

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION MAY 2024
(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 among the following anions is the best nucleofuge? (a) AcO ⁻ (b) OH ⁻ (c) TsO ⁻ (d) EtO ⁻	K1	CO1
	2	Neighbouring group participation occurs at the rate limiting step, the rate of the reaction is significantly enhanced. This enhancement is known as (a) Anchimeric assistance (b) Ambident nucleophiles (c) Primary isotopic effect (d) Secondary kinetic effect	K2	CO1
2	3	Which one of the following is correctly matched? (a) Saytzeff's rule, least substituted alkenes (b) Hofmann rule, most substituted alkenes (c) E1CB reaction, Hofmann elimination (d) E1 reaction, Hofmann product	K1	CO2
	4	Identify the suitable reagent for the conversion of acetaldehyde in glyoxal. (a) Zn/Hg + HCl (b) CrO ₃ /H ₂ SO ₄ (c) SeO ₂ (d) OsO ₄	K2	CO2
3	5	The Claisen condensation is often used in preparing (a) β-hydroxyl ester (b) α-hydroxyl ester (c) γ-ketoester (d) β-ketoester	K1	CO3
	6	Hydroboration follows (a) Regioselectivity (b) Markownikoff's rule (c) anti-Markownikoff's rule (d) Regioselectivity and anti-Markownikoff's rule	K2	CO3
4	7	Pick out the suitable reagent for the transformation of ethyl acetate to ethanol. (a) DCC (b) SeO ₂ (c) LiAlH ₄ (d) NaBH ₃ CN	K1	CO4
	8	Identify the suitable reagent for the transformation of R-OH to R-I. (a) DCC (b) I ₂ /ZnCl ₂ (c) (CH ₃) ₃ SiI (d) DDQ	K2	CO4
5	9	Which one of the following is an example of synthon? (a) CH ₃ MgBr (b) CH ₃ ⁺ (c) LiAlH ₄ (d) KOH	K1	CO5
	10	Suggest a reagent/condition for the protection an alcoholic functional group. (a) (CH ₃) ₃ C-OH in acidic condition (b) (CH ₃) ₃ C-OH in basic condition (c) Li to transform it into organometallic (d) PBr ₃ to transform it into alkyl halide	K2	CO5

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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) Aromatic nucleophilic substitution in aryl halides is difficult. Examine this statement. (3) (ii) Polar solvent favours SN1 reaction while a non-polar solvent favours SN2 reaction. Analyze this statement with examples. (4)	K4	CO1
	(OR)			
	11.b.	(i) Nucleophilic substitution reactions take place less readily in vinyl chloride than in ethyl chloride. Examine this statement. (3) (ii) SN1 mechanism leads to racemization. Justify this statement. (4)		
2	12.a.	(i) E2 reaction is most common elimination reaction among E2, E1 and E1CB. Evaluate this statement. (3) (ii) Identify the suitable name reaction for the following transformation and also explain its mechanism. (4) 2-butanone → n-butane	K5	CO2
	(OR)			
	12.b.	(i) Predict the major product formed when 2-chlorobutane is treated with alcoholic KOH. Name the rule which is used to make this prediction. (3) (ii) Compare cis and trans elimination mechanisms. (4)		
3	13.a.	(i) Complete the following reaction with its mechanism and name. (3) $2\text{CH}_3\text{-CHO} + \text{NaOH} \rightarrow ?$ (ii) Explain the reaction mechanism and synthetic importances of Michael reaction. (4)	K4	CO3
	(OR)			
	13.b.	(i) Complete the following reaction with its mechanism: $2\text{C}_6\text{H}_5\text{CHO} + \text{KCN} \rightarrow ?$ (3) (ii) Taking an example of propylene, Contrast Markownikoff's rule and anti-Markownikoff's rule. (4)		
4	14.a.	(i) Name and formulate the products formed when propene is ozonolysed followed by hydrolysis in presence of zinc? (3) (ii) Assess the synthetic utility of 1,3-dithiane. (4)	K5	CO4
	(OR)			
	14.b.	(i) List the synthetic uses of DCC. (3) (ii) Draw a structure of 18-crown-6-ether. Explain its salient features. (4)		
5	15.a.	(i) List the criteria of good disconnection approach. (3) (ii) Suggest the retrosynthetic approach for the synthesis of paracetamol. (4)	K6	CO5
	(OR)			
	15.b.	(i) Distinguish between synthon and synthetic equivalents. (3) (ii) Narrate the importance of order of events in disconnection approach with suitable examples. (4)		

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) I ⁻ is both a good leaving group and a good nucleophile. Inspect this statement. (5) (ii) What happens when Chlorobenzene reacts with KNH ₂ in the presence of liquid NH ₃ ? Inspect its reaction mechanism with supporting evidences. (5)	K4	CO1
2	17	(i) List the synthetic uses of SeO ₂ . (3) (ii) What is Chugave reaction? Explain its mechanism. (3) (iii) Explain Saytzeff rule taking 2-butanol as an example. (4)	K5	CO2
3	18	Predict the products of the following reactions and propose their reaction mechanism: (i) C ₆ H ₅ -CO-CH ₃ + HCHO + (CH ₃) ₂ -NH → ? (5) (ii) Diethyl succinate + CH ₃ -CO-CH ₃ + NaH /EtOH + →? (5)	K6	CO3
4	19	Pick out the suitable reagent(s) for the following functional group transformations? (i) Tetralin → Naphthalene (ii) Acetamide → Ethylamine (iii) 4-bromocyclohexanone → 4-vinylcyclohexanone (iv) 2-methyl-2-butene → Acetone + Acetaldehyde (4x2.5=10)	K5	CO4
5	20	(i) Name the protecting group for aldehyde and amine. (2) (ii) Explain the utility of Robinson Annulation reaction in retro synthetic approach. (3) (iii) List any five one step functional group interconversions from acetaldehyde. (5)	K4	CO5

Z-Z-Z

END