UNIVERSITY OF ESWATINI

MAIN EXAMINATION 2020/2021

TITLE OF PAPER:	METHODS OF ORGANIC SYNTHESIS
COURSE NUMBER:	CHE603
TIME ALLOWED:	THREE (3) HOURS
INSTRUCTIONS:	THERE ARE FOUR (4) QUESTIONS IN THIS PAPER. ANSWER QUESTION ONE (TOTAL 40 MARKS) AND ANY TWO OTHER QUESTIONS (EACH QUESTION IS 30 MARKS)

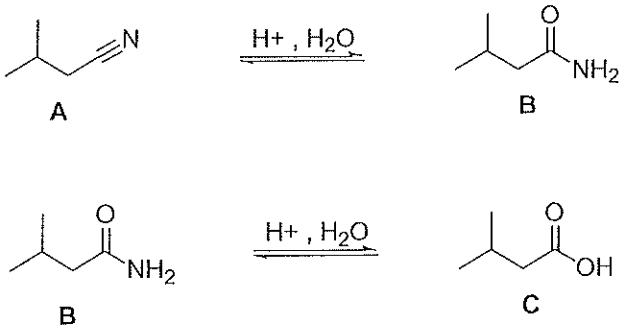
PLEASE DO NOT OPEN THIS PAPER UNTIL AUTHORISED TO DO SO BY THE CHIEF INVIGILATOR.

Question 1

(a) Discuss with examples any five arrows used in organic chemistry. [10]

(b) Discuss (using an appropriate example) the term mutarotation [5]

(c) The Hydrolysis of a nitrile **A** to a carboxylic acid **C** involves the initial formation of amide **B**. Provide a mechanism for each of the following transformations. [20]



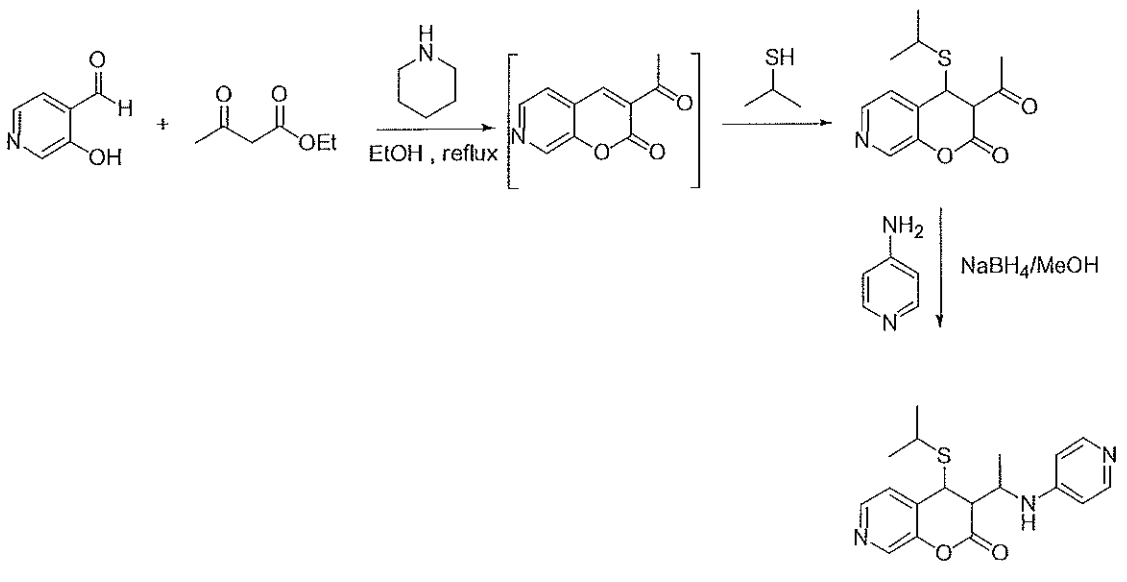
(d) Discuss five (5) properties of a good protecting group. [5]

Question 2

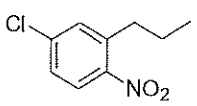
(a) The following coumarin derivative is a potential antiasthmatic. It is synthesized *via* a 3-step synthesis using domino Knoevenagel-Michael addition and reductive amination.

(i) Provide a rational reaction mechanism for each reaction step.

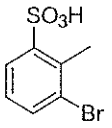
(ii) If each step has 80% yield, calculate the overall yield of the synthesis. [20]



(b) How would you synthesize the following compounds from benzene? [10]



4-Chloro-1-nitro-2-propylbenzene

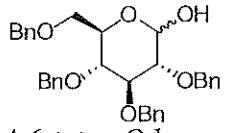


3-Bromo-2-methyl-benzenesulfonic acid

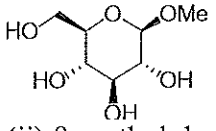
Question 3

(a) Discuss the Mizoroki-Heck reaction. Use appropriate reactants and reagents to propose a plausible mechanism for the reaction. [15]

(b) How would you convert D-glucose into the following compounds? [8]

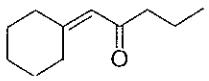


(i) 2,3,4,6-tetra-*O*-benzyl-D-glucose



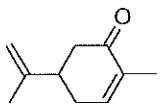
(ii) β-methylglucopyranoside

(c) Propose a retrosynthetic analysis of the following compound. Your answer should include both the synthons, showing your thinking, and the reagents that you would employ in the actual synthesis. [7]



Question 4

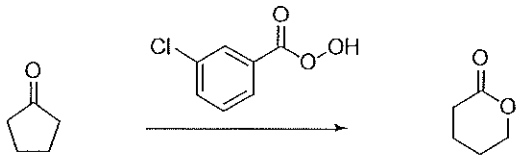
(a) Carvone is the major constituent of spearmint oil. Draw the products you would expect from a reaction of carvone with the following reagents? [16]



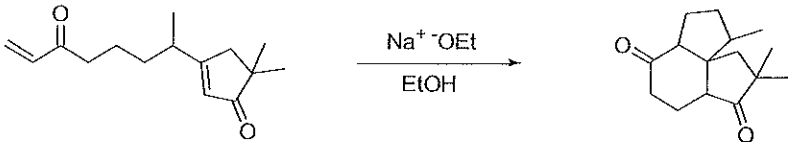
Carvone

(i) $(CH_3)_2Cu^-Li^+$, then H_3O^+
(ii) $LiAlH_4$, then H_3O^+
(iii) CH_3NH_2
(iv) C_6H_5MgBr, then H_3O^+
(v) H_2/Pd
(vi) CrO_3, H_3O^+
(vii) $(C_6H_5)_3P^+C^-CHCH_3$
(viii) $HOCH_2CH_2OH$, HCl

(b) Please provide a detailed mechanism for the following transformation. Show all arrow pushing. [8]



(c) The following reaction involves two successive intramolecular Michael reactions. Write both steps, and show their mechanism. [6]



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