

UNIVERSITY OF SWAZILAND

RESIT EXAMINATION

2019, JULY

TITLE OF PAPER : Functional Group Chemistry and Stereochemistry

COURSE NUMBER : CHE232

TIME : Three Hours

INSTRUCTIONS : Answer any **FOUR** questions. Each question carries **25** marks

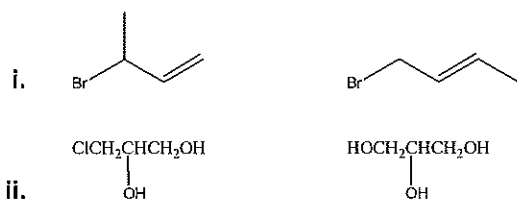
This Examination Paper Contains **SIX** Printed Pages Including This Page
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Chief Invigilator.*

Question 1

- a. Draw the following molecules whose names are shown below. (18)
- 1,3-butadiene
 - 2-chloro-2-methylbutane
 - 1,3-dibromocyclobutane
 - 2-Butenoic acid
 - 3-chloro-2-cyclohexenone
 - 1,3-Benzene dicarboxylic acid
 - 2,3,3-trimethyl-4-octyne
 - 2,3-dibromo-3-ethylheptane
 - 1-ethoxy-3-methyl-pentane
- b. Draw all the structural isomers for compounds with the following molecular formula, C_5H_{12} . (7)

Question 2

- a. How many asymmetric carbons atom are present in 3-ethyl-2,2,4-trimethylpentane (4)
- b. Describe two methods for the separation of enantiomers. (5)
- c. In each of the following pairs of compounds, identify which one is chiral. (4)



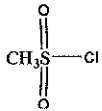
- d. Draw Fisher projections for (2R, 3S)-2-bromo-3-chlorobutane and (2S, 3R)-2-bromo-3-chlorobutane, with the carbon chain on the vertical line. Label each structure as (2R, 3S) or (2S, 3R). (8)
- e. Assume that you have a mixture of equal amount of each of the above compounds. Can they be separated into two containers based on physical properties such as b.p., m.p., etc.? Briefly explain why your answer. (4)

Question 3

- a. Propose how you would prepare 2,4-dimethyl-pentane, starting with an alkyl halide of your choice. (10)
- $$(CH_3)_2CHCH_2CH(CH_3)_2$$
- 2,4-Dimethyl-pentane
- b. Explain why carbonyl compounds are more soluble in water than the corresponding alkanes but less than the corresponding alcohols. (7)
- c. Explain the following observations:

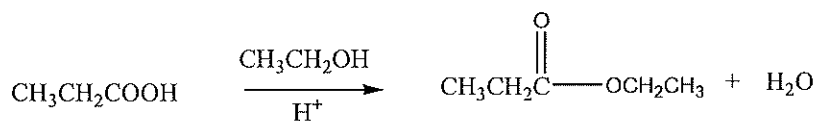
- i. Benzene undergoes electrophilic aromatic substitution and not electrophilic addition. (4)
- ii. Inductive effect in the reactions of aromatic benzene. (4)

Question 4

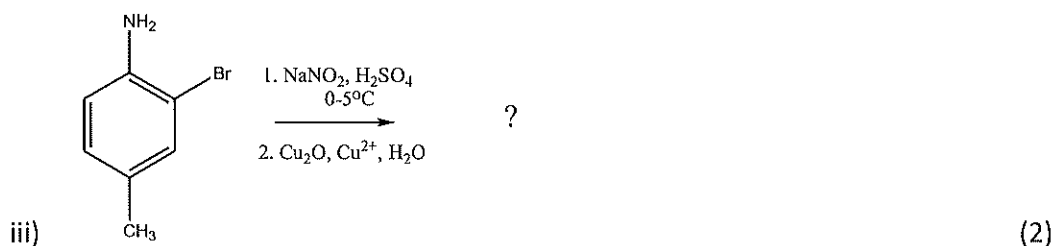
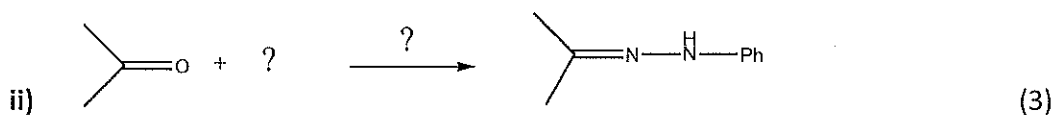
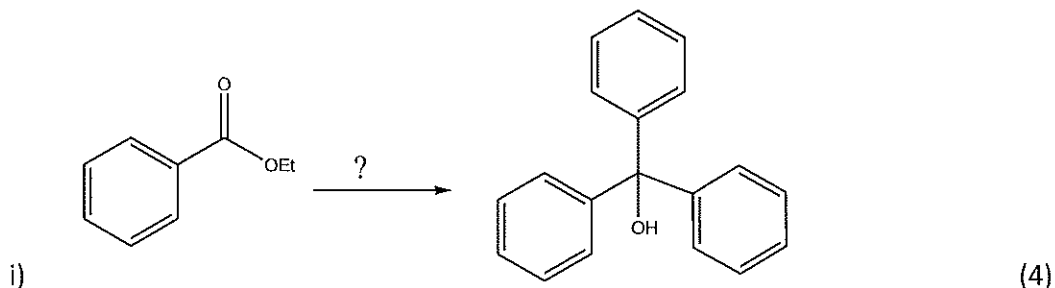
- a. Suggest a mechanism for the OH^- catalysed aldol addition of CH_3CHO . (15)
- b. Predict the major product of the reaction between 1-pentanol and each of the following. Write the IUPAC names of the products (10)
- PBr_3
 - 
 - $\text{PCC}, \text{CH}_2\text{Cl}_2$
 - NaH
 - Conc. H_2SO_4 , heat

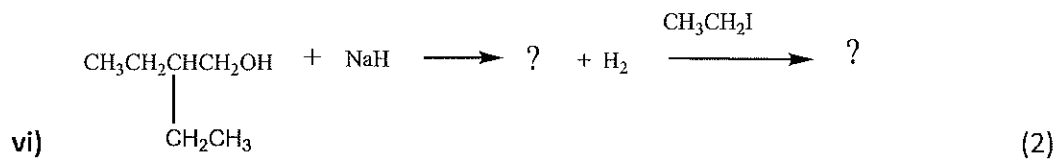
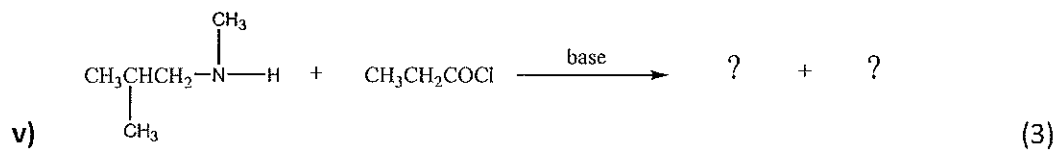
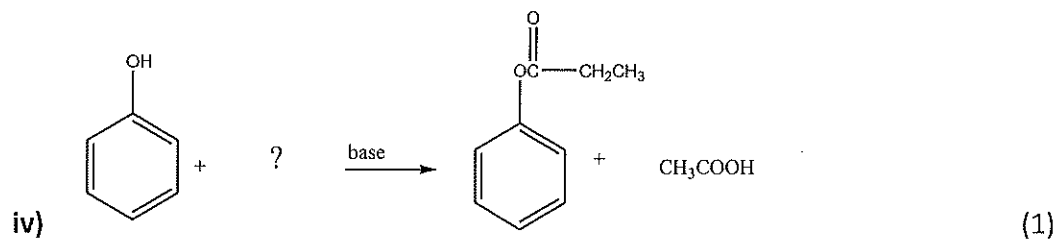
Question 5

- a. Show, with mechanistic detail, how the ester (below) is formed from a carboxylic acid and an alcohol in the presence of an acid catalyst. (10)



- a. Provide the missing reagents, product and/or reaction conditions where necessary for accomplishing the following transformations. Mechanisms are not necessary





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Department of Chemistry

1	H	1.0079																	2	He	4.0026																				
3	Li	6.941	4	Be	9.0122																	10	F	18.998																	
11	Na	22.990	12	Mg	24.305																	17	Cl	35.453																	
19	K	39.098	20	Ca	40.078																	35	Br	79.904																	
37	Rb	85.47	38	Sr	87.62																	53	I	126.90																	
55	Cs	132.91	56	Ba	137.33																	85	At	(210)																	
87	Fr	(223)	88	Ra	226.03																	86	Rn	(222)																	
21	Sc	44.956	22	Ti	47.88	23	V	50.942	24	Cr	51.996	25	Mn	54.938	26	Fe	55.847	27	Co	58.933	28	Ni	58.69	29	Cu	63.546	30	Zn	65.39												
39	Y	88.906	40	Zr	91.224	41	Nb	92.906	42	Mo	95.94	43	Tc	(98)	44	Ru	101.07	45	Rh	102.91	46	Pd	106.42	47	Ag	107.87	48	Cd	112.41												
57	La	138.91	72	Hf	178.49	73	Ta	180.95	74	W	183.85	75	Re	186.2	76	Os	190.2	77	Ir	192.22	78	Pt	195.08	79	Au	196.97	80	Hg	200.59												
89	Ac	227.03																	81	Tl	204.38	82	Pb	207.2	83	Bi	208.98	84	Po	(209)	85	At	(210)								
5	B	10.811	6	C	12.011	7	N	14.007	8	O	15.999	9	F	18.998																											
13	Al	26.982	14	Si	28.086	15	P	30.974	16	S	32.064	17	Cl	35.453																											
31	Ga	69.723	32	Ge	72.61	33	As	74.922	34	Se	78.96	35	Br	79.904																											
49	In	114.82	50	Sn	118.71	51	Sb	121.75	52	Te	127.60	53	I	126.90																											
81	Tl	204.38	82	Pb	207.2	83	Bi	208.98	84	Po	(209)	85	At	(210)																											
58	Ce	140.12	59	Pr	140.91	60	Nd	144.24	61	Pm	146.92	62	Sm	150.36	63	Eu	151.97	64	Gd	157.25	65	Tb	158.93	66	Dy	162.50	67	Ho	164.93	68	Er	167.26	69	Tm	168.93	70	Yb	173.04	71	Lu	174.97
90	Th	232.04	91	Pa	231.04	92	U	238.03	93	Np	237.05	94	Pu	(244)	95	Am	(243)	96	Cm	(247)	97	Bk	247	98	Cf	(251)	99	Es	(252)	100	Fm	(257)	101	Md	(258)	102	No	(259)	103	Lr	(260)