RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SECOND SEMESTER EXAMINATION, SEPTEMBER 2020

FIRST YEAR (BATCH 2019-22)

Date : 25/09/2020

CHEMISTRY (Honours)

Time : 11.00 am – 3.00 pm

Paper: III [CC3] & IV [CC4]

Full Marks : 25+25

Paper : III [CC3]

ORGANIC

Attempt <u>any five</u> questions from Question Nos. 1 – 6: **[5×5]**

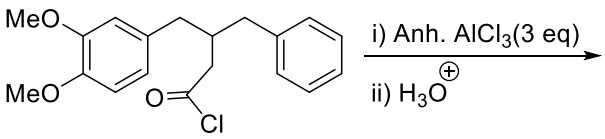
1. a) Account for the following observations: [2×2]

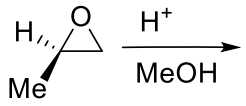
   i) 2-Butenol on treatment with thionyl chloride in ether medium gives only 3-chloro-1-butene.

   ii) Reaction of Erythro-3-bromo-2-bulanol with HBr gives only Erythro-2,3-dibromobutane.

   b) Justify or criticise: $HOO^{\ominus}$ is a better nucleophile than $HO^{\ominus}$. [1]

2. a) Predict the products for the following reactions: [2×2]

   i) 

   ii) 

   b) Justify or criticise: $PhS^{\ominus}$ is a better nucleophile than $PhO^{\ominus}$. [1]

3. a) Me_3CCH_2Br is inert to S_N2 reaction, though it is primary halide – explain.

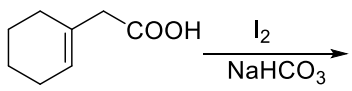
   b) Convert: (R)-2-butanol to (S)-2-butanol

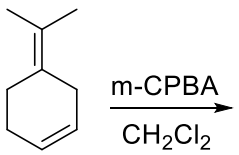
   c) Justify or criticise: Friedel-Crafts reaction of benzene with trimethylacetyl chloride gave alkylation product. [2+2+1]

4. a) Give orbital presentation for singlet and triplet carbenes.

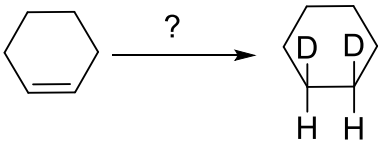
   b) Photochemical decomposition of diazomethane in cis-2-butene gives only cis-1,2-dimethylcyclopropane. However, if the reaction is performed in presence of nitrogen gas then cis-1,2-dimethylcyclopropane and trans-1,2-dimethylcyclopropane is obtained-explain the observation. [2+3]

5. a) Write down the structure of products for following reaction and also explain with mechanism: [2×2]

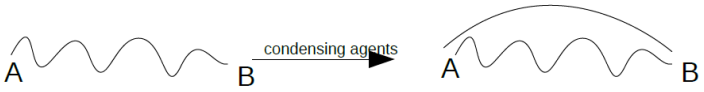
   i) 

   ii) 

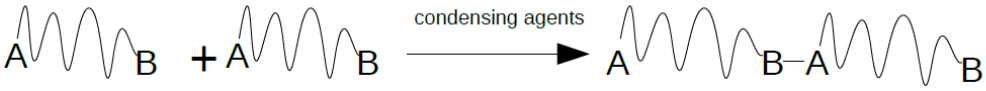
b) Write down the suitable reagents for the following conversion: [1]



6. a) The intramolecular condensation reaction [2]



is competed with the corresponding intermolecular version :



How would you ensure that the intramolecular product predominates?

b) Applying Hammond's postulate (with the aid of a suitable energy profile diagram) explain why the HX addition reaction is faster with 1-butene compared to 2-butene. [3]

Paper : IV [CC4]

INORGANIC

Attempt <u>any five</u> questions from Question Nos. 7 – 12: [5×5]

7. Explain the limitation of VBT and explain the following- (i) XeF_6 is distorted octahedral but $SbCl_6^{3-}$ is regular octahedral. [1+2+2]

8. Electronegativity is not inherent property, explain with example. What are the advantages of Mullikan's scale of electro negativity over Pauling's scale? [3+2]

9. a) When acetylene (ethyne) is passed through a solution of copper (I) chloride a red precipitate of copper acetylide, CuC_2, is formed. This is a common test for the presence of acetylene. Describe the bonding in the C_2^{2-} ion in terms of molecular orbital theory and compare the bond order to that of C_2. Also sketch the HOMO in each case. [3]

b) Arrange the species O_2^-, O_2^{2-}, O_2^+ in the order of decreasing bond length from their molecular orbital diagrams [2]

10. a) Oxygen is more electronegative than carbon. Yet, the dipole moment of CO is quite small, only 0.112D and it is known that the oxygen atom is the positive end of the dipole. Explain this from the molecular orbital diagram of CO. [3]

b) If 0.1 M Fe^{2+} is titrated against 0.1 M Ce^{4+} in 0.5 M H_2SO_4 solution, calculate the potential of the solution at the equivalence point (E_{eq})? Suggest a suitable indicator for detecting the end point of this titration. [2]

11. Treatment of potassium tetrakis(thicyanato)paladiamate(II) with bipyridine separately at (i) -78°C and (ii) 25°C gives two separate products - one is orange yellow (A) and other is light yellow (B). (A)→(B) at 150^0C. Write the formulas of (A) and (B) giving their relationship. [2.5 + 2.5]

12. a) Ethylene diamine is a bidentate as well as chelating ligand whereas hydrazine is a bidentate ligand but not chelating ligand, explain. [2]

b) What is chelate effect? Why chelate compels is more stable than non chelated complex? [1+2]

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