TDC (CBCS) Even Semester Exam., 2023

CHEMISTRY

(Honours)

(4th Semester)

Course No. : CHMHCC-402T

(Organic Chemistry)

Full Marks : 50
Pass Marks : 20

Time : 3 hours

The figures in the margin indicate full marks for the questions

SECTION—A

Answer any *ten* questions : 2×10=20

1. Account for the following : 1×2=2

(a) Nitrobenzene does not undergo Friedel-Crafts reaction.

(b) Aniline is less basic than ethylamine.

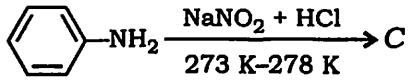
2. Convert the following : 1×2=2

(a) Nitrobenzene to benzoic acid

(b) Aniline to 1,3,5-tribromobenzene

3. Identify *A*, *B*, *C* and *D* from the following reactions : 1×2=2

(i) $CH_3NO_2 \xrightarrow[\Delta]{Zn + NH_4Cl} A \xrightarrow{\text{Tollen's reagent}} B$

(ii)  $\xrightarrow[273\ K–278\ K]{NaNO_2 + HCl} C \xrightarrow[H^+]{-N(CH_3)_2} D$

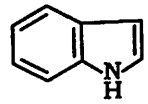
4. Why is electrophilic substitution reaction in pyrrole preferred at position 2 and not at position 3?

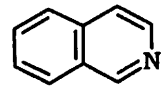
5. How will you prepare 2,5-dimethyl furan starting from acetonyl acetone?

6. Explain why pyridine is more basic than pyrrole.

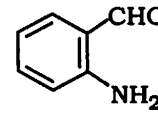
7. Electrophilic substitution of quinoline mainly takes place in benzene ring and not in heterocyclic ring. Explain.

8. Write the products of the following reactions : 1×2=2

(i)  $+ HCHO + (CH_3)_2NH \rightarrow ?$

(ii)  $\xrightarrow[\text{Alk. } KMnO_4]{[O]} ?$

9. Complete the following reaction and write the mechanism :

 $+ CH_3CHO \xrightarrow{OH^-} ?$

10. What are the physiological action of alkaloids?

11. Write a short note on Emde's modification.

12. Hygrine is having an N-methyl pyrollidone nucleus with an acetonyl group at its α-position. Explain.

13. What are terpenes? Give one example each of sesquiterpene and diterpene.

14. What is isoprene rule? Explain it with an example.

15. How will you show that citral is an α,β-unsaturated aldehyde?

SECTION—B

Answer any *five* questions : 6×5=30

16. *(a)* Discuss the mechanism of Hofmann's degradation of amide with suitable example. 3

(b) Justify the order of base strength of the following amines with suitable reasons : 2

$(CH_3)_2\ddot{N}H > CH_3NH_2 > (CH_3)_3N$

(in aqueous solution)

$(CH_3)_3\ddot{N} > (CH_3)_2\ddot{N}H > CH_3\ddot{N}H_2$

(in CCl_4 solvent)

(c) How will you convert aniline into phenylhydrazine? 1

17. (a) Distinguish among primary, secondary and tertiary amines by Hinsberg test. Write the chemical reaction in each case. 2½

(b) Write a short note on Hofmann exhaustive methylation. 1½

(c) Complete the following reaction and write the mechanism : 2

$C_6H_5NH_2 + CHCl_3 + KOH \rightarrow ?$

18. (a) Write Hansch synthesis of pyridine with mechanism. 3

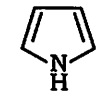
(b) How will you convert furan to thiophene and pyrrole? 2

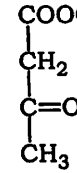
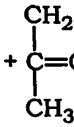
(c) Write the products for the following reactions : ½×2=1

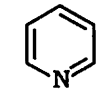
(i)  $+ NaNH_2 \xrightarrow[\Delta]{} ?$

(ii)  $+ HCN \xrightarrow{HCl} ?$

19. Complete the following reactions and write the plausible mechanism : 2×3=6

(i)  $\xrightarrow{CHCl_3 + KOH}$

(ii)  $+ NH_3 +$  $\longrightarrow ?$

(iii)  $+$ conc. $H_2SO_4 \xrightarrow{350\ ^\circ C} ?$

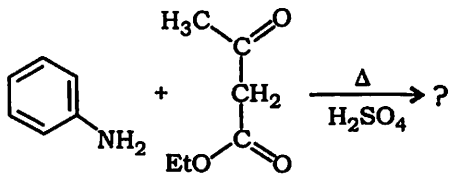
20. (a) Write the mechanism of Fischer-indole synthesis. 3

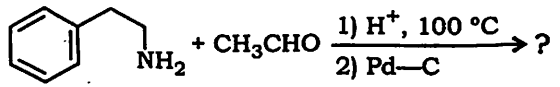
(b) Convert indole to 3-chloroquinoline. 1

(c) Prove that quinoline contains a benzene ring. 2

21. *(a)* Write a note on Bischler-Napieralski synthesis of isoquinoline with mechanism. 3

(b) Write the products of the following reactions (mechanism not required) : 1×2=2

(i) 

(ii) 

(c) Prepare 2-aminoquinoline from quinoline. 1

22. *(a)* Establish that—

(i) both the N-atoms of nicotine are 3°;

(ii) nicotine contains a pyridine ring. 1½+1½=3

(b) Write medicinal importance of morphine, hygrine and cocaine. 3

23. *(a)* Carry out the synthesis of nicotine indicating all the steps involved. 4

(b) Discuss the isolation of nicotine from tobacco leaves. 2

24. *(a)* Carry out the synthesis of citral. Clearly indicate the reagents and reaction conditions in each steps. 3

(b) Establish the structure of geraniol. 3

25. *(a)* What are α-terpineols? How will you detect the presence of the following in α-terpineol? 1+2=3

(i) A double bond

(ii) Tertiary —OH group

(b) What happens when—

(i) citral is ozonolyzed;

(ii) nerol is dehydrated with $KHSO_3$? 1+1=2

(c) Convert citral-a into geraniol. 1

★★★