

2022

CHEMISTRY — HONOURS

Paper : CC-12

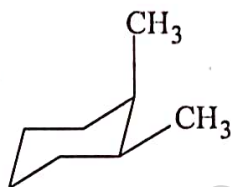
(Organic Chemistry)

Full Marks : 50

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*Answer **question no. 1** (compulsory) and **any eight (8)** questions from the rest (**question no. 2 to 12**).1. Answer **any ten** questions :

1×10

- Why 2, 3-ditertiarybutyl-but-1, 3-diene does not undergo Diels-Alder reaction?
- Why 9 or 10 position of anthracene is more reactive than any other position?
- Designate the structures of possible dipeptides which on hydrolysis afford one mole of glycine and one mole of alanine.
- Why do glycosides not react with either Fehling's or Tollens' reagent?
- What are the bases common both in DNA and RNA? (Structures not needed).
- Why indole-3-aldehyde cannot undergo Cannizzaro reaction?
- Why is conrotatory ring closure of $(4n + 2)\pi$ system photochemically allowed?
- Give an example of a substituted cyclohexane system where the conformation with axial substituent is more stable than the equatorial one.
- Furan undergoes Diels-Alder reaction, but pyrrole does not. Explain.
- Write down the structure of one pyrimidine base present in RNA only.
- Why 1,2-bond of naphthalene is shorter than 2,3-bond?
- What are the number of gauche-butane interactions present in the following compound?

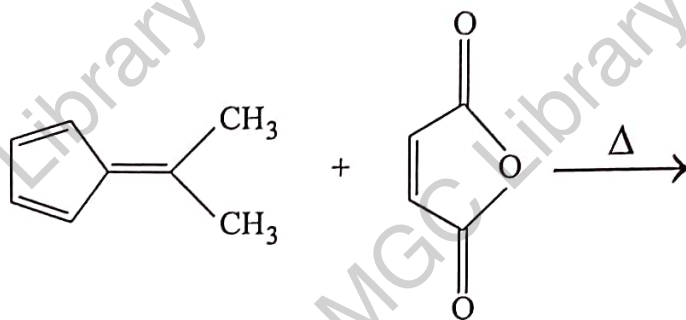
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- Explain why anthracene cannot be prepared from naphthalene by Friedel-Crafts reaction with succinic anhydride.
- Write down the mechanism of bromination of phenanthrene.

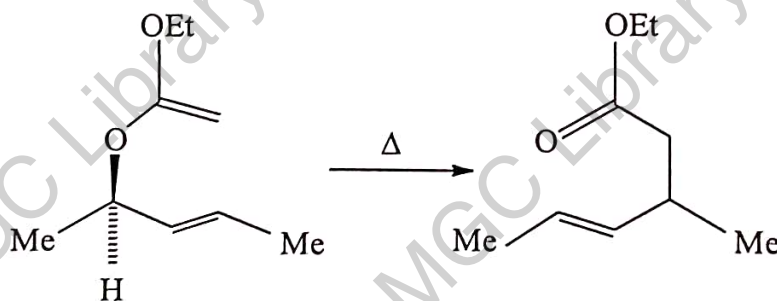
3+2

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3. (a) *cis*-cyclohexane-1,3-diol is oxidised by HIO_4 more rapidly than corresponding *trans*-isomer. Explain.
 (b) What happens when *cis*- and *trans*- isomers of 3-hydroxycyclohexanecarboxylic acid are heated separately? 3+2
4. (a) Convert open chain structure of D-galactose to β -D-galactopyranose and explain which form is more stable between 4C_1 and 1C_4 .
 (b) Why specific rotation of β -D-galactopyranose changes rapidly when dissolved in water? 3+2
5. (a) Predict the product of the following reaction and justify the formation in terms of FMO interaction.

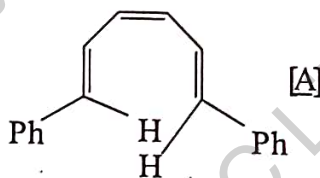


- (b) Suggest mechanism for the following transformation and depict the stereochemistry of the chiral centre. 3+2

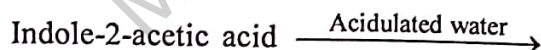


6. (a) Write the products when [A] is cyclised thermally and photochemically separately. Show FMO interaction and Woodward-Hoffman rule to explain the formation of products.

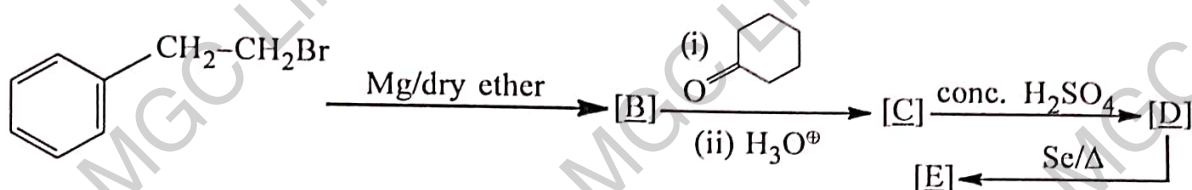
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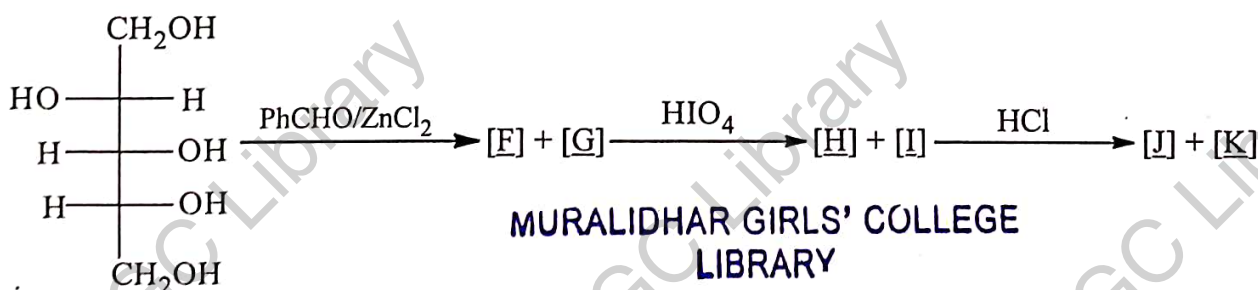
- (b) Write down the product of the following reaction with plausible mechanism.



7. (a) Identify [B] to [E] of the following sequence of reactions



- (b) What happens when pyridine-N-oxide is heated with acetic anhydride followed by hydrolysis of the product? 3+2
8. (a) Write down Sanger's degradation method for the N-terminal amino acid determination of the tripeptide ala-gly-phe. 3+2
- (b) Write down the reaction of proline with ninhydrin. 3+2
9. (a) Synthesise glutamic acid *via* phthalimidomalonic ester synthesis. 3+2
- (b) Provide the structures of the nucleosides of
- (i) Deoxyribose with cytosine
- (ii) Ribose with guanine. 3+2
10. (a) (i) Account for the formation of diketal from the reaction of D-glucose with acetone in sulphuric acid. 3+2
- (ii) Using the above technique convert D-glucose to D-3-benzylglucose.
- (b) Convert D-arabinose to D-mannose. 3+2
11. (a) Write down the mechanism of hydrolysis of adenosine and uridine. Which one undergoes more rapid hydrolysis in aqueous acid? Give reason in favour of your answer. 3+2
- (b) Write down the structure of cyclic AMP. When it is treated with aqueous sodium hydroxide, the major product is adenosine-3'-monophosphate rather than adenosine-5'-monophosphate. Explain the observation. 3+2
12. (a) Give the structures of [F] to [K] of the following :



- (b) Provide an explanation for the fact that under the same condition (NaOEt/EtOH at 75°C), the *cis*-isomer of 4-tertiarybutylcyclohexyl tosylate undergoes a facile E2 elimination reaction, but the *trans*-isomer does not. 3+2