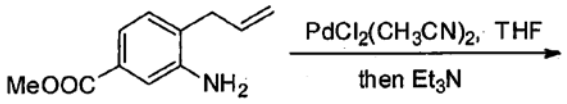
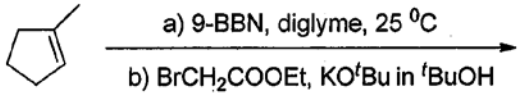
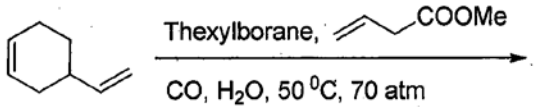
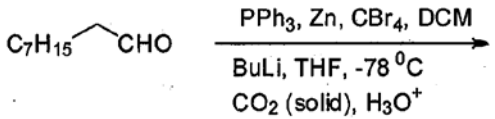
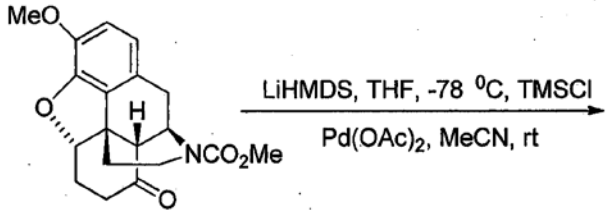
i) 

ii) 

iii) 

iv) 

v) 

M. Sc. Chemistry Examination, 2023

(3rd Semester, CBCS)

Paper: X-AO-1

[Analytical Chemistry (A1) + Organic Chemistry (O1)]

Time : Two Hours Full Marks : 40

(20 marks for each Unit)

Use a separate answer script for each Unit.

UNIT - 310A-1a & 1b

Answer ***Q.no. 1*** and either ***Q.no. 3***.

1. (a) The decomposition of zinc oxalate dihydrate (F.W. = 189) was shown by TGA and DTA to occur in two stages with a loss of mass of 19% at 200^0C and a total loss of 57% at 400^0C. Comment and conclude on the observation? How could we identify both gaseous and solid product?
   (b) Describe the steps involved in structure determination from power data.
   (c) Mention two differences between crystalline solids and amorphous solids.
   (d) Discuss the working principle of power X-Ray Diffractometer.
   (e) Discuss the applications (any four) of differential scanning calorimetry (DSC). 2+2+2+2+2
2. (a) What are microscopic and macroscopic techniques used for different sample analysis?

(b) What is SAED pattern during TEM analysis? How will it help to justify the purity of the materials?

(c) Morphology of the gas sensing material SnO_2 changes during fabrication with the change of precursors. Justify why it happens.

(d) What is electron-beam damage? How can you avoid such damaging during FE-SEM analysis?

(e) Why does peak shift take place in PXRD analysis of Fe_2O_3 samples when Pd nanoparticles are doped in it?

UNIT : 310 - 01

3. Answer any ***one*** from (a) and (b) : along with (c) and (d).

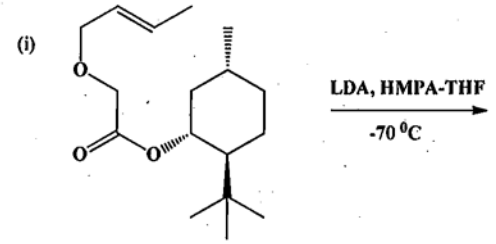
(a) 'Aerobic oxidation of alcohol using separately Cu[I or II] triflet-TEMPO and $Fe(NO_3)_3.9H_2O$-TEMPO are complementary to each other'– establish this complementarity using at least two examples. Also discuss the corresponding oxidative mechanistic pathways. 2+2

(b) Mechanistically show the basic difference between Cu-promoted Click reaction and strain promoted Click reaction. With suitable examples of substrate pairs and reagent/condition in each case discuss with mechanism of both of these. 4

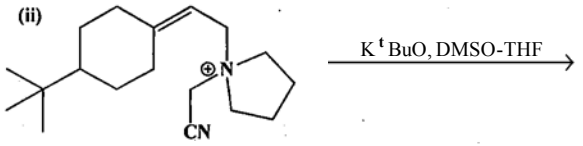
(c) Starting with suitable multicomponent reaction (MCR) partners and condition, and also using one-pot MCR synthesize an α-aminoacyl amide. Also depict the corresponding mechanistic pathway. Mention one limitation of this reaction. 3

(d) Write the structure of the product (exclusive/major) with proper stereo/regio chemical outcome and mention the major product as applicable for the following reactions and also mention the name of the rearrangement/reaction involved. 1x3

(i)



(ii)



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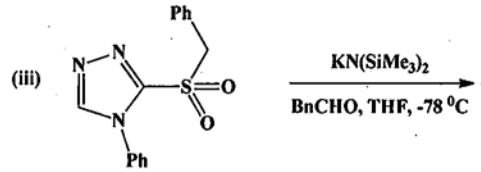

4. (a) Discuss the synthesis of Eschenmoser's salt starting from trimethyl amine. Give an example of the reaction with Eschenmoser's salt and explain with mechanism. 1+1

(b) Predict the product(s) with proper stereochemistry mentioning the major compound with plausible mechanistic justification of the following reactions. Answer any ***four***. 2x4