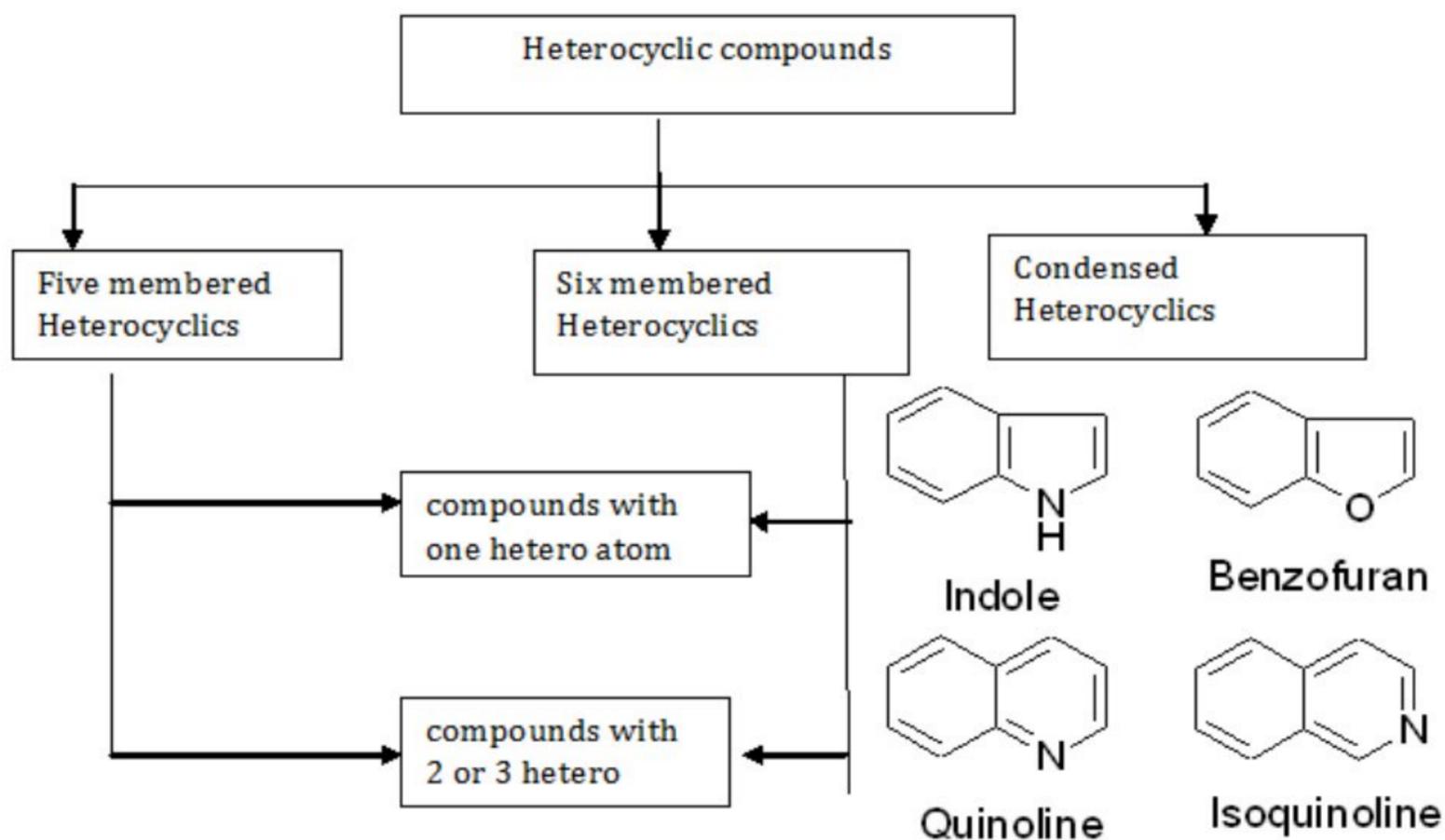


UNIT-4

HETEROCYCLIC COMPOUNDS

4.0 INTRODUCTION

Heterocyclic compounds are compounds with at least one heteroatom as the ring member which are relatively stable and exhibits aromatic character.

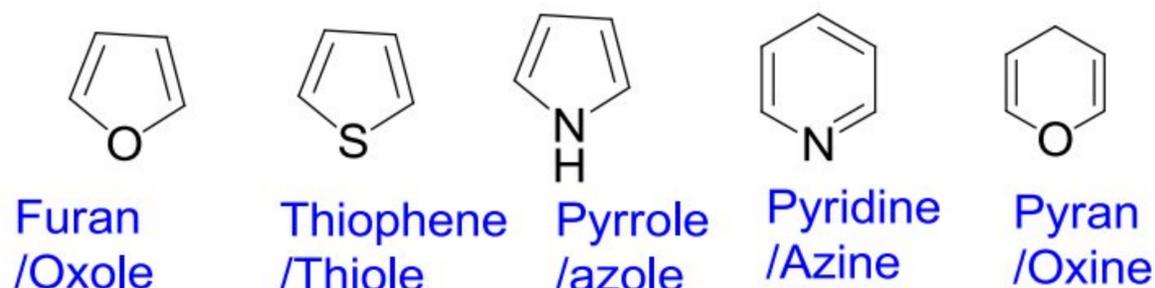


4.1 NOMENCLATURE

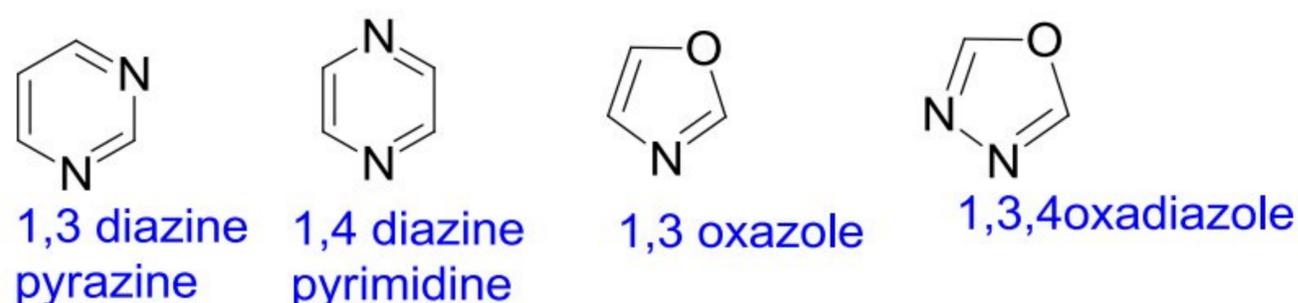
Rings with one hetero atom follows the following rule:

Hetero atom	Prefix	No. of atoms	Suffix	UnSaturated Other Atoms N	UnSaturated N	Saturated Other Atoms	N
N	Aza	3	Ir	ene	ine	Ane	dine
O	Oxa	4	Et	e	e	Ane	dine
S	Thia	5	Ol	e	e	ane	dine

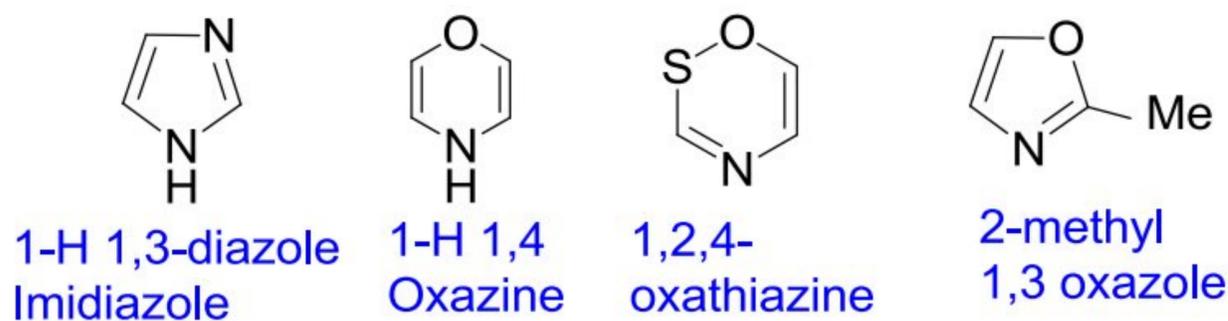
P	Phospha	6	In	e	e		
As	arsa	7	epin	e	e		



Rings with more than one heteroatom, the order of priority is O>S>N.



A saturated heteroatom with an extra-hydrogen attached is given priority over an unsaturated form of the same atom.

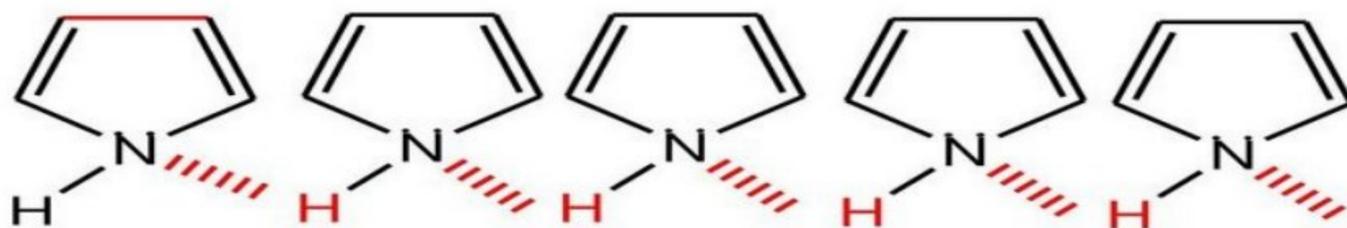


Systems where two rings share a common single or double bond, which are said to be fused rings. A common case is where a benzene ring is fused to a heterocyclic ring. The name begins with the prefix "benzo." The point of attachment is indicated by a letter that defines the "face" of the heterocycle involved. Thus, the 1,2- position on the heterocyclic ring is always the "a-face," 2,3- is the "b-face," 3,4- is the "c-face," and so on.

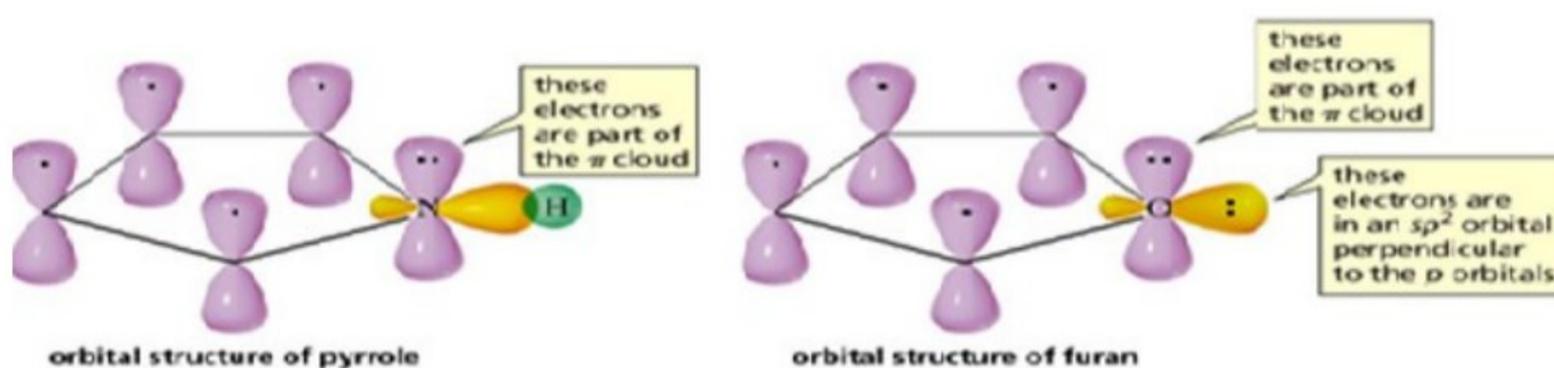


4.2 GENERAL CHARACTERISTICS

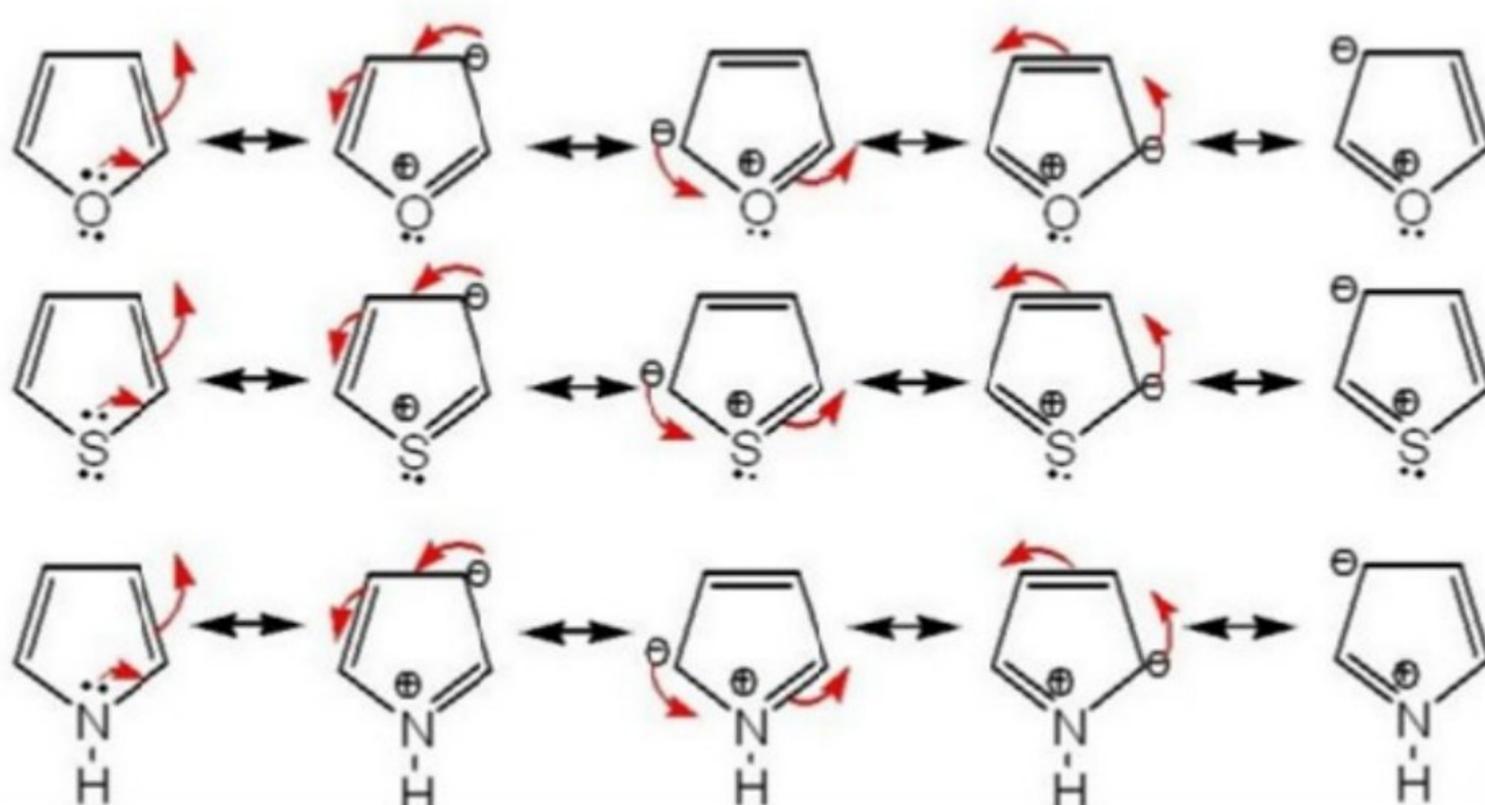
Pyrrole, furan and thiophene are colorless liquids of boiling points 126°, 32°, and 84° respectively. Pyrrole has a relatively high boiling point as compared to furan and thiophene, this is due to the presence of intermolecular hydrogen bonding in pyrrole.



Pyrrole furan and thiophene are aromatic because: 1) they fulfill the criteria for aromaticity, the extent of delocalization of the nonbonding electron pair is decisive for the aromaticity, thus the grading of aromaticity is in the order of: furan < pyrrole < thiophene < benzene. oxygen (3.44), nitrogen (3.04) and thiophene (2.56).



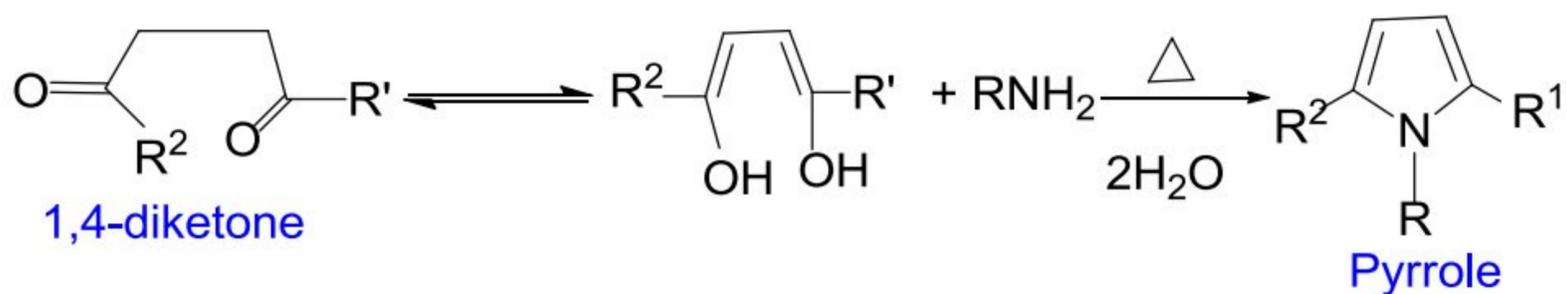
They tend to react by electrophilic substitution due appearance of -ve charge on carbon atoms due to delocalization as shown in the following resonance structures.



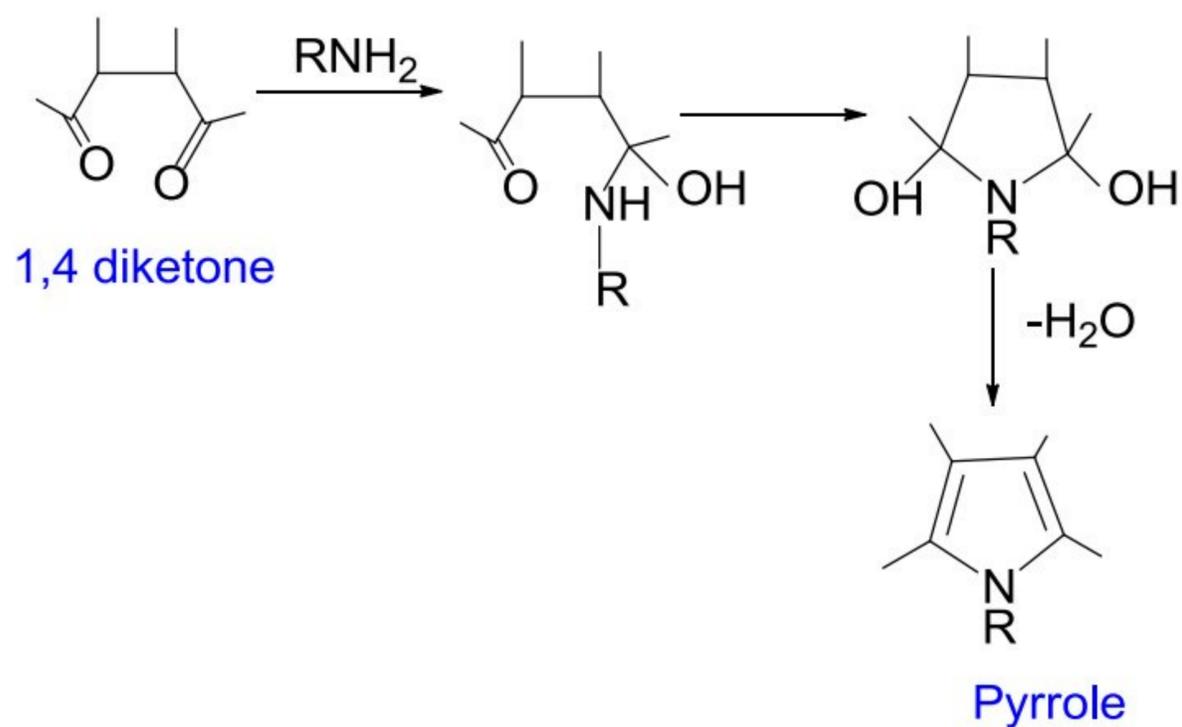
4.3 PYRROLE

4.3.1 Synthesis:

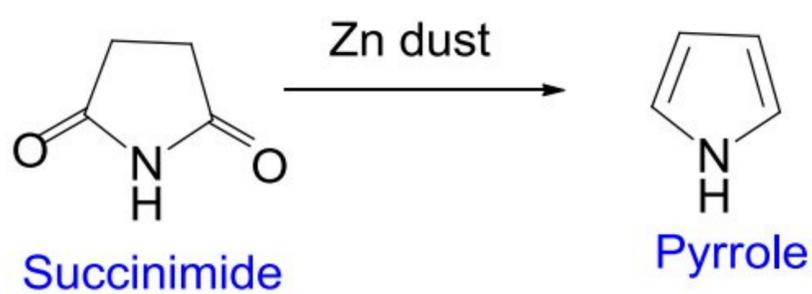
1) Pall-Knorr synthesis: Heating diketone with ammonia or aliphatic amine.



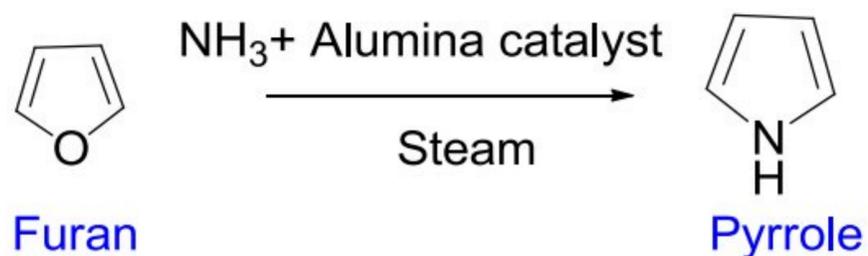
Mechanism:



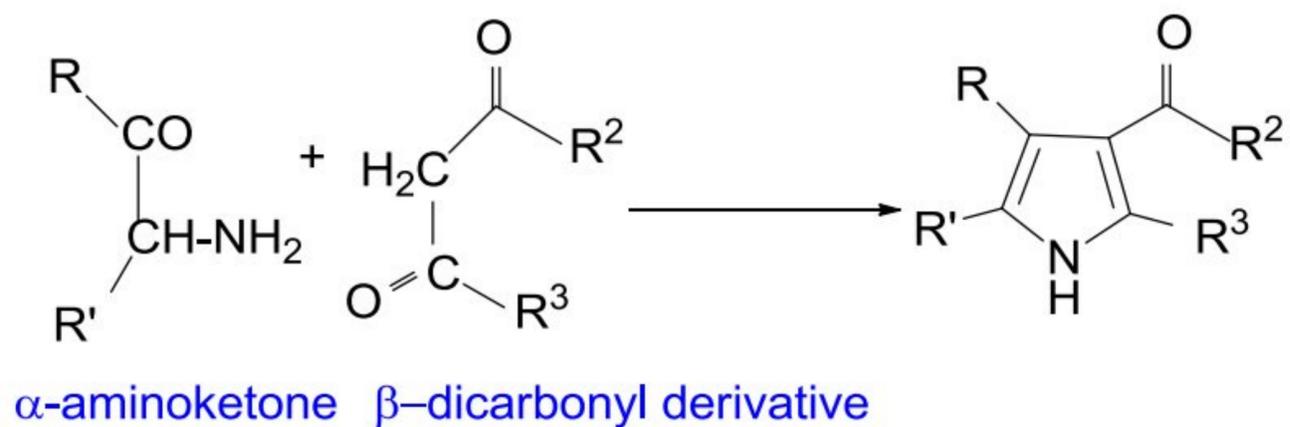
2) Pyrrole is obtained by distillation of succinimide over zinc dust



3) By heating a mixture of furan, ammonia, steam over the presence of alumina catalyst



4) Knorr-Pyrrole synthesis: Reaction between α - amino ketone and β -keto ester.



4.3.2 Electrophilic Substitution:

Electrophilic substitution in 5 membered ring occurs at C2 and not at C3. The resonance structures are more at C2 than at C3.

