

M. SC. CHEMISTRY EXAMINATION, 2025

(3rd Semester)

PAPER : XII-O

[Organic Chemistry Special]

Time : Two Hours

Full Marks : 40

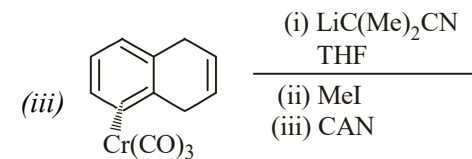
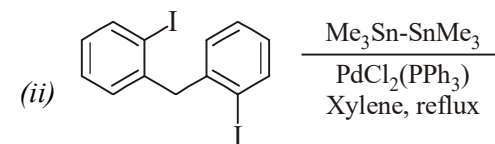
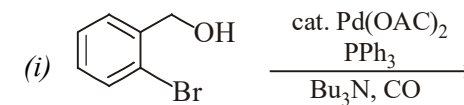
(20 marks for each Unit)

Use a separate Answer Script for each Unit.

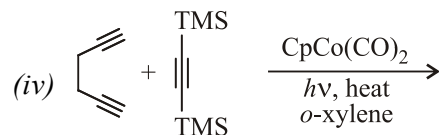
UNIT—O-3121

1. Answer all the questions.

(a) Predict the products and propose the mechanism of the following reactions (*any three*) : 3×3



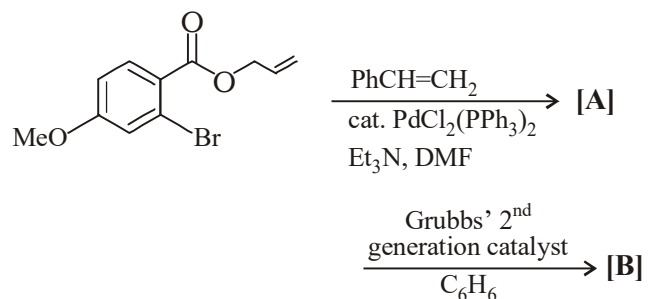
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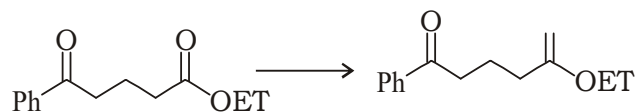
(b) Discuss the mechanism of reduction of $\text{Pd}(\text{OAc})_2$ to $\text{Pd}(\text{O})$ in the presence of PPh_3 . 2

(c) Mechanistically explain the regioselectivity of Pauson-Khand reaction between phenylacetylene and 1-butene in the presence of $\text{Co}_2(\text{CO})_8$. 3

(d) Predict the products [A] and [B] in the following reactions. 2



(e) Draw the structure of Tebbe's reagent. Using this reagent, how can you selectively carry out the following transformation? 2



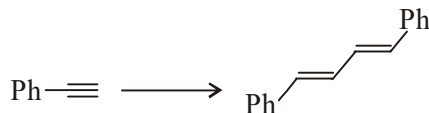
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5. Briefly discuss the basic principle of Electrospray Ionization (ESI) along with a schematic diagram. Compare the similarities and differences between the ionization techniques ESI and MALDI. 2+3

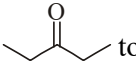
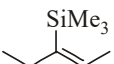
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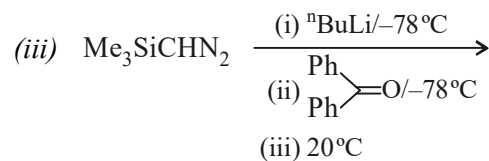
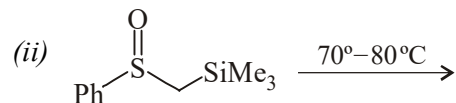
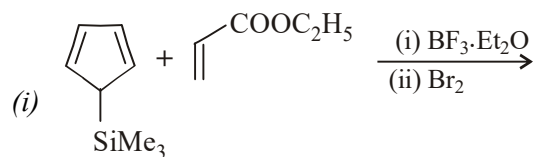
- (f) How can you carry out the following transformation using Suzuki reaction in one of the steps? 2



UNIT—O-3122

2. (a) Write down the steps for the conversion of  to  by Shapiro reaction. 2

- (b) Predict the product(s) of the following reactions with plausible mechanism, where applicable (*any two*) : 1½×2



CHEM-1037

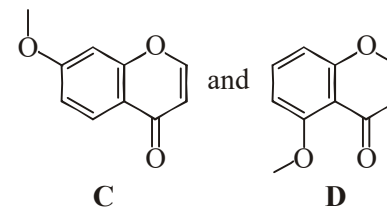
[Turn Over]

(4)

3. Answer *any two* of the following questions.

- (a) What is *J*-modulated spin echo experiment in NMR spectroscopy? Discuss its usefulness in determining the chemical structure of an organic compound. Comment on the advantages of spin echo protocol. 2+1+1
- (b) Discuss the importance of polarization transfer in NMR and the information obtained from ¹³C-DEPT NMR experiments towards elucidation of chemical structures. 2+2
- (c) What is the difference in information obtained in COSY and TOCSY experiments? Explain how HMBC experiment helps in elucidating chemical structure. 2+2
- (d) Draw a plausible spectral pattern of ¹H, ¹⁹F and ³¹P NMR spectra of HP(O)F₂. Give an example where the hybridization of Phosphorus plays an important role in ³¹P-NMR spectra. 3+1

4. How do you distinguish the following structures **C** and **D** by NMR experiments? 2



CHEM-1037

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