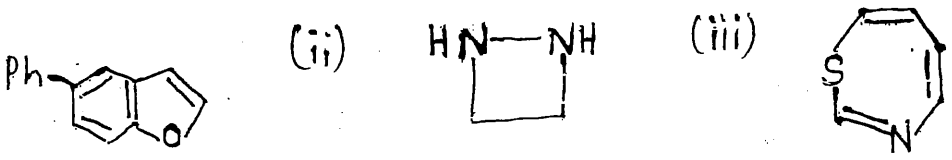
(3 Hours) [ Total Marks : 75

N. B. : (1) Attempt **All** questions.
(2) **Figures** to the **right** indicate **full** marks.

1. Answer any **five** of the following :–
(a) Give the IUPAC names of the following compounds: 3




(b) Electrophilic substitution in pyrrole takes place at position -2 while in indole it takes place at position-3. 3
(c) Explain structure - activity relationship (SAR) of the following :– 3


Where R = (i) $-SO_3H$
(ii) $-SO_2NHCH_3$

(d) Give the synthesis of Ramipril. 3
(e) Discuss the applications of fluorescence spectroscopy. 3
(f) How is NOE useful in NMR spectroscopy? 3
(g) Give the synthesis of 4-tert butyl Calix [4] arene. 3
(h) Give the chemical reactivity of $C_{60}$. 3

2. (a) (i) How is coumarin synthesised by :– 3
(I) Pechmanns synthesis
(II) From o-hydroxy benzaldehyde and anhydride.
(ii) Explain :– 3
(I) Position 1 in isoquinoline is activated much more strongly than position-3 for a nucleophilic attack.
(II) Imidazole is more basic than pyridine.

**OR**

(a) (i) Give two methods of preparation of pyrimidines. 3
(ii) Explain the following :– 3
(I) Pyridine N-oxide undergoes both electrophilic and nucleophilic substitution reactions.
(II) Pyrazole is a weaker base than imidazole.

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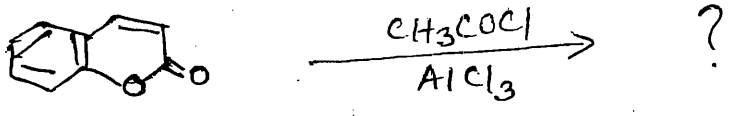
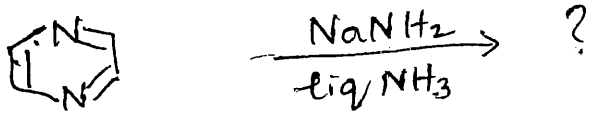
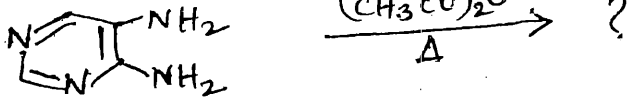
(b) How is quinoline synthesised by 4
(i) Skraups synthesis
(ii) Friedlanders synthesis

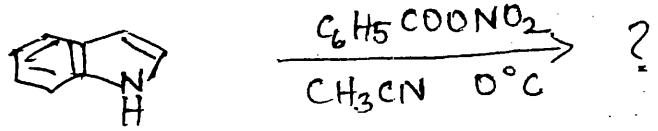
**OR**

(b) Complete the following reactions :– 4

(i) 


(ii) 


(iii) 


(iv) 


(c) Give the synthesis of benzimidazole from 1,2-diaminobenzene. Explain the reactivity of imidazole towards electrophiles. 5

3. (a) Explain the measurement and importance of lipophilicity in drug action. 6

**OR**

(a) What is combinatorial synthesis? Explain the manual and automated approach to the above synthesis. 6

(b) Give the synthesis and applications of Nateglinide. 4

**OR**

(b) What is a lead compound? Can drugs be discovered without a lead? Explain. 4

(c) Explain chain branching and ring chain transformation to increase potency and therapeutic index of a drug. 5

4. (a) Draw a sketch of COSY and HETCOR spectrum for 4-methylpentan-2-one, showing the expected diagonal and off-diagonal peaks. 6

**OR**

(a) Discuss the applications of ESR spectroscopy. 6

Calculate $^{13}C$ NMR chemical shift of all the aromatic carbons using the chemical shift correlation table given below, for the following compounds :

(i) 2-nitrophenol (ii) 1,3-dinitrobenzene.

| Increments in ppm | | | | |
|---|---|---|---|---|
| Substitute | ipso | ortho | meta | para |
| OH | 26.6 | -12.7 | 1.6 | -7.3 |
| $NO_2$ | 19.6 | -5.3 | 0.9 | 6.0 |

(b) Draw the proton decoupled, DEPT-135, DEPT-90 and DEPT-45 of the compound isobutylacetate. 4

**OR**

(b) Explain COSY technique with a suitable example. 4

(c) Discuss in brief: Long range coupling. 5
Explain why the diastereotopic protons have different chemical shifts.

5. (a) Give the different classes of cyclophanes and any two methods of synthesis of cyclophane. 6

**OR**

(a) Discuss the structure and give methods of synthesis of [3] prismane. 6

(b) What are rotaxanes? Outline the structural features of rotaxanes. 4

**OR**

(b) What is photochromism? Give the synthesis of spiropyrans. 4

(c) Describe the metal ion sensors derived from crown ethers and give its synthesis. 5

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