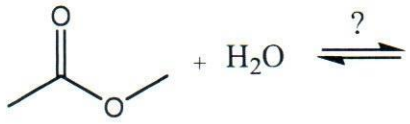
(1 mark)

ii)



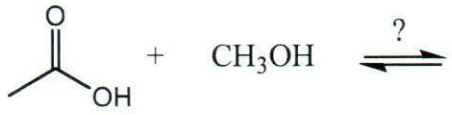
(1 mark)

iii)



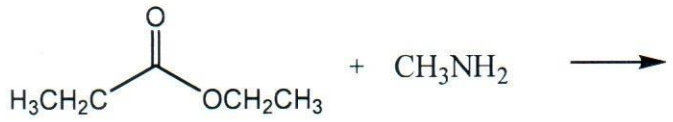
(2 marks)

iv)



(2 marks)

v)



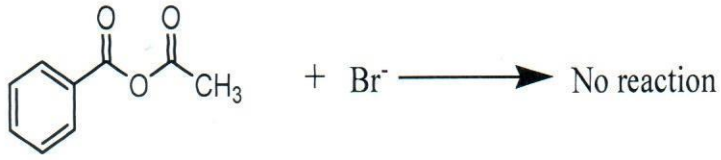
(1 mark)

b) What name is given to the reaction in the equation (v) above? **(1 mark)**

c) Give the mechanism of the acid catalyzed reaction in equation (iii) above **(7 marks)**

d) Give the mechanism of the reaction in equation below. **(3 marks)**

e) Explain why the reaction in equation below cannot occur.

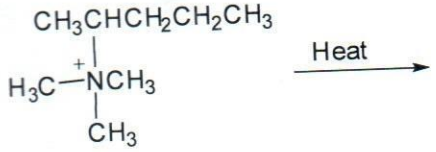


(2marks)

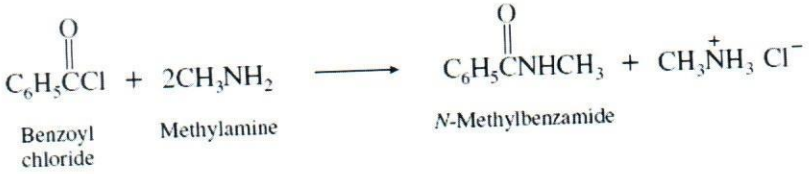
Question Three (20 Marks)

a) Mention three methods a carboxylic acid can be prepared in the laboratory **(3 marks)**

b) Holfmann elimination involves a reaction of quaternary ammonium ion with a hydroxide ion. Complete the equation on a reaction below indicating the major and the minor products. **(4marks)**

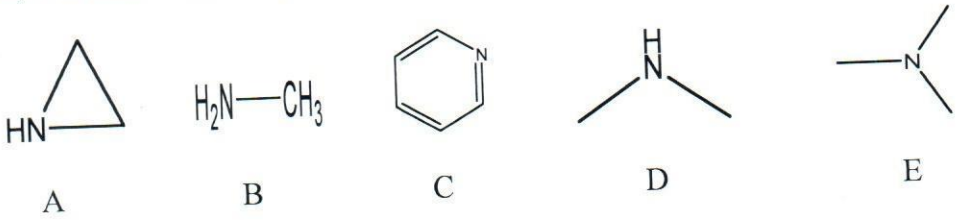


c) Establish the mechanism of the reaction below **(5 marks)**



d) Use an example to describe how an alkyl halides can be used to prepare a secondary amine. **(3marks)**

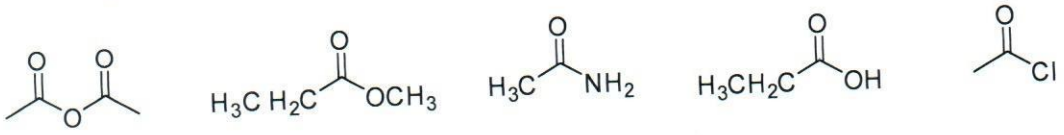
e) Classify the following compounds as either primary, secondary or tertiary amines. **(5 marks)**



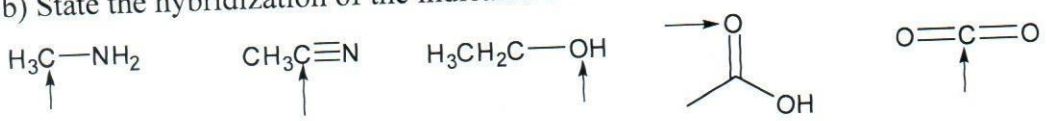
A B C D E

Question Four (20 Marks)

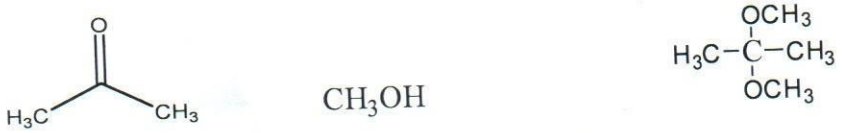
a) Arrange the following in order of reactivity from the most reactive. **(3 marks)**



b) State the hybridization of the indicated atom. **(5 marks)**



b) Using A and B as starting materials, illustrate by use of mechanism how C can be prepared using acid as a catalyst. **(8 marks)**



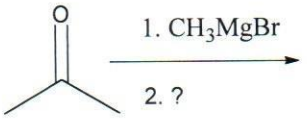
A B C

c) Draw the enol tautomer of the compound A using a base as catalyst. **(4 marks)**

Question Five (20 Marks)

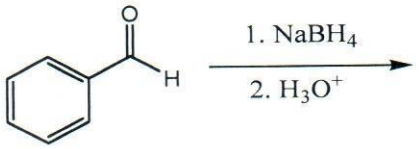
a) Give the products and/or reactants of the following nucleophilic addition reactions;

i.



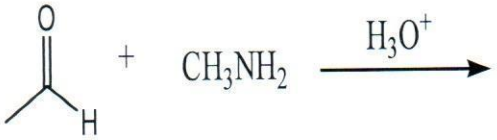
(2 marks)

ii.



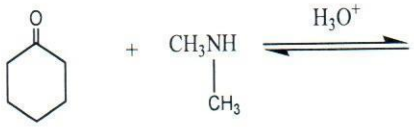
(2 marks)

iii)



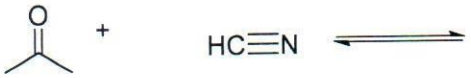
(2 marks)

(iv)



(2 marks)

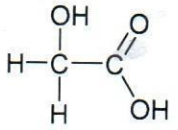
v)



(2 marks)

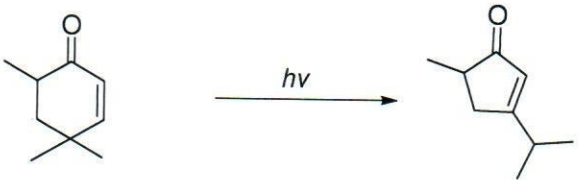
c) State two methods in which amines can be prepared. **(2 marks)**

d) i) The structure of compound X is shown below, show how Infra-red spectroscopy is used to confirm this structure. **(2 marks)**



X

ii) UV-Vis and IR were used to follow the following photochemical reaction. By giving a brief explanation show how the reactants can be distinguished from products by:



A) UV spectroscopy **(3 marks)**

B) IR spectroscopy **(3 marks)**