22CHP205N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION MAY 2025
(Second Semester)

Branch - **CHEMISTRY**

ORGANIC REACTION MECHANISM AND RETRO - SYNTHESIS

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	Which of the following statements are incorrect? (a) Vinyl chloride does not give SN reaction but allyl chloride gives. (b) Displacement of H^- is easier than that of Cl^- (c) CH_2-CH=CH-CH_2Cl reacts with KCN to give a mixture of isomeric products. (d) CH_3-CH_2-O-CH_2-Cl is much more reactive in SN1 reaction than CH_3-CHCl-CH_3	K1	CO1
	2	In an S_N2 reaction there is (a) Partial racemization (b) Complete racemization (c) Complete inversion (d) A little inversion and mostly racemization	K2	CO1
2	3	Which one the following alkyl iodide readily undergoes elimination? (a) methyl (b) n-propyl (c) isopropyl (d) tertiary butyl	K1	CO2
	4	Reaction intermediate of E1CB mechanism is: (a) Carbocation (b) Six membered cyclic TS (c) Carbanion (d) Benzyne	K2	CO2
3	5	Which one of the following reaction can be used for the formation of C-C-N bond in organic synthesis? (a) Aldol condensation (b) Mannich reaction (c) Michael addition (d) Robinson annulation	K1	CO3
	6	Condensation of diethyl succinate with a ketone in the presence of t-BuOK gives (a) Lactone (b) Unsaturated ester (c) Alkene (d) Keto-ester	K2	CO3
4	7	Which one of the following is used as a phase transfer catalyst? (a) Primary amine (b) Tertiary nitro alkane (c) Quaternary ammonium salt (d) Tertiary amine	K1	CO4
	8	Suggest a reagent for the conversion of α-picoline to pyridine-2-carbaldehyde (a) SeO_2 (b) $LiAlH_4$ (c) DCC (d) $NaBH_3CN$	K2	CO4
5	9	1,3-dithiane is an example for (a) Synthon (b) Synthetic equivalent (c) Umpolung (d) Target unit	K1	CO5
	10	An imaginary bond breaking corresponding to the reverse of real reaction is known as (a) FGI (b) Target molecule (c) Disconnection (d) Reversal of polarity	K2	CO5

SECTION - B (35 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	(i) C_2H_5I is more reactive than C_2H_5Br towards nucleophilic substitution reactions. Inspect this statement. (3) (ii) Distinguish between S_N1 and S_N2 mechanisms. (4)	K4	CO1
		(OR)		
	11.b.	(i) CH_3COO^- is a stronger nucleophile than CF_3COO^-. Comment this statement. (3) (ii) How would you effect the following transformation? Examine its mechanism. Pyridine → 2-aminopyridine. (4)		

Cont...

2	12.a.	(i) Account for the fact that tert-butyl alcohol undergoes dehydration extremely rapidly. (3) (ii) Compare Hoffmann and Saytzeff rules of elimination reactions with examples. (4)	K5	CO2
		(OR)		
	12.b.	(i) Complete the following reactions: 1. $CH_3CHO + SeO_2 \rightarrow$? 2. $CH_3CHO + NH_2\text{-}NH_2/NaOEt \rightarrow$? 3. $CH_3CHO + CH_3\text{-}CH(OH)\text{-}CH_3 + Al[OCHMe_2]_3 \rightarrow$? (2+2+3=7)		
3	13.a.	(i) Explain the mechanism of Benzoin condensation. (3) (ii) How would you effect the following transformation? Examine its mechanism. Benzaldehyde → Styrene (4)	K4	CO3
		(OR)		
	13.b.	(i)Addition of HX on alkenes is regioselective. Justify this statement.(3) (ii) Explain the mechanism of Stobbe condensation with an example.(4)		
4	14.a.	(i) Write the synthetic importance of LDA. (3) (ii) Pick out the suitable reagent(s) for the following reactions: 1. Ethyl benzoate → Benzyl alcohol 2. Cyclohexene →Hexanedial (2+2=4)	K6	CO4
		(OR)		
	14.b.	(i) List the synthetic uses of crown ethers. (3) (ii) Identify the suitable reagent (s) for the following reactions: 1. $CH_3\text{-}CH{=}CH\text{-}CHO \rightarrow CH_3\text{-}CH_2\text{-}CH_2\text{-}CHO$ 2. $CH_3\text{-}CO\text{-}Cl \rightarrow CH_3\text{-}CH_2\text{-}OH$ (2+2=4)		
5	15.a.	(i) Distinguish between regio-selectivity and chemo-selectivity. (3) (ii) Disconnect aspirin and suggest the retro synthetic route for aspirin with proper reagent. (4)	K5	CO5
		(OR)		
	15.b.	(i) List the advantages of retro synthesis. (3) (ii) Discuss two groups C-C disconnection with reference to Diels-Alder reactions. (5)		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	(i)Compare the reactivity of chlorine atom in (1) methyl, (2) ethyl (3) vinyl and (4)allyl chlorides towards nucleophilic substitution reactions. (4) (ii) How would you effect the following transformation? Examine its mechanism with evidences. $C_6H_5\text{-}Cl \rightarrow C_6H_5\text{-}NH_2$(6)	K4	CO1
2	17	(i) Give evidence to prove that E2 reactions are predominantly anti-eliminations, and there is relation between conformation and reactivity. (5) (ii) Assess the salient features and mechanistic path ways of Birch reduction. (5)	K5	CO2
3	18	Predict the products of the following reactions and propose their reaction mechanism: (i) $CH_3CHO + CH_2\text{-}(COOH)_2$ + Pyridine → ? (5) (ii) $2CH_3CHO + NaOH \rightarrow$? (5)	K6	CO3
4	19	Suggest the suitable reagent(s) for the following functional group transformations? (i) $C_6H_5\text{-}CH{=}CH\text{-}CHO \rightarrow C_6H_5\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}OH$ (ii) $C_6H_5\text{-}I \rightarrow C_6H_5\text{-}CH_3$ (iii) R-OH →R-I (iv) $Cl\text{-}CH_2\text{-}CH_2\text{-}O\text{-}CO\text{-}CH_3 \rightarrow CH_3\text{-}CH_2\text{-}O\text{-}CO\text{-}CH_3$ (4x2.5=10)	K5	CO4
5	20	(i) Write the protecting and deprotecting group for ketones. (2) (ii)What are synthetic equivalents? Mention their synthetic applications. (3) (iii) List any five one step functional group interconversions from 2-butene. (5)	K4	CO5

Z-Z-Z END