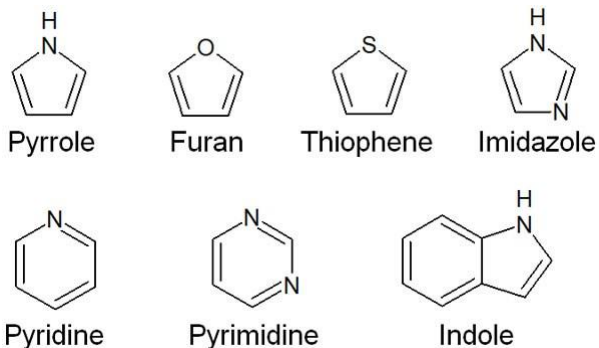


Heterocyclic Compounds

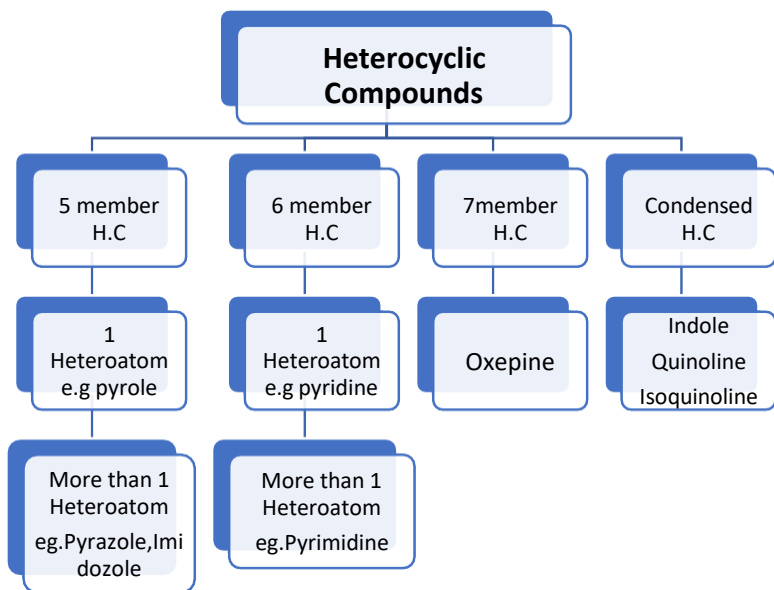
Defination:

Any cyclic organic compound in which there is atleast one atom of an element is other than carbon (N , S , O etc) called heteroatom.

Examples:



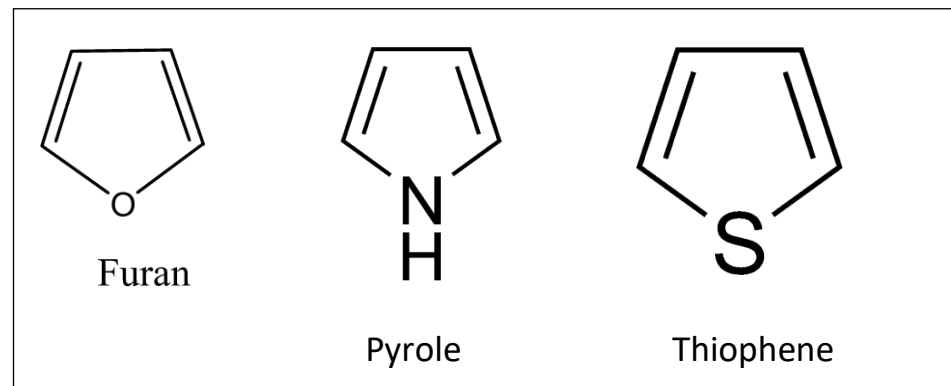
Classification of Heterocyclic Compounds



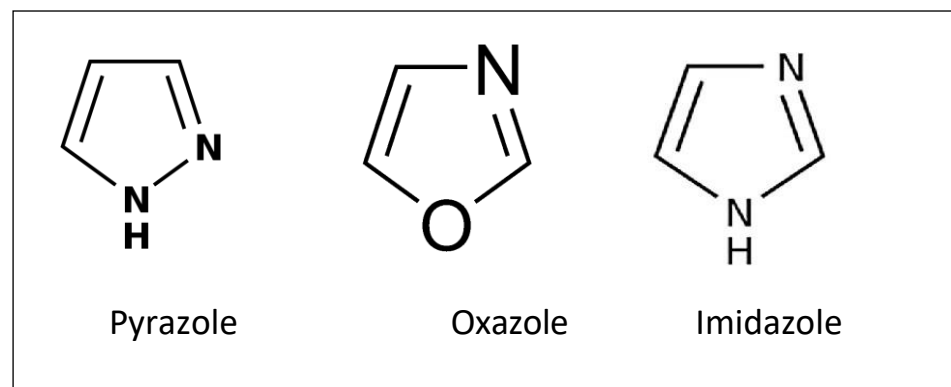
1) 5 member Heterocyclic Compound

A ring contains 5 atoms.

a) One Heteroatom



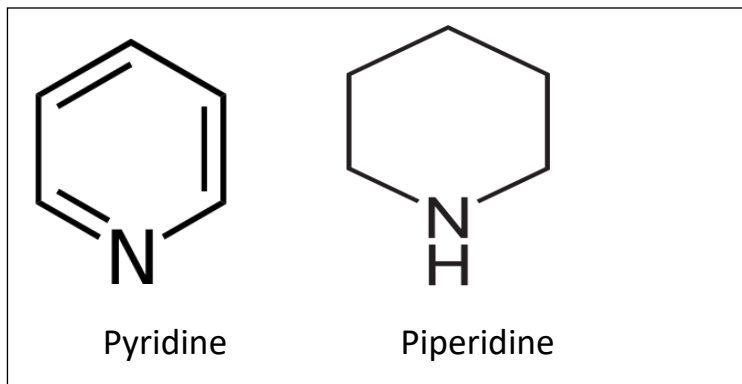
b) More than one heteroatom



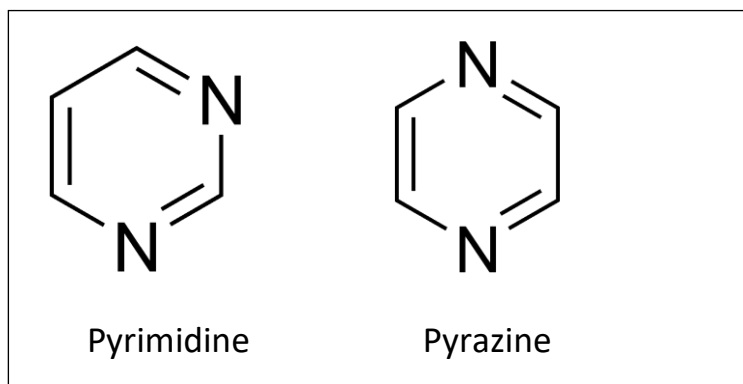
2) 6 member Heterocyclic Compound

Those heterocyclic compounds in which 6 atoms are present in ring.

a) One Heteroatom

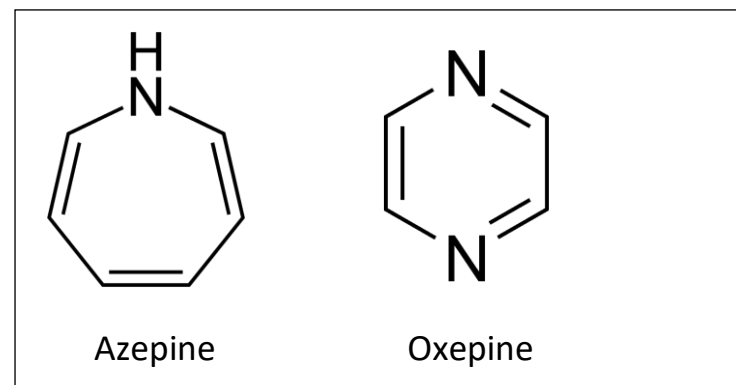


c) More than one heteroatom



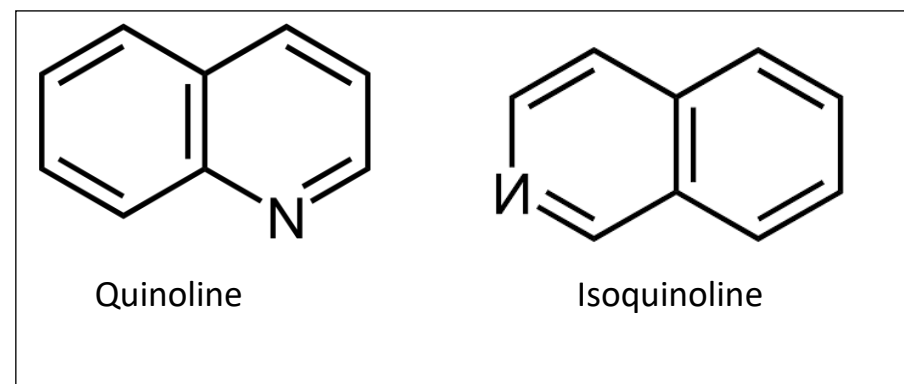
3) 6 member Heterocyclic Compound

A heterocyclic compound containing 7 atoms.



4) Condensed Compound

Those heterocyclic compounds in which at least two rings are fused.



Nomenclature of heterocyclic compounds:

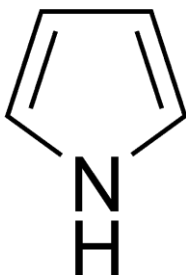
Oxygen (O) \Rightarrow Oxa

Nitrogen (N) \Rightarrow Aza

Sulphur (S) \Rightarrow Thia

Pyrrole:

It is 5 membered heterocyclic compound containing nitrogen as heteroatom.

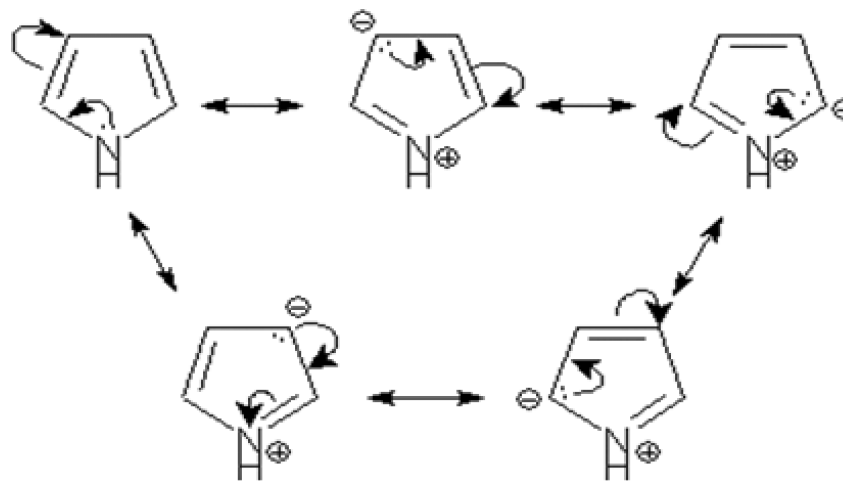


- Chemical formula : C_4H_5N
- Molecular weight: 67
- It occurs naturally in alkaloid, chlorophyll, haemoglobin.

Physical Properties:

- Pyrrole is a liquid which rapidly turns brown on exposure to air.
- Weakly basic in nature.
- Sparingly soluble in water but dissolves in Ethane and ether.
- Boiling point -129°C .

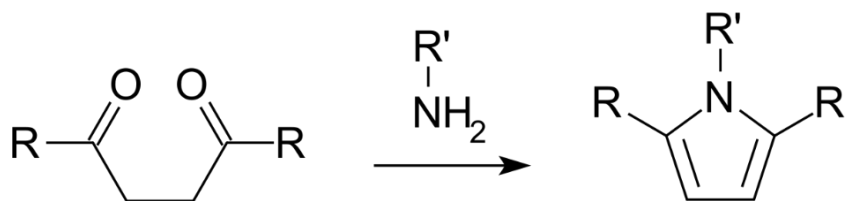
Resonance Structure Of Pyrrole



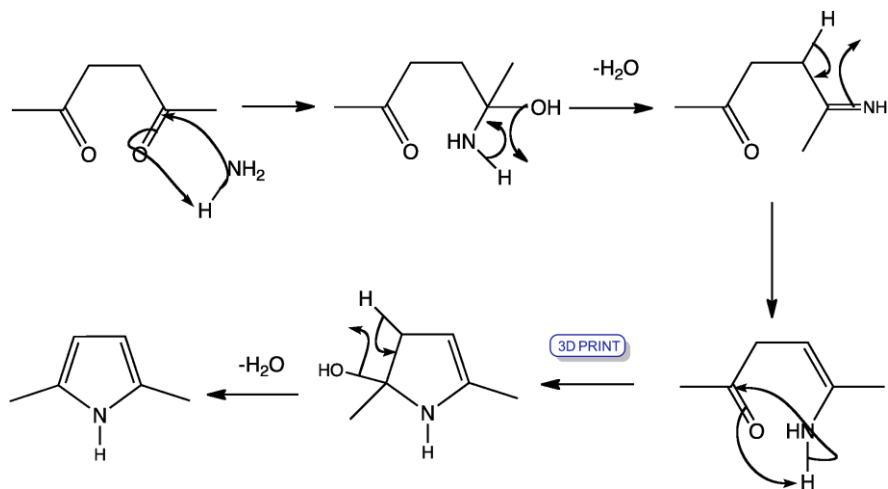
Synthesis of Pyrrole

1) Paal-Knorr Synthesis

In this reaction 1,4-diketone compound react with ammonia and gives derivatives of pyrrole.



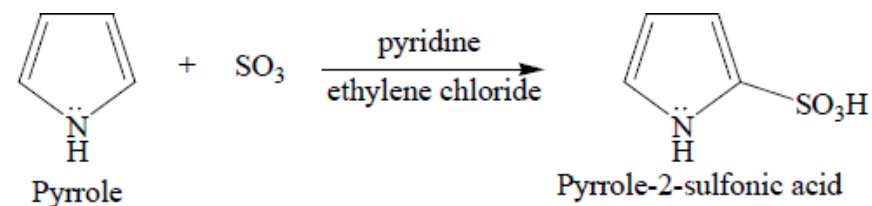
Mechanism



Chemical Reaction Of Pyrrole

1) Sulphonation

In this the reaction pyrrole is treated with sulphuric acid in the presence of pyridine to gives pyrrole-2-sulphonic acid.

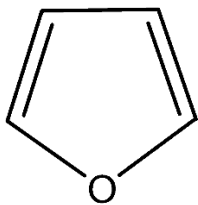


Medicinal use of pyrrole & it's derivatives

- i) **Procyclidine** – It is an anti-muscarinic drug used in the treatment of parkinsonism.
- ii) **Atorvastatin** – Useful to prevent cardiomascular diseases.

Furan:

It is five membered heterocyclic compound containing oxygen as heteroatom.



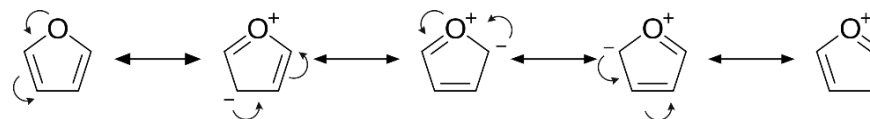
Furan

- Chemical formula : C_4H_4O
- Molecular weight: 68
- Hybridization : sp^2 (Carbon), sp^3 (Oxygen)

Physical Properties:

- It is a colourless liquid.
- It is only slightly soluble in water.
- It has a chloroform like smell.
- Boiling point is $32^\circ C$.

Resonance Structure

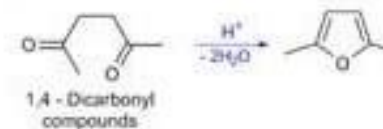


Synthesis

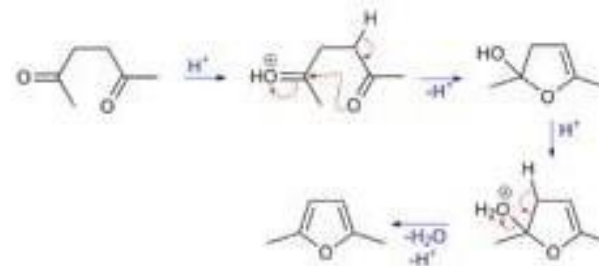
1) Paal-Knorr Synthesis

In this reaction, a 1,4-dicarbonyl compound converts into an enol form which further on dehydration gives 2,5-dimethyl furan.

Mechanism of Paal-Knorr synthesis of Furan

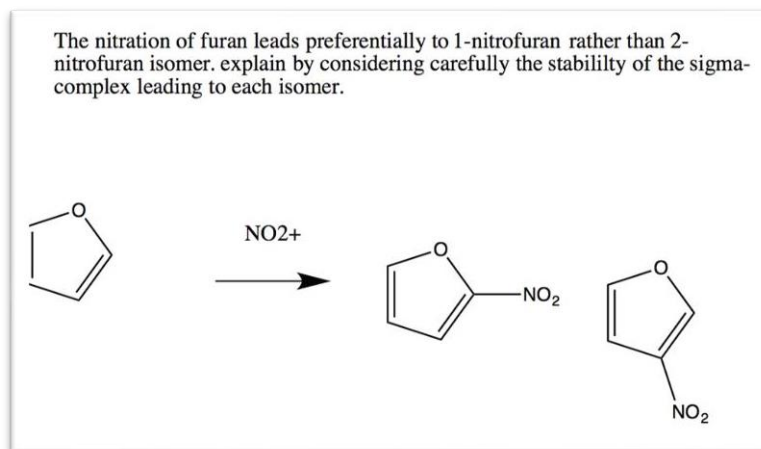


Mechanism



Chemical Reaction

1) Nitration

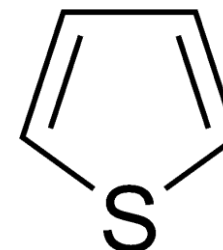


Medicinal uses:

- Used in the treatment of antidepressants.
- Analgesic, Muscle relaxant, antihypertensor.
- Used as solvent for resin.

Thiophene:

It is five membered heterocyclic compound containing sulphur as heteroatom.



Discovered by Victor Meyer in 1882.
Thiophene is aromatic in nature.

- **Chemical formula :** $\text{C}_4\text{H}_4\text{S}$
- **Molecular weight:** 84
- **Hybridization :** SP^2

Physical Properties:

- It is a colourless liquid.
- It is insoluble in water but miscible with most organic solvent.
- It have an odour very similar that of benzene.
- Boiling point is 84°C .

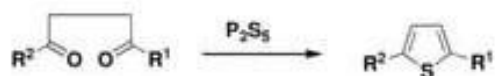
Synthesis

1) Paal-Knorr Synthesis

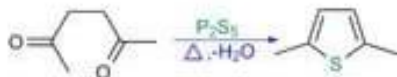
Synthesis

1. Paal-Knorr synthesis of Thiophene

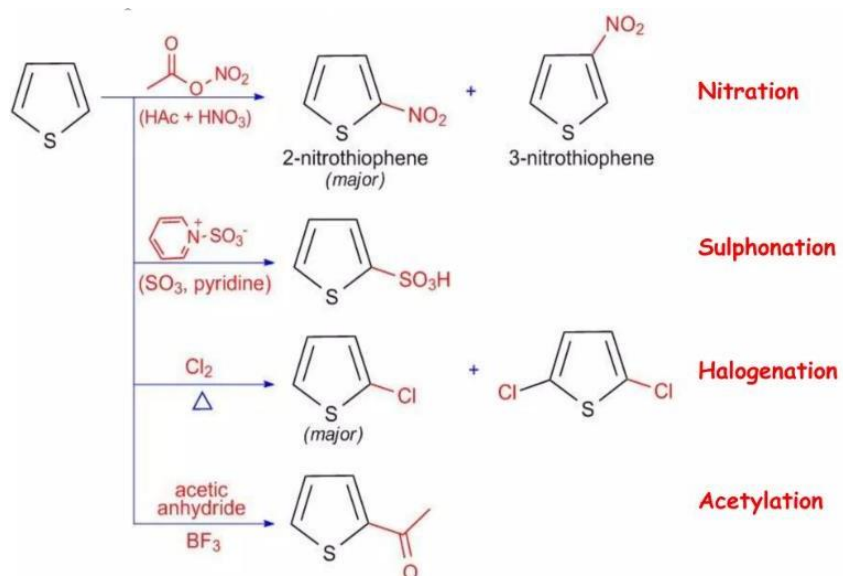
- The condensation of 1,4-dicarbonyl compounds with sulfur sources gives thiophene.



OR



Chemical Reaction



Medicinal Uses of Thiophene:

- Used as medicines.
- Used as anticancer agent.
- Diuretic.
- Antiaesthemic agent.
- Sedative and hyponotic.
- Anticonsulent.

PREPARED BY: 1) Kunal Dhondibhau Dangat(11)

2) Aryan Kiran Kute (38)

GUIDE BY: MRS. CHIWADSHEETI N.S. (ASSISTANT PROFESSOR)

SUBJECT: PHARMACEUTICAL ORGANIC CHEMISTRY-III

TOPIC NAME: HETEROCYCLIC COMPOUNDS

SUBJECT CODE: BP401T

CLASS: SECOND YEAR B.PHARMACY

ACADEMIC YEAR: 2022-2023

