RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SIXTH SEMESTER EXAMINATION, MAY 2019

THIRD YEAR [BATCH 2016-19]

Date : 08/05/2019 **CHEMISTRY (Honours)**

Time : 11 am – 1 pm **Paper :** VIII [Gr. B & C] Full Marks : 50

[Use a separate Answer Book for <u>each group</u>]

Group – B

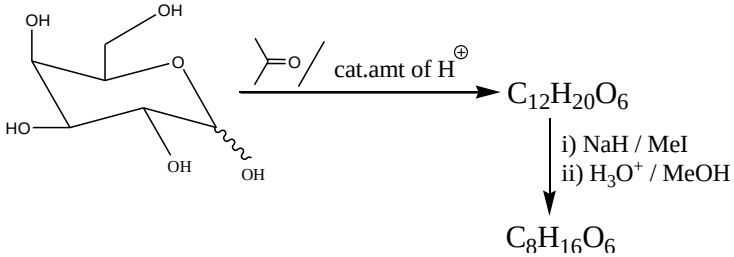
[***Attempt <u>one question</u> from <u>each Unit</u>***]

Unit – I

[15 marks]

1. a) Explain why D-fructose reduces Fehling's Solution although it is a Ketohexose. [2]
   b) Compound A is D-aldopentose and on oxidation yield an optically inactive dibasic acid B. A on Ruff's degradation gives an aldotetrose C which oxidation product is meso tartaric acid. Deduce the correct configuration from A to C. Also explain the steps involved. [4]
   c) Explain how will you convert D-fructose to D-glucose. [2]
   d) Show how you would use Strecker Reaction to make (±) tyrosine. [2]
   e) How is N-terminal amino acid determined by Edman's method? Why is it more advantageous than Sanger's method? [3]
   f) State and illustrate 'isoprene rule'. [2]

2. a) Why do many proteins show a strong band at ≈ 279 nm in UV spectrum? [2]
   b) Describe the DNFB method (or Sanger's method) to pointing out N-terminal amino acid in a protein chain. [2]
   c) Describe the denaturation of protein by a) changing pH b) heavy metal (Pb^{2+}) addition. [2]
   d) Draw the structural unit present in natural rubber. [1]
   e) Predict the structure of the following products and give mechanism for their formation: [3]

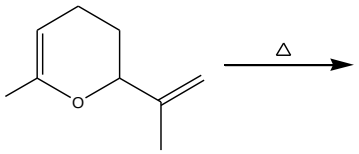


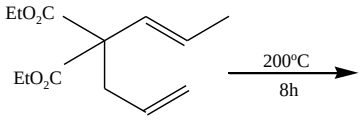
   f) D-altrose prefer to remain in the furanose form rather than in the pyranose form. why? [2]
   g) Write down the structures of A-T and G-C base pairings in DNA. [3]

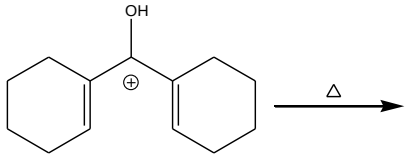
Unit – II

[10 marks]

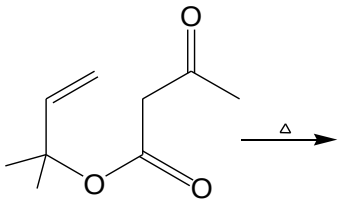
3. a) Predict the products with explanation [3×2]



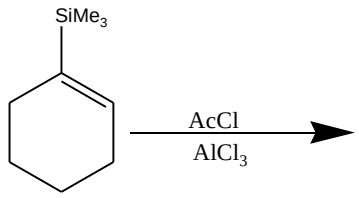




b) Write down the product of the following reaction which follows [3,3] sigmatuspic pathway and justify. [2]

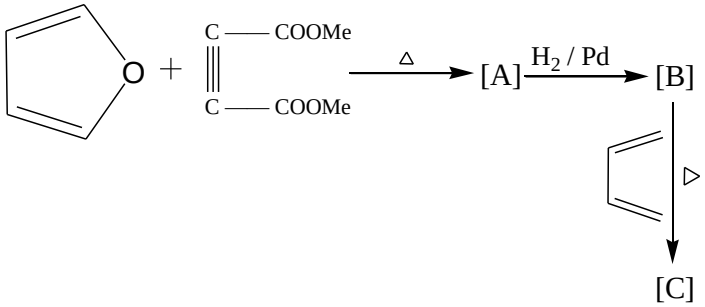


c) Suggest the product with pathway [2]

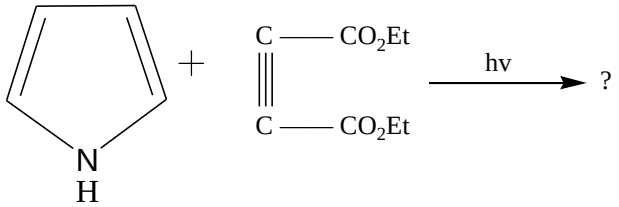


4. a) Write down the uses of the following reagents with proper reaction. [1.5×2]
i) TMSCN ii) TMSI

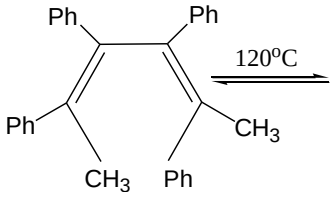
b) Write the products [A] , [B], [C] with their mechanism of formation [3]



c) Predict the product with mechanism. [2]



d) Predict the product of the following reaction from FMO consideration :- [2]



Group – C

[*Attempt one question from each Unit*]

Unit – I

[9 marks]

5. a) Discuss the trends in the variation of the following properties across the period of 3d serics: [2+2]

   i) d-electron ionisation energy $\left(d^n \rightarrow d^{n-1}\right)$.

   ii) Redox potential for $M^{3+}_{(aq)} + \bar{e} \rightleftharpoons M^{2+}_{(aq)}$

   b) Of the two ions, Co^{2+} and Cr^{3+} , one is highly prone to form octahedral but other to form tetrahedral complexes. Give reason in favour of your judgement. [2]

   c) Electronic absorption bands of lanthanide ions are sharper compared to those of transition metal ions — Explain. [3]

6. a) Calculate the magnetic moment (β) of $4f^x$ species. (Given: Ground term = $^3H_4$). Give the value of x. [3]

   b) Mn^{3+} and Cr^{2+} are isoelectronic. Mn^{3+} is highly oxidising but Cr^{2+} is highly reducing — Explain. [2]

   c) What happens when —

   i) an aqueous acidic solution of Ti(IV) salt is treated with a dilute solution of H_2O_2 followed by addition of a few crystals of NH_4HF_2.

   ii) Gold (III) chloride solution is treated with hydroxylamine hydrochloride. [2+2]

Unit – II

[8 marks]

7. a) The longarithm of stability constant values of $Cu(en)^{2+}$, $Cu(NH_3)_2^{2+}$, $Ag(en)^{+}$ and $Ag(NH_3)_2^{+}$ are 10.7 , 7.8 , 4.7 and 7.2 respectively. Explain why is the ethylene diamine complex of copper (II) is more stable than the ammine complex whereas the reverse is true for the corresponding silver (I) complexes. [3]

   b) The compound $Co(en)_2(NO_2)_2Cl$ (en = ethylenediamine) has been prepared in a number of isomeric forms. One form undergoes no reaction with either silver nitrate or ethylenediamine. A second form reacts with silver nitrate but not with ethylenediamine. A third form reacts both with silver nitrate and ethylenediamine. Identity each of the three forms with proper justification. [3]

   c) $\left[Pt(NH_3)_2Cl_2\right]$ has two isomeric forms. Suggest a chemical pathway to elucidate the structures of the isomers. [2]

8. a) Mixing solution of iron(II) salts and potassium hexacyanochromate (III) results in a brick red precipitate which turns green on heating. Both the compounds have the same composition. Indicate the type of isomerism involved. [3]

b) A solution of 0.1332 gm of $CrCl_3.6H_2O$ was passed through a cation exchange resin in acid form 8.0 ml of a standard caustic soda solution (containing 5.0 gm of NaOH/litre) was required for the titration of the liberated acid. Determine the correct formulation of the complex. [Atomic wt. of Cr = 52] [2]

c) Write a brief note non : Job's method for the determination of the composition and formation constants of complexes. [3]

Unit – III [8 marks]

9. a) What is carbon nanotube (CNT) ? How is it related to graphene? Describe the properties of CNTs and their application . [1+1+2]

b) The solvent exchange rate is very fast for $Cu^{2+}_{(aq)}$ and $Cr^{2+}_{(aq)}$ ions. Explain. [2]

c) Mention one method of synthesis of gold nanoparticles in aqueous medium. Mention any one application of gold nanoparticles. [1+1]

10. a) Illustrate the solution based chemical method of synthesis of gold nanopaste. [2]

b) Find out the expression of rate law of the association mechanism of nucleophilic subsfituion reaction of a complex. [2]

c) Briefly explain why K^+ ion form a more stable complex with 18-C-6 compared to pentaglyme? [2]

d) Nanoparticle behave differently from macroparticles. Explain. [2]

———— × ————