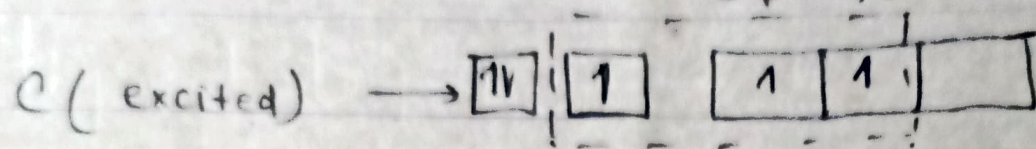


Structure of Furan $\rightarrow$ In furan the oxygen atom and four C-atoms are in sp^2 hybridised state. sp^2 hybridisation.

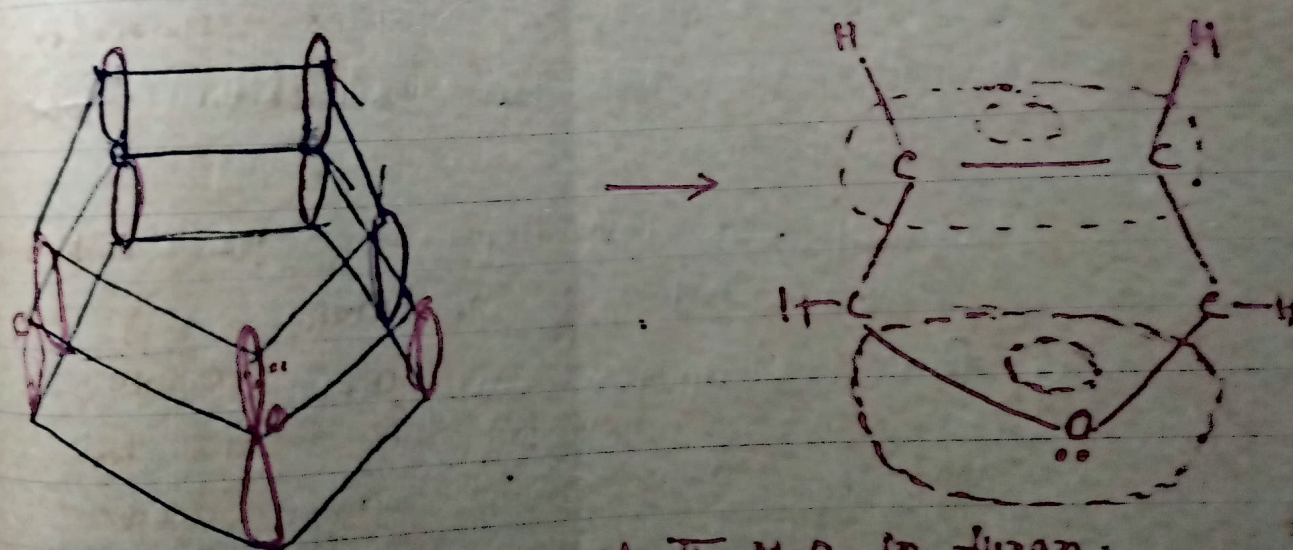
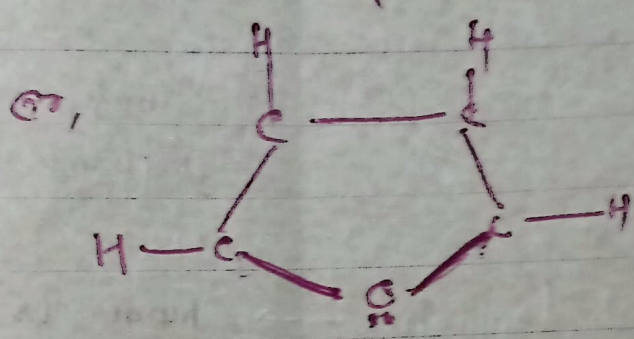
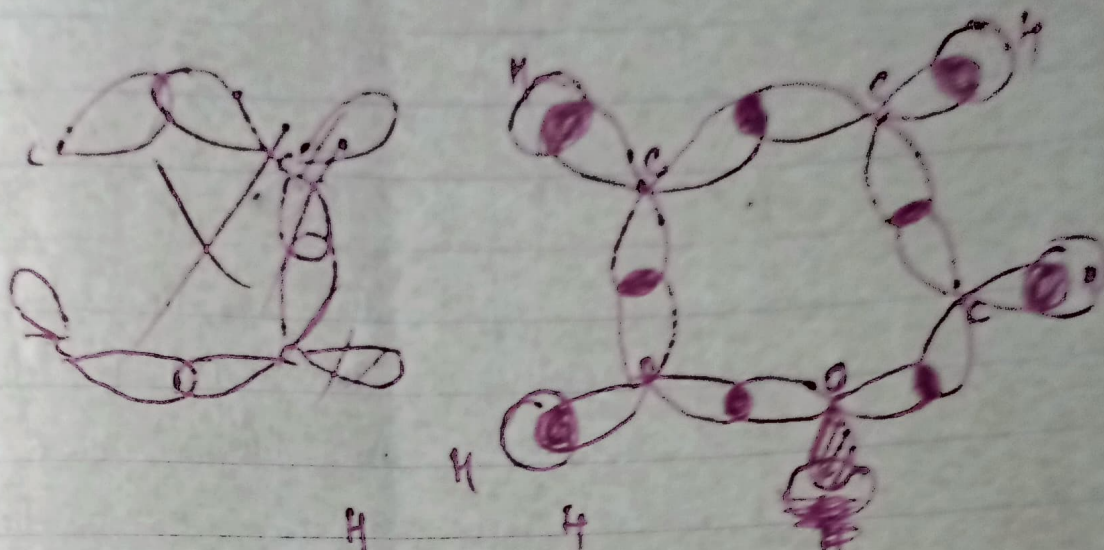


The sp^2 hybrid orbitals overlap with each other and with s-atomic orbitals of hydrogen to form C-C-, C-H, C-O σ bonds. One sp^2 hybrid orbital of oxygen is completely filled.

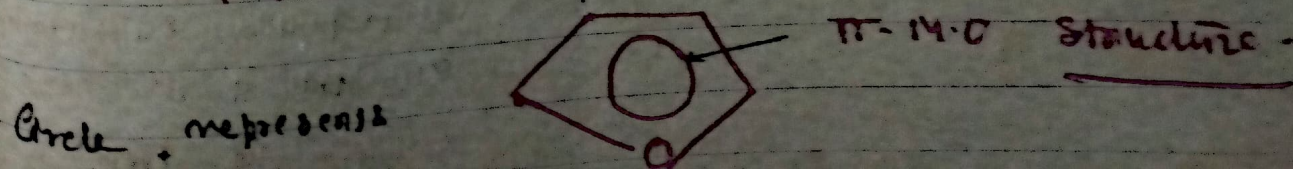
Also each carbon atom and the ~~three~~ oxygen atom possess an unhybridised p-orbital and these p-orbitals are ~~perpendicular~~ perpendicular to the plane of σ -bonds. The unhybridized p-orbital of each carbon atom contains one electron.

The unhybridised p-orbital of oxygen atom contains a lone pair of electron (the other lone pair). The lateral overlap of these p-orbital results in the formation of delocalised π -M.O.

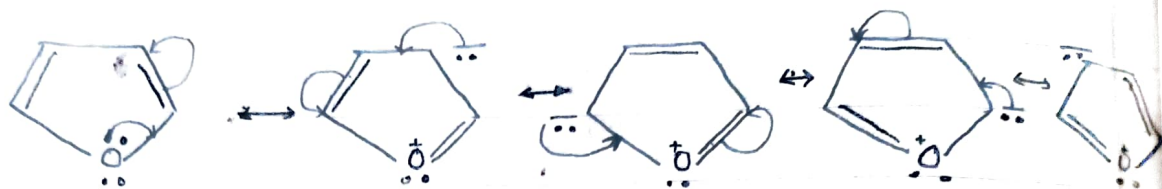
Containing six π -electrons. Furan has aromatic character because the delocalized π -electrons satisfy the Hückel rule.



formation of π -M.O in furan.
Furan is represented as follows.



According to the resonance theory Furan is considered to be the resonance hybrid of the following Canonical forms.



Measurement of bond lengths by X-ray analysis confirms the hybrid character of furan molecule. In furan C-O bond length is $1.37 \text{ \AA}$ but normal C-O bond length (single bond) is $1.43 \text{ \AA}$, thus C-O bond in furan possesses significant double bond character.

Physical Properties $\rightarrow$ Furan is a colourless liquid its b.p. is 32°C and other is like the chloroform. It is sparingly soluble in water but soluble in most organic solvents.

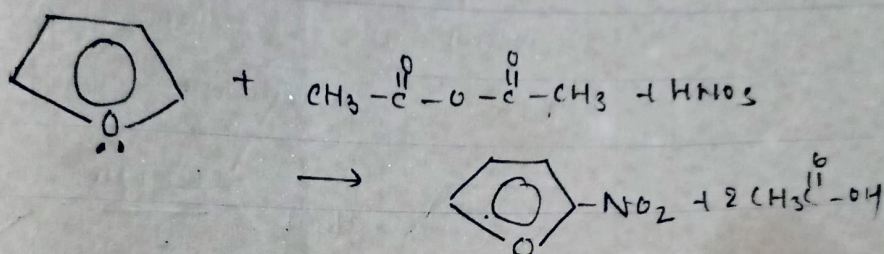
Chemical $\rightarrow$ Following are the important chemical properties of furan.

(1) **Basic character** $\rightarrow$ Like Pyrrole, furan is a weak base. It forms unstable salts with mineral acid.

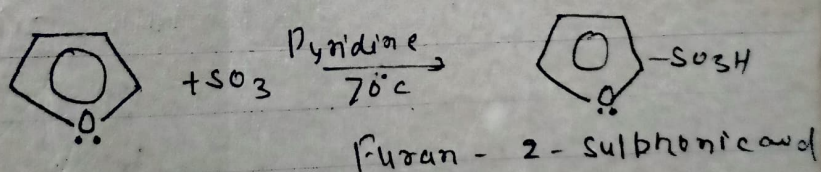
(2) **Electrophilic Substitution** $\rightarrow$ Furan like Pyrrole undergoes electrophilic substitution reaction at C-2. Substitution at C-5 occurs only when both of the

Electrophilic substitution reactions of Furan are not carried in the presence of strong acid, because under such conditions it undergoes Polymerization.

Nitration $\rightarrow$ Furan can be nitrated with a hot solution of nitric acid in acetic anhydride to give 2-nitro furan.



(b) Sulphonation $\rightarrow$ Furan may be Sulphonated by Sulphur trioxide gas in the presence of Pyridine at 70°C .



(c) Halogenation $\rightarrow$ Furan reacts with Chlorine and Bromine to give Poly halogenated products. It does not react at all with Iodine. Much milder conditions are used to obtain mono chloro and mono bromo derivatives.

