

Chapter Exercise

1. Which one of the following heterocyclic compounds is not aromatic?

- (a) Pyridine (b) Pyrrole (c) Furan (d) Piperidine

2. The nitrogen atom in pyridine is

- (a) sp^2 -hybridised (b) sp^3 -hybridised
(c) sp -hybridised (d) Cannot be predicted

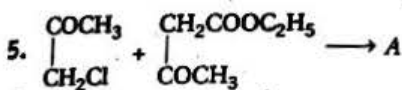
3. Pyridine has a delocalised π -molecular orbital containing

- (a) $4\pi e^-$ (b) $6\pi e^-$ (c) $8\pi e^-$ (d) $12\pi e^-$

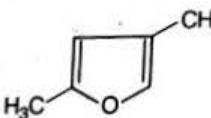
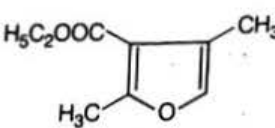
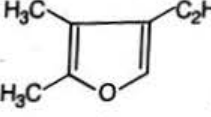
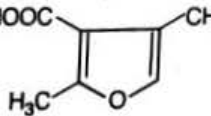
4. Pentose $\xrightarrow{\text{Acid}}$ $\xrightarrow{O_2}$ $\xrightarrow{\Delta}$ Product,

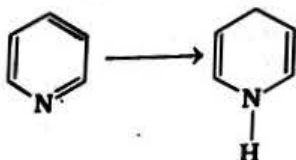
The product is

- (a)  (b) 
(c)  (d) 



Here, A is

- (a) 
(b) 
(c) 
(d) 



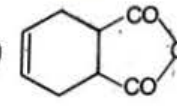
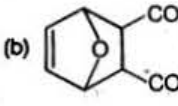
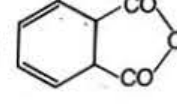
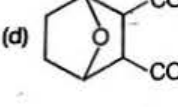
The above reaction is brought about by

- (a) Na / liq. NH_3 (b) Na / $\text{C}_2\text{H}_5\text{OH}$
(c) LiAlH_4 (d) HI / Δ

7. Pyrrole is less basic than pyridine because the lone pair of electrons of N-atom in pyrrole

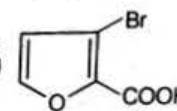
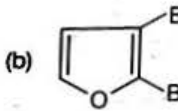
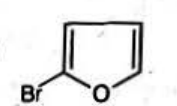
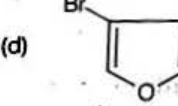
- (a) is the part of the delocalised π -molecular orbital
(b) is not part of the delocalised π -molecular orbital
(c) resides in sp^2 -hybrid orbital
(d) resides in sp -hybrid orbital

8. Furan reacts with maleic anhydride to give

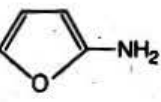
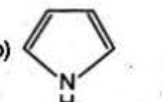
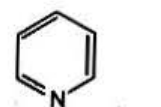
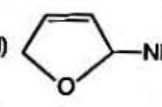
- (a)  (b) 
(c)  (d) 



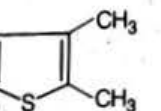
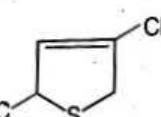
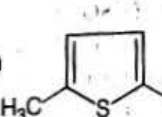
The major product of the reaction is

- (a)  (b) 
(c)  (d) 

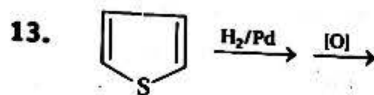
10. Which of the following product is formed, on passing a mixture of furan, ammonia and steam over heated alumina?

- (a)  (b) 
(c)  (d) 

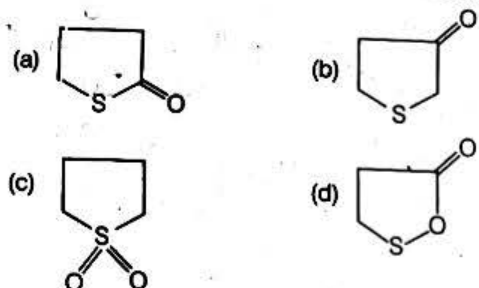
11. An enolisable 1,4-diketone on heating with P_2S_5 gives

- (a)  (b) 
(c)  (d) 

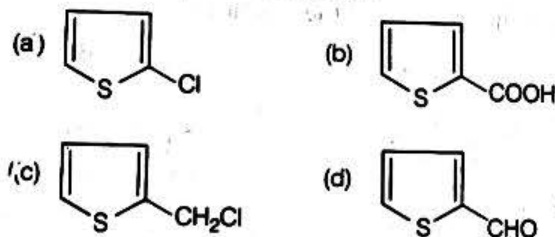
12. Pyridine is less basic than aliphatic amine because the lone pair of electrons on N-atom in pyridine resides in
- sp^2 -hybrid orbital
 - sp -hybrid orbital
 - sp^3 -hybrid orbital
 - sp^2d -hybrid orbital



The end product of the above reaction series is



14. Thiophene reacts with dimethyl formamide and phosphorus oxychloride to give



15. The order of aromaticity of furan, thiophene and pyrrole is as

- thiophene > furan > pyrrole
- furan > pyrrole > thiophene
- thiophene > pyrrole > furan
- pyrrole > thiophene > furan

16. Pyrrole reacts with chloroform in the presence of base to give pyrrole-2-carboxyaldehyde. This reaction is an example of

- Reimer-Tiemann reaction
- Gomberg reaction
- Houben-Hoesch reaction
- Cannizzaro reaction

17. Nicotinic acid reacts with soda lime to give

- pyrrole
- piperidine
- pyrrolidine
- pyridine

18. Pyridine undergoes electrophilic substitution with fuming H_2SO_4 at $350^\circ C$ to give

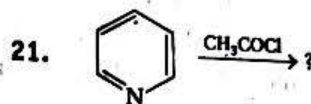
- 2-pyridinesulphonic acid
- 4-pyridinesulphonic acid
- 3-pyridinesulphonic acid
- None of the above

19. Pyridine reacts with a mixture of HNO_3 and H_2SO_4 at $300^\circ C$ to give

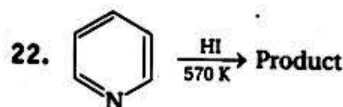
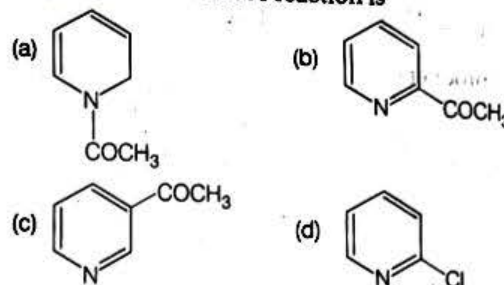
- 1-nitropyridine
- 2-nitropyridine
- 3-nitropyridine
- 4-nitropyridine

20. Which one of the following reagents will react with pyrrole to form 2-formyl pyrrole?

- $HCOOH$
- $CHCl_3 / KOH$
- H_2O_2
- $(CH_3CO)_2O / SnCl_4$

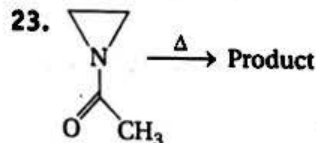


The product of the above reaction is

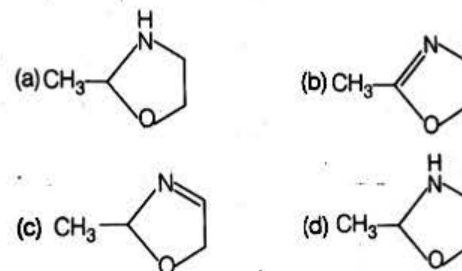


The product is

- piperidine
- n-pentane
- Both (a) and (b)
- pentanamine



The product is



24. Quinoline undergoes nucleophilic substitution on heating with $NaNH_2$ to give

- 2-aminoquinoline
- 4-aminoquinoline
- 3-aminoquinoline
- 8-aminoquinoline

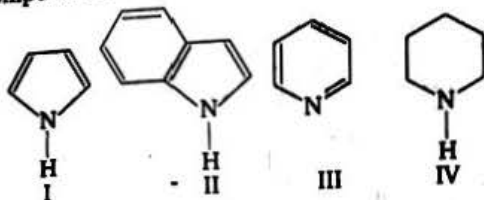
25. Which of the following reagents will react with furan to form 2-furan sulphonic acid?

- Dil. H_2SO_4 at $200^\circ C$
- SO_2 at $100^\circ C$
- Dil. H_2SO_4 at $100^\circ C$
- SO_3 in pyridine at $100^\circ C$

26. Pyridine undergoes nucleophilic substitution with NaNH_2 at 100°C to give

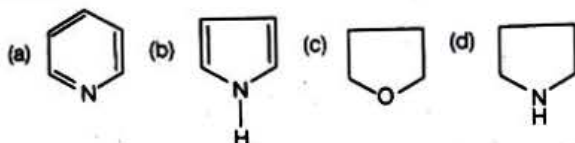
- (a) 3-aminopyridine (b) 2-aminopyridine
(c) 3,5-diaminopyridine (d) 2,5-diaminopyridine

27. The correct order of the basicity of the following compounds is

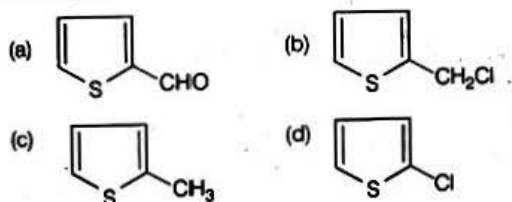


- (a) $\text{III} > \text{IV} > \text{I} > \text{II}$ (b) $\text{III} > \text{IV} > \text{II} > \text{I}$
(c) $\text{IV} > \text{III} > \text{I} > \text{II}$ (d) $\text{IV} > \text{III} > \text{II} > \text{I}$

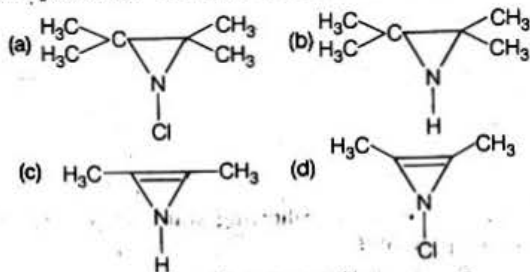
28. Among the following compounds, the most basic compound is



29. Thiophene reacts with HCHO in the presence of aqueous HCl to give



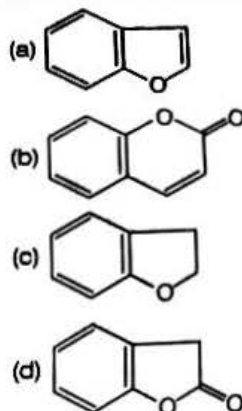
The product, P of the above reaction series is



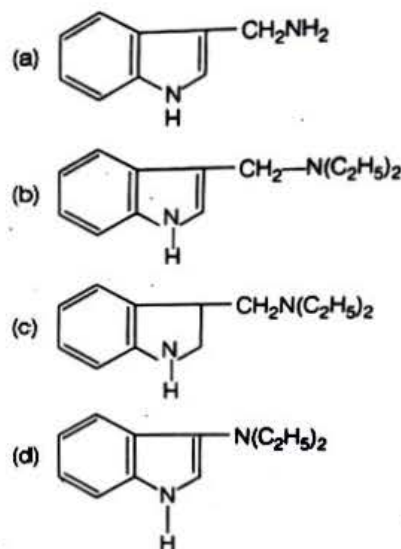
31. Azetidine reacts with H_2O_2 to give

- (a) $\text{CH}_3\text{CH}=\text{CH}_2 + \text{NH}_3$ (b) $\text{CH}_3\text{CH}=\text{CH}_2 + \text{N}_2$
(c) $\text{CH}_3\text{CH}_2\text{CH}_3 + \text{N}_2$ (d) $\text{CH}_3\text{CH}_2\text{CH}_3 + \text{NH}_3$

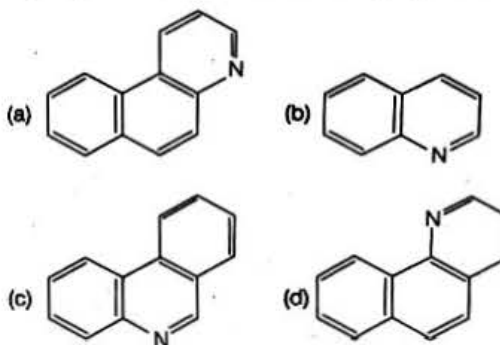
32. The structure of coumarone is as



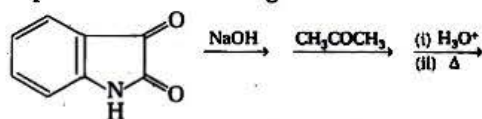
33. Indole + $\text{CH}_2\text{O} + (\text{C}_2\text{H}_5)_2\text{NH} \longrightarrow \text{Product}$
The product of the above reaction is



34. Which of the following compounds is formed, when α -naphthylamine is used in the Skraup synthesis?



35. The product of the following transformation is



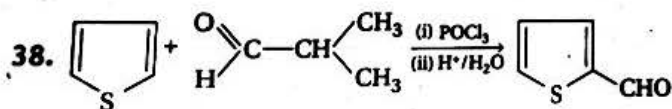
- (a)
- (b)
- (c)
- (d)

36. On nitration with nitric acid and acetic anhydride, quinoline gives the major product,

- (a) 5-nitroquinoline (b) 8-nitroquinoline
(c) 3-nitroquinoline (d) 2-nitroquinoline

37. Isoquinoline on oxidation with alkaline KMnO_4 gives

- (a)
- (b)
- (c) Both (a) and (b) (d) None of these



This reaction is known as

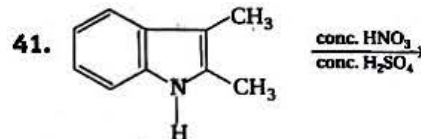
- (a) Vilsmeier-Haack reaction (b) Friedlander reaction
(c) Pfitzinger reaction (d) Döbereiner-Miller reaction

39. Fischer's indole synthesis involves

- (a) [2, 3] sigmatropic shift (b) [3, 3] sigmatropic shift
(c) [3, 2] sigmatropic shift (d) [2, 2] sigmatropic shift

40. Benzofuran reacts with peracid to give

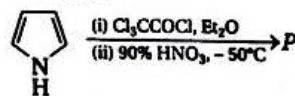
- (a)
- (b)
- (c)
- (d)



The major product of the above nitration reaction is

- (a)
- (b)
- (c)
- (d)

42. Identify the major product, *P* in the following two steps reaction.



- (a)
- (b)
- (c)
- (d)

43. Which one of the following statements is not correct about pyridine?

- (a) Pyridine undergoes halogenation but less readily than benzene
(b) On nitration, pyridine gives 3-nitropyridine
(c) Pyridine is used as a solvent
(d) Pyridine resembles benzene in all of its properties

44. Consider the following statements.

- I. Quinoline is a secondary base.
- II. Quinoline on oxidation with aqueous KMnO_4 gives quinolinic acid.
- III. Isoquinoline is a stronger base as compared with quinoline.
- IV. In isoquinoline, nucleophilic substitution occurs at 5-position.

Select the correct statements.

- (a) II, III and IV (b) I and II
(c) II and III (d) I, II and IV

45. Match the List I with List II and choose the correct answer using the codes given below.

List I	List II
A. Pyrrole	1. Indophenin reaction
B. Pyridine	2. Dippels oil (bone oil)
C. Indole	3. In denaturing rectified spirit
D. Quinoline	4. Indigotin
	5. Antiseptic

Codes

- | | |
|-------------|-------------|
| A B C D | A B C D |
| (a) 2 3 4 5 | (b) 2 5 1 3 |
| (c) 3 2 4 5 | (d) 3 4 1 5 |

46. Match List I with List II.

List I	List II
A. Pyrrole	1. Pictet-Spengler
B. 1,4-dihydropyridine	2. Chichibabin
C. Isoquinoline	3. Paal-Knorr
	4. Hantzsch

Codes

- | | |
|-----------|-----------|
| A B C | A B C |
| (a) 1 2 3 | (b) 2 3 4 |
| (c) 4 1 2 | (d) 3 4 1 |

7. Which one of the following is not the use of quinoline?

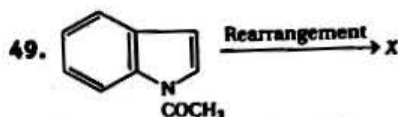
- (a) It acts as a high boiling solvent
(b) It acts as an antiseptic
(c) In analytical work for precipitation of certain metals
(d) In denaturing alcohol

8. Consider the following statements.

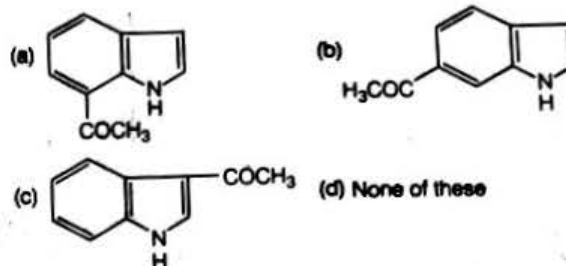
- I. Furan undergoes electrophilic substitution at the 2-position.
- II. Thiophene ring occurs in the vitamin-C molecule.
- III. Thiophene is more aromatic than furan.
- IV. Pyrrole is more basic than pyridine.

Select the correct statements.

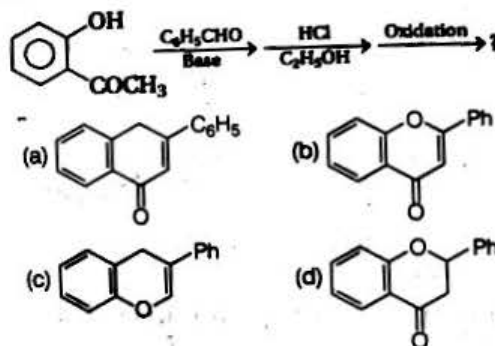
- (a) I and III (b) I, III and IV
(c) I, II and III (d) III and IV



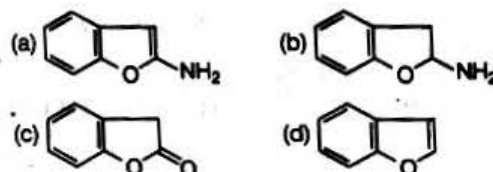
In this reaction, product X is



50. The major product of the following transformation is



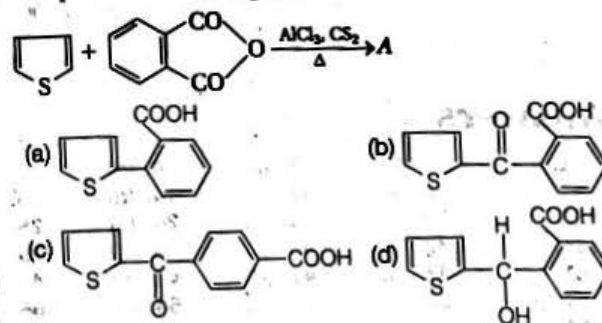
51. The reduction of 2-nitrobenzofuran with Sn/HCl to give

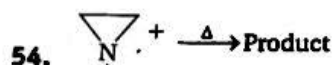


52. Which of the following reagents will react with furan to form 2-furan sulphonic acid?

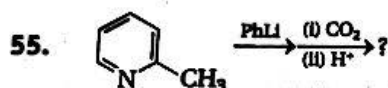
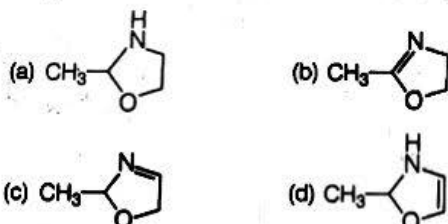
- (a) Dilute H_2SO_4 at 200°C (b) SO_2 at 100°C
(c) Dilute H_2SO_4 at 100°C (d) SO_3 in pyridine at 100°C

53. The product 'A' in the given reaction is

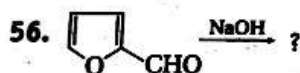
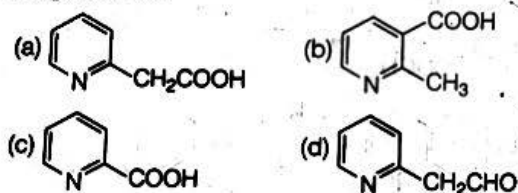




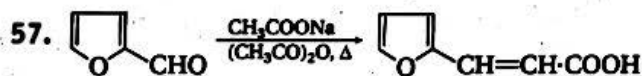
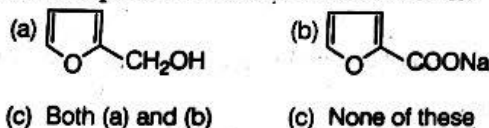
The product is



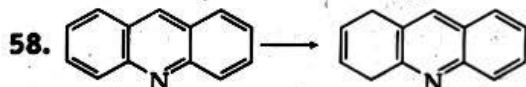
The product is



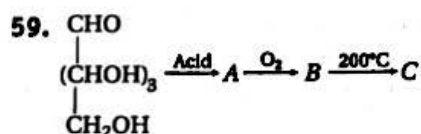
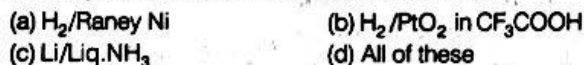
The end product of the above reaction is:



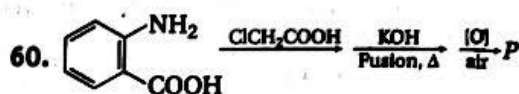
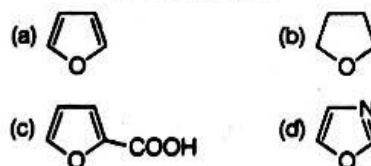
This reaction is called



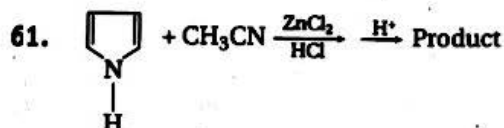
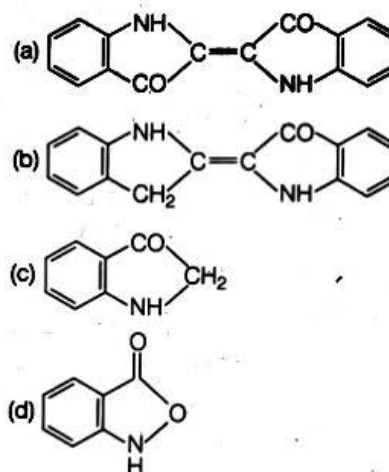
The reagent for the above transformation is



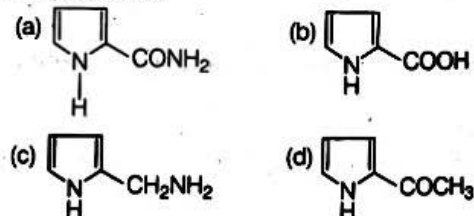
The structure of compound C is



The product P is



The product is



Answers

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (d) | 2. (a) | 3. (b) | 4. (b) | 5. (b) | 6. (a) | 7. (a) | 8. (b) | 9. (c) | 10. (b) |
| 11. (d) | 12. (a) | 13. (c) | 14. (d) | 15. (c) | 16. (a) | 17. (d) | 18. (d) | 19. (c) | 20. (b) |
| 21. (a) | 22. (b) | 23. (b) | 24. (a) | 25. (d) | 26. (b) | 27. (d) | 28. (d) | 29. (b) | 30. (b) |
| 31. (a) | 32. (a) | 33. (b) | 34. (d) | 35. (a) | 36. (c) | 37. (b) | 38. (a) | 39. (b) | 40. (b) |
| 41. (a) | 42. (a) | 43. (d) | 44. (c) | 45. (a) | 46. (d) | 47. (d) | 48. (a) | 49. (c) | 50. (b) |
| 51. (c) | 52. (d) | 53. (b) | 54. (b) | 55. (a) | 56. (c) | 57. (b) | 58. (a) | 59. (a) | 60. (a) |
| 61. (d) | | | | | | | | | |