



**WEST BENGAL STATE UNIVERSITY**  
B.Sc. Honours 5th Semester Examination, 2020, held in 2021

**CEMACOR12T-CHEMISTRY (CC12)**

Time Allotted: 2 Hours

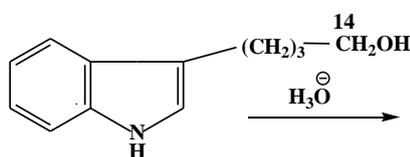
Full Marks: 40

*The figures in the margin indicate full marks.  
Candidates should answer in their own words and adhere to the word limit as practicable.  
All symbols are of usual significance.*

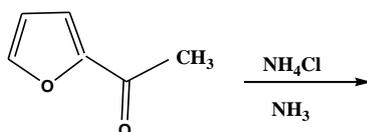
**Answer any five questions taking one from each unit**

**UNIT-I**

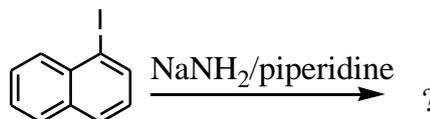
1. (a) How could you synthesize phenanthrene using Bardhan-Sengupta protocol? 2½ × 4 = 10  
(b) Identify the product(s) of the following reactions with proper explanation.



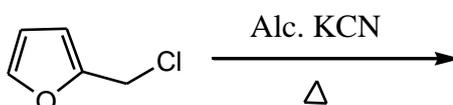
- (c) How could you carry out nitration at C-3 of pyrrole? Explain with plausible mechanism.  
(d) Predict the product in the following with plausible mechanism.



2. (a) How can you synthesise 2,4,6-trimethyl pyridine using suitable starting materials? 2½ × 4 = 10  
(b) Indicate the major and minor products of the following reaction with mechanism.



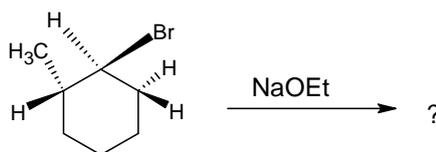
- (c) Predict the product in the following with plausible mechanism.



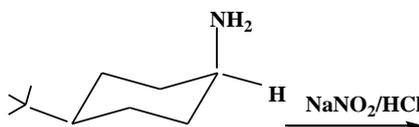
- (d) What happens when aniline, conc. sulphuric acid, glycerol and a mild oxidizing agent are heated together? Explain with plausible mechanism.

## UNIT-II

3. (a) Find the major product obtained in the following reaction and justify. 2×3=6

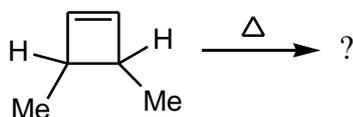


- (b) *cis*-4-*t*-butylcyclohexanol undergoes faster  $\text{CrO}_3$ -mediated oxidation than *trans* isomer. Explain.
- (c) Draw the preferred conformation of 1-methyl-1-phenylcyclohexane and justify your answer.
4. (a) Acetolysis of optically active *trans*-2-acetoxy cyclohexyl tosylate gives optically inactive *trans*-1,2-diacetoxy cyclohexane but acetolysis of optically active *cis*-2-acetoxy cyclohexyl tosylate gives optically active *trans*-1,2-diacetoxy cyclohexane. Explain. 2×3=6
- (b) What happens when *cis*- and *trans*-isomers of 3-hydroxycyclohexane carboxylic acid are heated separately?
- (c) Write down the product with proper stereochemistry for the following reaction and explain.

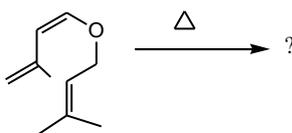


## UNIT-III

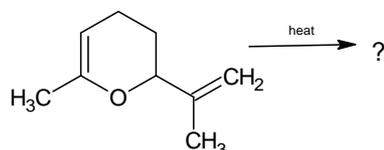
5. (a) Predict the product(s) of the following reaction and justify their formation in terms of FMO interaction. 2×3=6



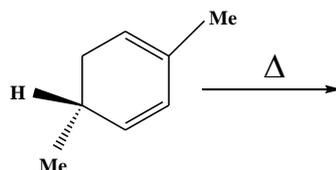
- (b) Thermal [1,5]-hydrogen shift is facile but [1,3]-hydrogen shift is not observed. Explain.
- (c) Indicate the product(s) of the following reaction with mechanism.



6. (a) Predict the product in the following reaction. 2×3=6



- (b) Explain why the following compound undergoes racemisation on heating.



- (c) Depict the FMO interactions for  $[^4\pi_s + ^2\pi_s]$  involving thermally allowed process. Explain why the reaction does not take place under photochemical conditions.

#### UNIT-IV

7. (a) D-glucose reacts with hydroxylamine to give compound A. Heating of A with 1-fluoro-2,4-dinitrobenzene in aqueous sodium bicarbonate furnishes compound B. Identify A and B and show the plausible mechanism for the conversion of A to B. 3
- (b) Discuss the mechanism of osazone formation. Why osazone formation does not proceed beyond the first two carbon atoms? 2+1
- (c) How do epimers differ from anomers? Illustrate with examples. 2
8. (a) How would you convert an aldose into its epimer? Clearly represent the most stable conformation of D-glucose in the  $\beta$ -pyranose form. 2+1
- (b) An *O*-methyl derivative of D-glucose gives active dicarboxylic acid on  $\text{HNO}_3$  oxidation. When subjected to Kiliani-Fischer synthesis, it gives two diastereomers, one of them is active and other inactive. Identify the *O*-methyl derivative of D-glucose and justify your answer. 3
- (c) In anhydrous methanol the equilibrium mixture of D-glucose contains 50% of the  $\alpha$ -form whereas in water it is 36%. Explain. 2

#### UNIT-V

9. (a) Show the steps involved in the synthesis of the tripeptide Leu-Phe-Ala using Merrifield's method. 3
- (b) (i) What is nucleoside? Illustrate with suitable example(s). 2+2
- (ii) Explain why RNA and not DNA is sensitive to alkaline hydrolysis.
- (c) Write down the structure of the violet-coloured product in the reaction of an  $\alpha$ -amino acid with ninhydrin. Explain the reaction with mechanism. 3
- 10.(a) Give the synthesis of  $(\pm)$ -phenylalanine following azalactone method. Can IR spectroscopy distinguish between D- and L-phenylalanine? 3+1

- (b) How can you separate a mixture of alanine and lysine on the basis of their isoelectric points? 2
- (c) Briefly explain the factors responsible for the stabilisation of a DNA duplex. 2
- (d) Write down the structure(s) of pyrimidine base(s) found in RNA. 2

**N.B. :** *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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