



## WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 5th Semester Examination, 2021-22

### CEMACOR12T-CHEMISTRY (CC12)

Time Allotted: 2 Hours

Full Marks: 40

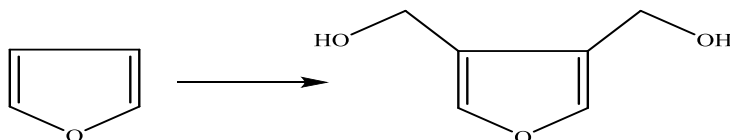
*The figures in the margin indicate full marks.  
Candidates should answer in their own words and adhere to the word limit as practicable.  
All symbols are of usual significance.*

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

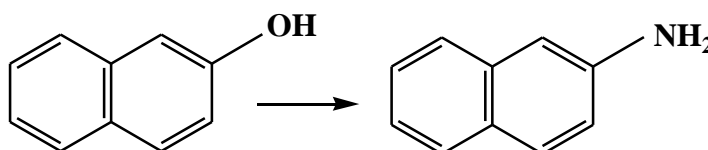
#### UNIT-I

1. (a) Outline Bogert-Cook Synthesis of Phenanthrene. How can you minimize the formation of the undesired spirocyclic product in this reaction? 2+1

- (b) (i) How can you accomplish the following transformation? 2+2



- (ii) Carry out the following transformation with plausible mechanism.

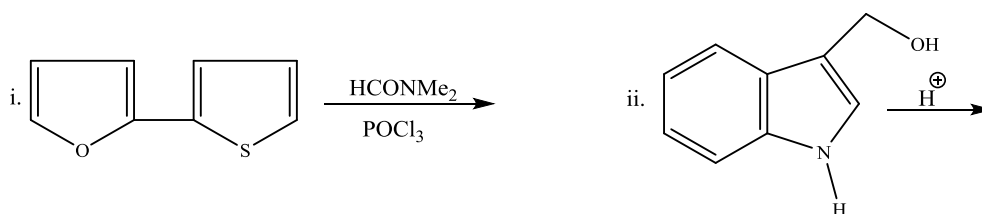


- (c) (i) Compare the basicity of 2-methyl indole and 3-methyl indole. 1 1/2 + 1 1/2

- (ii) State, with mechanism, how can you convert benzaldehyde into 1-methylisoquinoline.

2. (a) What happens when 2-naphthol is treated with ferric chloride? 1

- (b) Predict the product(s) in the following reactions and suggest mechanism in each case. 2 1/2 + 2 1/2

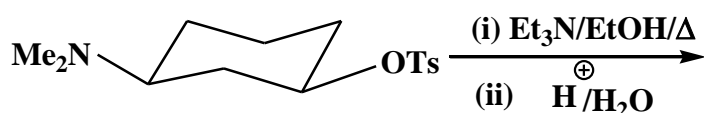


- (c) Furan reacts differently with nitronium fluoroborate and acetyl nitrate (in pyridine) to give 2-nitrofuran. — Explain. 2

- (d) How 2-bromonaphthalene is prepared from naphthalene? 2

## UNIT-II

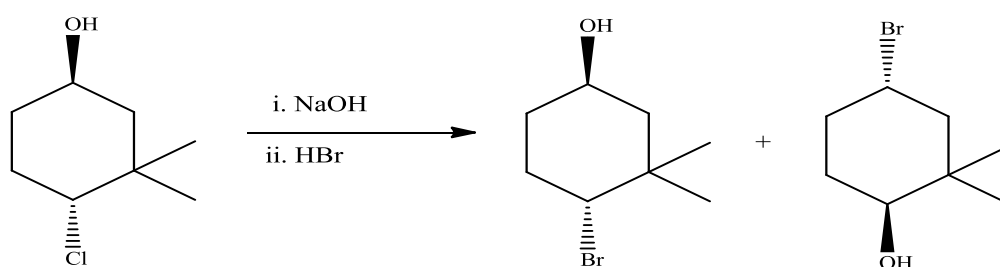
3. (a) Predict the product(s) and give mechanism for the following reaction. 1  $\frac{1}{2}$



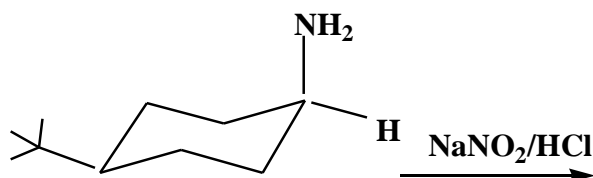
- (b) What happens when *cis*-1,3-cyclohexane dicarboxylic acid is heated? Comment on the chirality of the product. 2

- (c) Explain the fact that *trans*-4-*tert*-butylcyclohexyl tosylate undergoes bimolecular reaction with the base bromide and thiophenolate, although not with the much stronger base ethoxide. 2  $\frac{1}{2}$

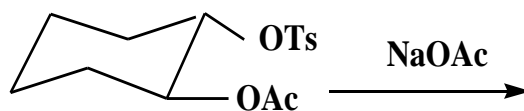
4. (a) Provide a mechanistic rationalisation to explain the stereochemical aspects of the following reaction. 3



- (b) Write the product with proper stereochemistry for the following reaction and explain: 1  $\frac{1}{2}$



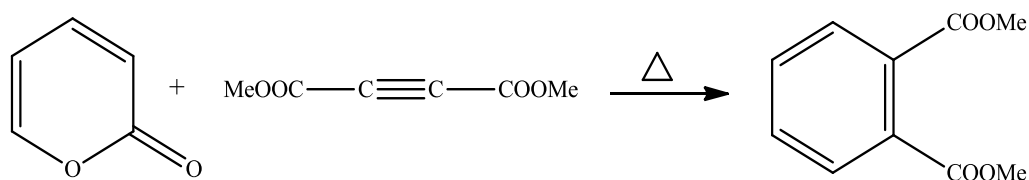
- (c) Predict the product of the following reaction with suitable mechanism: 1  $\frac{1}{2}$



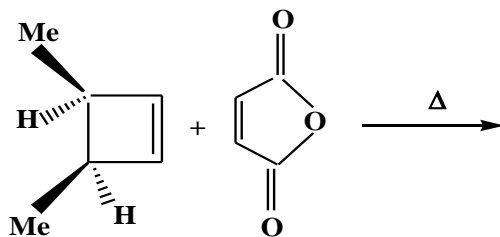
## UNIT-III

5. (a) In the thermal ring opening of *trans*-3,4-dimethylcyclobutene, two products can be formed by conrotatory mode, but only one is actually formed. Identify the possible products. Which one is observed and why? 2

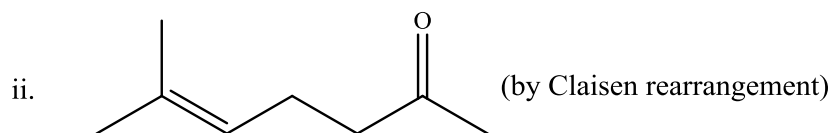
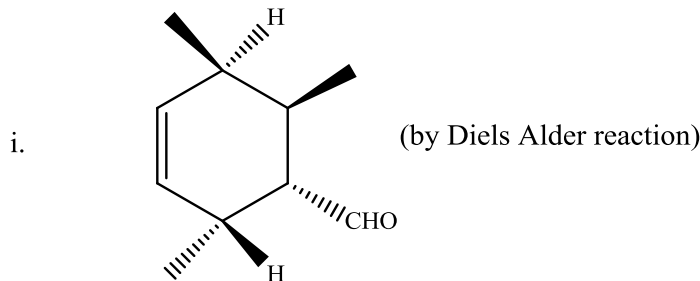
- (b) Propose a mechanism for the following reaction clearly indicating the pericyclic steps involved therein. 2



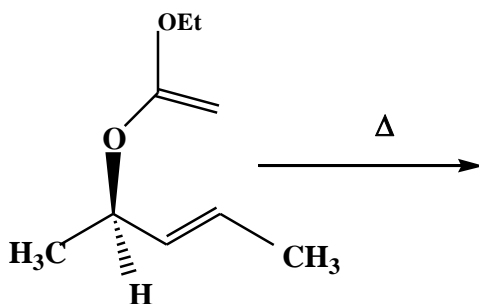
- (c) Predict the product with stereochemistry in the following reaction and indicate the reaction pathways: 2



6. (a) How can you synthesise the following compounds as directed? 2



- (b) Predict the product of the following reaction with explanation: 2

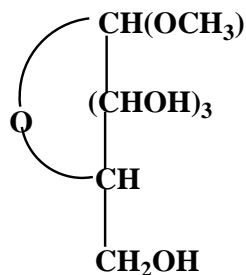


- (c) Thermal 1,3-sigmatropic shift of hydrogen is symmetry forbidden but thermal 1,3-sigmatropic shift of an alkyl group may be symmetry allowed. Explain in terms of FMO theory. 2

#### UNIT-IV

7. (a)  $\beta$ -D-Glucopyranose is oxidized at 250 times faster rate than  $\alpha$ -D-Glucopyranose using  $\text{Br}_2/\text{H}_2\text{O}$ . — Explain. 2
- (b) How can you convert D-glucose into: 2
- (i) *meso* tartaric acid and (ii) D-glucuronic acid?
- (c) D-Glucose and another aldohexose (A) give the same product when treated with sodium amalgam. Find out the structure of (A). To which family between D and L, does (A) belong? 2
- (d) How would you distinguish chemically between ribose and 2-deoxyribose? 2

8. (a) How many moles of  $\text{HIO}_4$  will be required for the oxidation of one mole of the following compound? Write down the products. 2



- (b) Why osazone formation doesn't proceed beyond C-2 of an aldohexose? 2
- (c) Clearly represent the most stable conformation of the  $\beta$ -pyranose form of the following sugars and justify. 2
- (i)  $\beta$ -D-allopyranose (ii)  $\beta$ -L-glucopyranose
- (d) Diisopropylidene derivative of D-glucose can be O-methylated at C-3, but that of D-galactose cannot give the same result. — Explain. 2

### UNIT-V

9. (a) Specific rotation of an amino acid is pH-dependent. — Justify. 2
- (b) Name one amino acid that produces yellow colour with ninhydrin. Write down the pertinent reaction. 1+2
- (c) A tripeptide X on hydrolysis gives two amino acids, Glu (2 equivalent) and Ala (1 equivalent). X does not react with 2,4-dinitrofluorobenzene. Ala is released first when X is incubated with carboxypeptidase. Deduce the structure for X. 3
- (d) Define the isoelectric point of an amino acid. How can lysine (pI 9.6) be separated from glycine (pI 5.97) by electrophoresis? 2
- 10.(a) Explain the role of cellular water in the stabilisation of a DNA duplex. Show the G-C base pairing in DNA. 1+2
- (b) In deionised water, isoelectric and isoionic points of an amino acid are identical. — Why? 1
- (c) Trace the route of synthesis of  $\text{Ph-CH(NH}_2\text{)-CO}_2\text{H}$  from phthalimide. 2
- (d) Predict the product with mechanism when leucine is heated with acetic anhydride in presence of pyridine. 2
- (e) How can you synthesise L-tryptophan using azlactone method? 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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