

## **Criteria for Aromaticity:-**

An aromatic (or aryl) compound contains a set of covalently bound atoms with specific characteristics:

- 1. A delocalized conjugated  $\pi$  system, most commonly an arial gement of esale.c alternating single and double bonds
- 2. Coplanar structure, with all the contributing atoms in the same plane

3. Contributing atoms intanged in one o moverings

4.7 the ber of  $\pi$  delocation delocation that is even, but not a multiple of 4. That is,  $4n + 2\pi$ -electrons, where n = 0, 1, 2, 3, and so on. This is known as Hückel's rule.

According to Hückel's rule, if a molecule has  $4n + 2\pi$ -electrons, it is aromatic, but if it has  $4n\pi$ -electrons and has characteristics 1–3 above, the molecule is said to be antiaromatic. Whereas benzene is aromatic (6 electrons, from 3 double bonds), cyclobutadiene is antiaromatic, since the number of  $\pi$  delocalized electrons is 4, which of course is a multiple of 4. The cyclobutadienide(2-) ion, however, is aromatic (6 electrons). An atom in an aromatic system can have other electrons that are not part of the system, and are therefore ignored for the 4n + 2 rule. In furan, the oxygen atom is sp<sup>2</sup> hybridized. One lone pair is in the  $\pi$  system and