RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SECOND SEMESTER EXAMINATION, JUNE 2022

FIRST YEAR (BATCH 2021-24)

Date : 20/06/2022 **CHEMISTRY (HONOURS)**

Time : 11.00 am – 1.00 pm **Paper : III [CC3]** Full Marks : 50

[Use one Answer book for **Unit - I & IV** and another Answer book for **Unit - II & III**]

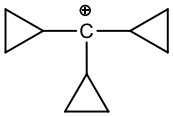
Unit : I

Answer **any one** question: [12 marks]

1. a) Comment on the enol contents of the following two compounds [2]

i) $CH_3COCOCH_3$ and ii) 

b) Arange the following carbocations in increasing order of reactivity and also explain your answer. [2]

 , $Ph_3\overset{\oplus}{C}$, $Me_3\overset{\oplus}{C}$

(a) (b) (c)

c) Draw the orbital picture for sight and triplet carbene. Give one example of nucleophilic carbene and why it is called so. [2]

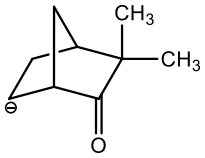
d) When diazoamino benzene boiled with HCl the istopic nitrogen found to be present in both aniline and nitrogen - explain with mechanism. [2]

e) Draw the energy profile diagram for the following equilibrium :-

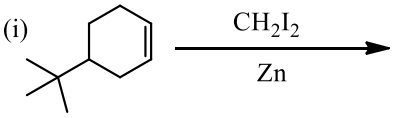
$$A \underset{}{\overset{K_1}{\rightleftharpoons}} B \overset{K_2}{\rightleftharpoons} C \quad (K_1 > K_2)$$

which one is the major product after equilibration of the reactions. [2]

f) Draw the resonance structures of the following intermediates and indicate the most stable resonance hybrid in each case :- [2]

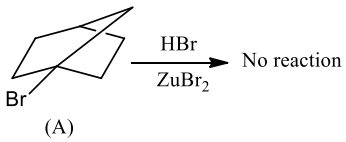
(*i*) $CH_3-\overset{\oplus}{C}=O$ *(ii)* 

2. a) Complete the following reaction with mechanism - [2×2]

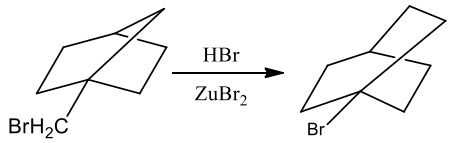
(i) 

(ii) $Ph_3COH \xrightarrow[\triangle]{50\%\ H_2SO_4}$ yellow colour solution $\xrightarrow{H_2O}$ Colourless Solution

b) Explain the following observations where substrate 'A' does not react but 'B' gives product - 'C'. [2]



(A)

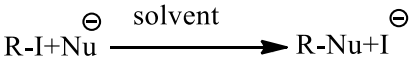


(B) (C)

c) Draw the energy profile diagram for the following reaction for

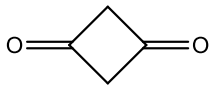
(i) S_N1

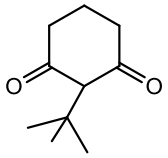
(ii) S_N2



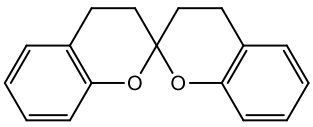
(iii) the solvent for the reaction was changed from non-polar to polar. Then what will be change in energy profile diagram. [3]

d) The following molecules exists in 100% Keto forms. Give suitable reason for the observations. [2]

(i) 

(ii) 

e) The following molecule is a very good example of thermochromics substance i.e. it is colourless when cold but it is red when sot - explain the observation. [1]



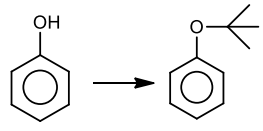
(Thermochromic subsfrance)

Unit : II

Answer **any one** question: [13 marks]

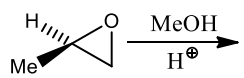
3. a) Carry out the following conversions. Give mechanism. [2×2]

(i) (R)- 2 - phenylethanol → (R) - 2 - phenylethylchloride

(i) 

b) Predict the product(s) of the following reactions and suggest plausible mechanism in each case. [2×2]

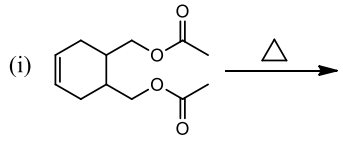
(i) (S) - Me (Et) CHOMe $\xrightarrow[\text{Cold condition}]{\text{HI}}$

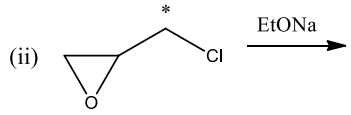
(ii) 

c) Explain, showing the stereochemical course of the reaction, what happens when threo - 1- bromo -1,2- diphenylpropane is treated with NaOEt in EtOH. Explain whether, under the same reaction conditions, the erythro isomer will undergo the same reaction at a faster rate or not. [4]

d) Justify or criticise : HO^- is a better nucleophile than HOO^-. [1]

4. a) Predict the product of the following reactions. Give mechanism. [2×2]

(i) 

(ii) 

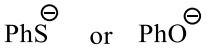
b) What happens when $F_3C-CHCl_2$ is heated with EtONa in Ethanol? By which path the reaction occurs? Justify. [2]

c) Explain the stereochemistry and mechanism of the reaction when threo isomer of Ph CH(Me) CH (Me) OTs is treated with acetic acid. [2]

d) Cite an example of SN^2 reaction which is attended by racemisation. [1]

e) $Me_3C\ CH_2\ Br$ is inert to SN^2 reaction, though it is a primary halide. Explain. [2]

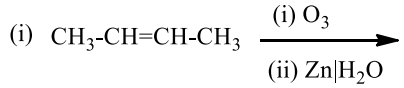
f) Which one of the following is a better nucleophile? Explain your answer. [2]

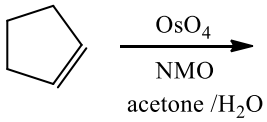


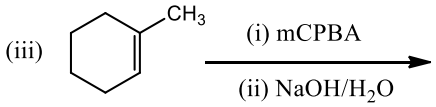
Unit : III

Answer **any one** question: [12 marks]

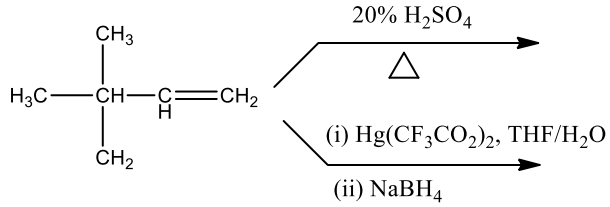
5. a) Complete the following reactions with mechanism. [3×2]

(i) 

(ii) 

(iii) 

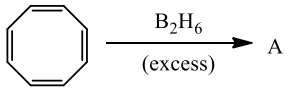
b) i) Complete the following reactions and also account for the products formation. [3]

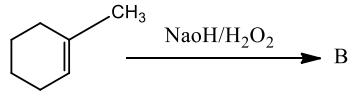


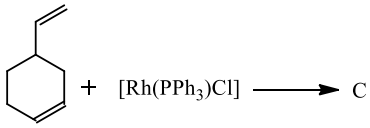
ii) Justify the following statement : "Hydroboration reaction is more to be Markonifov addition rather than anti-Markonifov addition. [1]

c) Describe the preparation and use of $Si\alpha_2BH$. [2]

6. a) Complete the following reactions with mechanism. [3×2]

(i) 

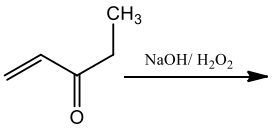
(ii) A+ 

(iii) 

b) Justify the following statement : "Non-polar solvent and high temperature promote allylic bromination reaction when alkene reacts with bromine". [2]

c) Compare the reaction out come between Woodward dihydroxylation and Prevost modification along with mechanism for each. [3]

d) Complete the following reactions (no mechanism required). [1]



Unit : IV

Answer **any one** question: [13 marks]

7. a) Using Chloromethylation reaction, convert benzene into benzyl chloride. Give mechanism. [2]

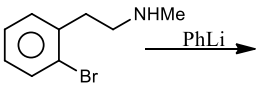
b) Both ortho and meta bromoanisole give the same product on treatment with sodamide in liquid ammonia. Write the product with explanation. [2]

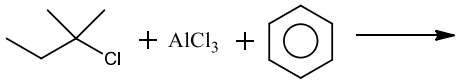
c) Account for the following observations: [2×2]

(i) Nitration of anisole with N_2O_5 gives mainly ortho nitro product.

(ii) 1,3 - Dichloro - 2,5 - dinitrobenzene on treatment with methanolic NaOMe produces only 1,3-dichloro - 2- methoxy -5- nitrobenzene.

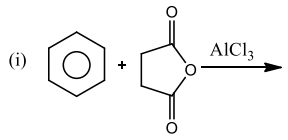
d) Predict the product(s) in the following reactions and explain their formation. [2×2]

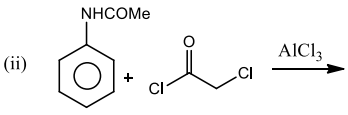
(i) 

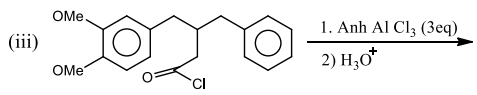
(ii) 

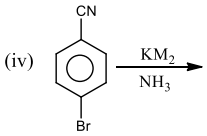
e) Justify or Criticise : Nitration of Cinnamic acid gives predominantly paranitrocinnamic acid. [1]

8. a) Write only the structure of the product formed in the following reactions. [4×1]

(i) 

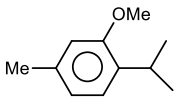
(ii) 

(iii) 

(iv) 

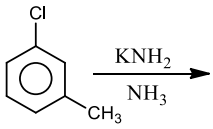
b) Discuss the reaction of piperidine with 2,4- dinitrofluorobenzene (DNFB) highlighting SN^2 (aromatic) mechanism. [2]

c) Compound (I) on treatment with mixed acid forms only one aromatic product of which the molecular formula is $C_8H_8N_2O_5$. Account for the reaction. [2]

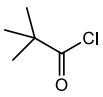


(I)

d) Predict the product(s) of the following reaction and explain their formation.



Cite an evidence in favour of the formation of benzyne intermediate in this reaction. [3]

e) Justify or Criticise : Friedel Craft reaction of benzene with 

gives only the alkylation product. [2]

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