

2021

## CHEMISTRY

[ Honours ]

PAPER – VI(A + B)

*Full Marks : 90**Time : 4 hours**The figures in the right-hand margin indicate marks***Use separate answer scripts for VI(A) and VI(B)****PAPER – VI-A***( Organic )*

[ Marks : 45 ]

## GROUP – A

Answer any **one** of the following questions : 5 × 1

1. (a) Define isoelectronic point of an  $\alpha$ -amino acid. Give its usefulness.  
(b) Define absorbance. 2 + 1 + 2
2. (a) Sucrose on heating with dil. HCl reduces Fehling's reagent. Why ?  
(b) Which protons between ethylene and acetylene are more deshielded and why? 2 + 1 + 2

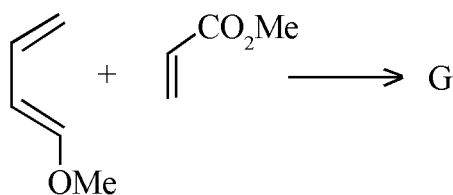
## GROUP – B

Answer any **two** of the following questions : 20 × 2

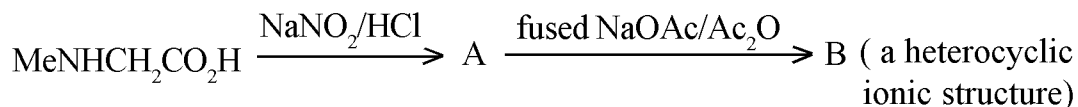
3. (a) Synthesize phenylalanine using Erlenmeyer azlactone synthesis.  
(b) What is the difference between nucleotide and nucleoside ?  
(c) Discuss the reaction of  $\alpha$ -D-glucose with acetone in the presence of acid catalyst. How the product can be used for selective epimerization of C3-OH group ?

*(Turn Over)*

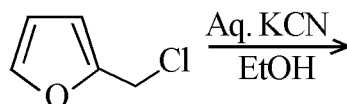
(d) Predict the structure of 'G' and rationalise its formation using F.M.O theory.



(e) Complete the following sequences and predict the aromaticity of the final product.



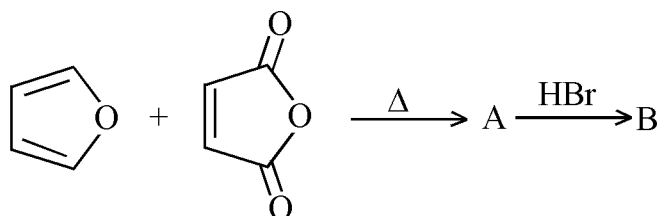
(f) Write down the product of the following reaction with suitable explanation.



(g) What do you mean by Finger print region ? 3 + 2 + + (3 + 1) + 3 + 3 + 3 + 2

4. (a) Write down the preferred conformation of  $\beta$ -L-glucopyranose. Convert D-glucose to D-fructose.

(b) Write down the structures of 'A' and 'B' in the following reaction and give suitable mechanism of their formation.



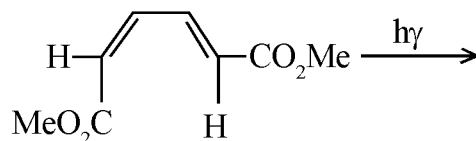
(c) Write down the Skraup synthesis of quinoline.

(d) Write down the mechanism of Fischer Indole synthesis.

(e) Discuss the Bischler-Napieralski synthesis of isoquinoline.

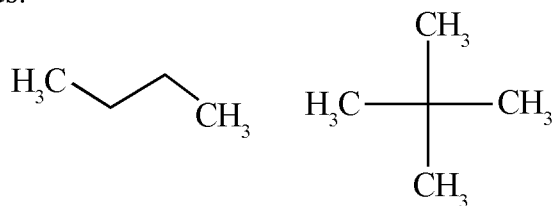
(2 + 3) + (2 + 2) + 4 + 4 + 3

5. (a) Predict the product with stereochemical outcome of the following reaction and show the mechanism with the help of orbital (HOMO).

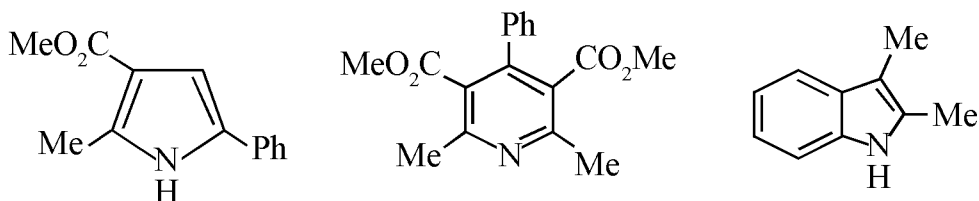


(b) Indole 3-carboxylic acid and indole 2-acetic acid decarboxylates readily in boiling water. Explain mechanistically.

- (c) Indicate what NMR ( $^1\text{H}$ ) spectra you expect from the following two compounds.



- (d) Outline the synthesis of following heterocyclic compounds (any two) :



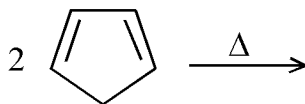
- (e) Discuss the validity of the following statements :

(i) Glucose is the only aldose that mutarotates

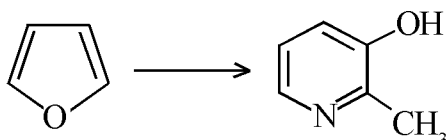
(ii) Glycosides mutarotates.

(2 + 2) + (2 + 2) + (2 + 2) + 5 + 3

6. (a) Outline the sequence of reactions by which D-glucose can be converted into methyl-2, 3, 4, 6-tetra-O-acetyl-D-glucopyranoside.
- (b) Write down the reaction which is used for the identification of amino acids using a spray reagent.
- (c) Write down the difference between DNA and RNA. Why guanosine is hydrolysed more rapidly than adenosine ?
- (d) Justify the formation of the products of the following reactions from FMO considerations.



- (e) Transform :



- (f) Write down the structure of the violet-coloured product from the reaction between an amino acid with ninhydrin. Explain mechanistically.
- (g) Suggest a method for the preparation of 3-nitropyrrole.

3 + 2 + (3 + 1) + 3 + 3 + (1 + 2) + 2

( 4 )

**PAPER – VI-B**

( *Inorganic* )

[ Marks : 45 ]

**GROUP – A**

Answer any **one** of the following questions : 5 × 1

1. Draw the MO diagram of  $\text{CoF}_6^{3-}$  complex and explain its magnetic property. 5
2. Draw the catalytic cycle for hydroformylation reaction using cobalt carbonyl as catalyst. 5

**GROUP – B**

Answer any **two** of the following questions : 20 × 2

3. (a) The ion  $\text{CrF}_6^{3-}$  shows absorption band at 14900; 22700; and 34400  $\text{cm}^{-1}$  respectively. Assign the bands from the Orgel diagram. Find out  $10Dq$  value.  
(b) Discuss the structure and bonding in Zeise's salt.  
(c) Give a flow chart for the extraction of ultrapure Ti from its ore. Write the related chemical reactions.  
(d) What do you mean by cooperative interaction during oxygenation of Hb and Mb ? 5 + 5 + 6 + 4
4. (a) Explain briefly the principle of separation of lanthanides by ion exchange method.  
(b) Find the expressions of CFSE of  $d^5$ ,  $d^6$  and  $d^7$  in weak and strong octahedral fields in terms of  $D_q$  and pairing energy(P).  
(c) Explain the role of hemoglobin and cytochromes in the biological system.  
(d) Show the different binding modes of NO in complexes giving suitable examples. 5 + 6 + 6 + 3
5. (a) Explain the nature of Jahn-Teller distortion expected for an octahedral complexes of  $d^9$  metal ion.  
(b) Explain with suitable examples, the different possible exchange pathways for the observed antiferromagnetism in transition metal complexes.

- (c) What are photosystem-I and II ? Explain their role in photosynthesis using Z-scheme.
- (d) Draw a polarogram and identify different parts. Define half-wave potential.  
5 + 5 + 5 + 5
6. (a) What is spectrochemical series ?  $\text{OH}^-$  is lower than  $\text{H}_2\text{O}$  in the spectrochemical series. Explain.
- (b) What do you mean by oxidative addition and insertion reaction. Explain with examples.
- (c) Cr(II) acetate monohydrate is diamagnetic at room temperature. Explain.
- (d) What is cis-platin ? State its medical use.
- (e) The cis isomer of  $[\text{Co}(\text{NH}_3)_5\text{Br}_2]^+$  is more intensely coloured than the trans isomer. Explain.  
5 + 5 + 4 + 3 + 3
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