

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**  
(END SEMESTER EXAMINATION)

CLASS: I. M. Sc./M.Sc./PHD  
BRANCH: CHEMISTRY

SEMESTER : VIII/II/NA  
SESSION : SP-2023

SUBJECT: CH410 MODERN ORGANIC CHEMISTRY

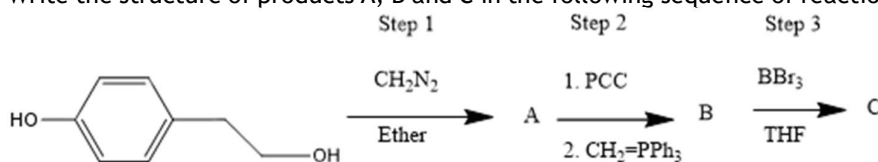
TIME: 3 Hours

FULL MARKS: 50

**INSTRUCTIONS:**

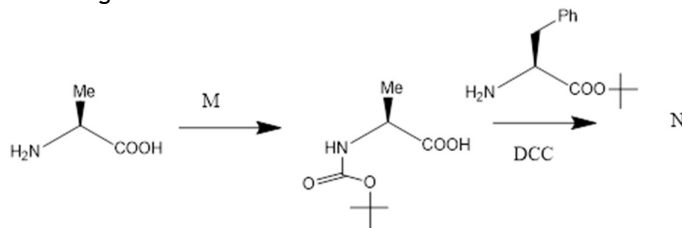
- The question paper contains 5 questions each of 10 marks and total 50 marks.
- Attempt all questions.
- The missing data, if any, may be assumed suitably.
- Before attempting the question paper, be sure that you have got the correct question paper.
- Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

- Q.1(a) Write the structure of products A, B and C in the following sequence of reactions. Marks [4] CO 1 BL 3

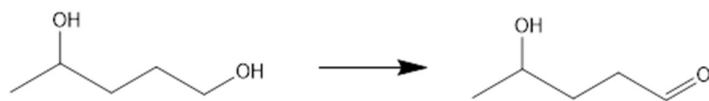


Write the mechanism for Step 1 and Step 3.

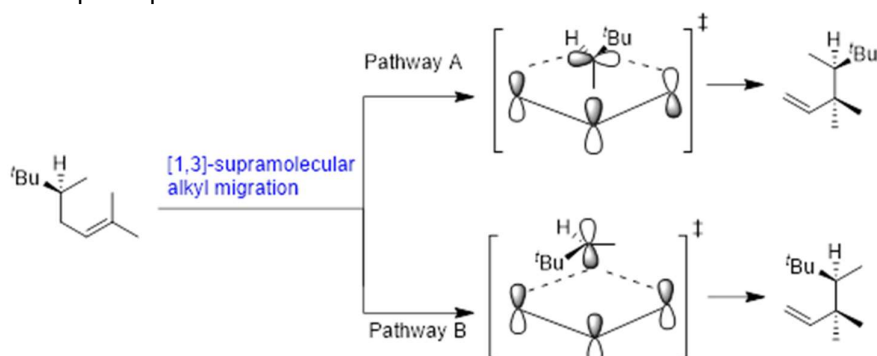
- Q.1(b) (i) Write the structures M and N along with the mechanisms for each of the following reaction: [4+2] CO 2 BL 4



- (ii) How would you carry out the following conversion?



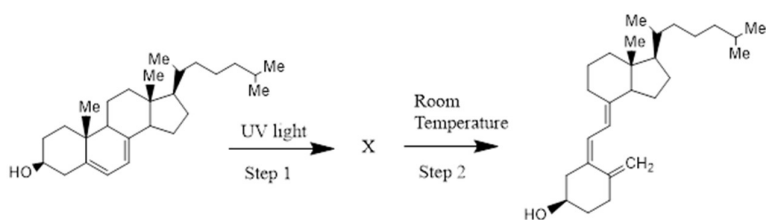
- Q.2(a) Consider the transition states for the following conversions and answer the subsequent questions: [3] CO 1 BL 3



- Which Transition state is aromatic in nature? Give reasons
- Which pathway is photochemically allowed?
- Which pathway goes with inversion?

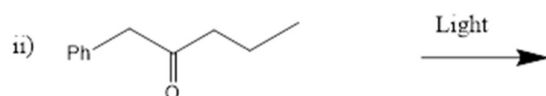
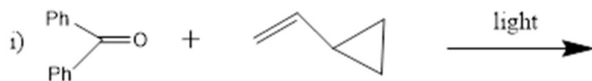
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Q.2(b) (i) Consider the following reaction sequence and answer the subsequent questions? [3+4] 2 4

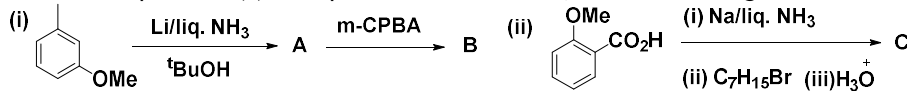


- Write down the structure of X
- Classify the two reactions in terms of pericyclic nomenclature.
- Why does the step 1 take place under light and not under heat?

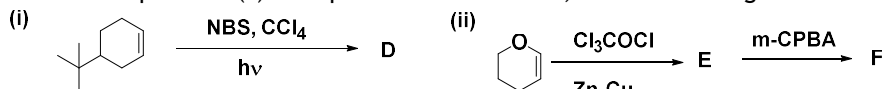
(ii) Identify the possible products of the following reactions. Classify each reaction and write the mechanism for their formation.



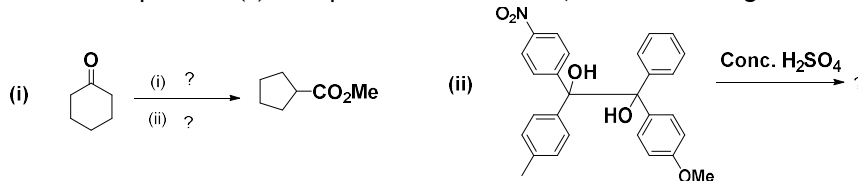
Q.3(a) Predict the products(s) with plausible mechanism, in the following cases.: [2.5+2.5] 1 3



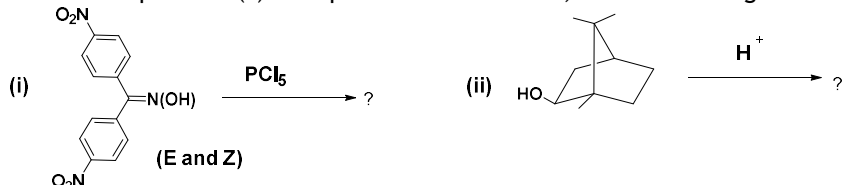
Q.3(b) Predict the products(s) with plausible mechanism, in the following cases.: [2.5+2.5] 2 4



Q.4(a) Predict the products(s) with plausible mechanism, in the following cases. [2.5+2.5] 1 3



Q.4(b) Predict the products(s) with plausible mechanism, in the following cases. [2.5+2.5] 2 4



Q.5(a) (i) Draw the mechanism for the hydrogenation of olefins catalyzed by Wilkinson's catalyst with a suitable example. Labels each step. [3+2] 1 3

(ii) Draw a diagram that illustrates the bonding and back bonding interactions for a metal-olefin complex.

Q.5(b) (i) Draw the complete catalytic cycle for the Pd-catalyzed Stille coupling reaction. Clearly label each step with a suitable example, draw the appropriate reagents and products, and show the oxidation state of the Pd species in each step. [3+2] 2 4

(ii) Explain the role of SPhos ligand in a Pd catalyzed any cross-coupling reaction.