# LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

**B.Sc.** DEGREE EXAMINATION – **CHEMISTRY**

FIFTH SEMESTER – **APRIL 2025**

**UCH 5501 – ORGANIC FUNCTIONAL GROUPS - II**

Date: 24-04-2025 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

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| | **SECTION A - K1 (CO1)** | |
| | **Answer ALL the Questions -** | **(10 x 1 = 10)** |
| **1.** | **Multiple Choice Question** | |
| a) | Which of the following reagents is the strongest reducing agent?<br>(i) $NaBH_4$ (ii) $LiAlH_4$ (iii) $H_2/Pd\text{-}C$ (iv) Zn/HCl | |
| b) | Acid anhydrides can be prepared by:<br>(i) Heating carboxylic acids with $P_2O_5$<br>(ii) Reacting carboxylic acids with acid chlorides<br>(iii) Reacting carboxylic acids with alcohols<br>(iv) Both (a) and (b) | |
| c) | The Claisen rearrangement is a reaction that involves the migration of an allyl group by the _____ mechanism.<br>(i) pericyclic (ii) cationic (iii) anionic (iv) free radical | |
| d) | Acetoacetic ester can be used to synthesize<br>(i) ketones<br>(ii) aldehydes<br>(iii) carboxylic acids<br>(iv) all of these | |
| e) | Organometallic compounds of Cu and Zn are generally<br>(i) highly reactive towards electrophiles<br>(ii) stable in the presence of oxygen and moisture<br>(iii) less reactive than those of alkali metals<br>(iv) only used in inorganic chemistry | |
| **2.** | **Fill in the blanks** | |
| a) | The key reagent in the Wittig reaction is _____ . | |
| b) | The acidity of a carboxylic acid can be determined by measuring its _____value. | |
| c) | The photo-Fries rearrangement differs from the Fries rearrangement in that it is initiated by _____ . | |
| d) | Diazoacetic ester is primarily used for the synthesis of _____. | |
| e) | The coupling of aryl halides with alkyl- or arylboronic acids in the presence of a palladium catalyst is known as _____. | |
| | **SECTION A - K2 (CO1)** | |
| | **Answer ALL the Questions** | **(10 x 1 = 10)** |
| **3.** | **State True or False** | |
| a) | The MPV reduction is a mild reaction that can be carried out under neutral conditions. | |
| b) | Acid chlorides can be prepared by reacting carboxylic acids with thionyl chloride. | |
| c) | Anionotropic reactions involve the migration of a hydrogen atom. | |
| d) | Diazomethane can be used to convert alcohols to ethers. | |
| e) | Organolithium compounds can be used as strong bases. | |

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| **4.** | **Match the following** | |
| a) | Sodium borohydride | - Acyl azide to isocyanate |
| b) | Acetic acid | - Formation of carboxylic acid |
| c) | [1,2]-Sigmatropic rearrangement | - Oxidation of ethanol using potassium permanganate. |
| d) | Cyanoacetic ester | - Coupling of two aryl halides |
| e) | Ullmann reaction | - Reduces aldehydes and ketones to alcohols |

**SECTION B - K3 (CO2)**

**Answer any TWO of the following** **(2 x 10 = 20)**

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| 5. | Explain the Norrish Type I and Type II reactions, providing examples for each. | (10) |
| 6. | Describe the preparation of acid chlorides, acid anhydrides, amides, and esters. | (10) |
| 7. | Write a suitable mechanism for the following reactions involving migration of an atom or a group to electron deficient nitrogen by (i) Lossen and (ii) Curtius rearrangements. | (10) |
| 8. | (a) Explain the concept of tautomerism with suitable examples.<br>(b) Write the preparation and any two properties of Gilman reagent. | (5)<br>(5) |

**SECTION C – K4 (CO3)**

**Answer any TWO of the following** **(2 x 10 = 20)**

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| 9. | Analyse the reduction mechanisms of sodium borohydride and lithium aluminium hydride. | (10) |
| 10. | (a) Write the preparation of phthalic acid from phthalic anhydride.<br>(b) Discuss the commercial method of preparation of adipic acid from cyclohexanol.<br>(c) Describe the synthesis of succinic acid from ethyl bromide. | (3)<br>(4)<br>(3) |
| 11. | Predict the mechanism of pinacol-pinacolone rearrangement with suitable example. | (10) |
| 12. | (a) Discuss any three synthetic applications of acetoacetic ester.<br>(b) Explain the coupling reactions of organometallic compounds**.** | (6)<br>(4) |

**SECTION D – K5 (CO4)**

**Answer any ONE of the following** **(1 x 20 = 20)**

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| 13. | (a) How does the choice of zinc reagent affect the reactivity of the Reformatsky reaction?<br>(b) Describe the mechanism for the formation of cyanohydrin from acetaldehyde and cyanide ion. How can this cyanohydrin be converted to lactic acid? | (10)<br>(10) |
| 14. | (a) Summarize the following:<br>(i) Benzil-benzilic acid rearrangement (ii) Fries rearrangement.<br>(b) Describe the mechanism of the Hoffmann rearrangement.<br>(c) How do the electronic effects of substituents on the carbonyl carbon influence the reactivity of carbonyl compounds towards nucleophilic addition reactions? Explain your answer using an example of benzaldehyde. | (5+5)<br>(5)<br>(5) |

**SECTION E – K6 (CO5)**

**Answer any ONE of the following** **(1 x 20 = 20)**

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| 15. | (a) Write the mechanism of 1,2- and 1,4-Michael addition reactions with suitable examples.<br>(b) Explain the stereoselective addition to maleic and fumaric acid.<br>(c) Explain the mechanism of Beckmann rearrangement. | (8)<br>(7)<br>(5) |
| 16. | (a) Summarize and outline the synthesis of isobutyric acid and barbituric acid starting from malonic ester.<br>(b) Discuss the applications of organolithium and Grignard reagents in organic synthesis. Provide specific examples to illustrate their utility. | (10)<br>(10) |

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