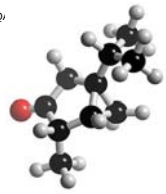
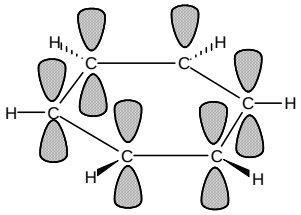
STRUCTURE & BONDING IN BENZENE



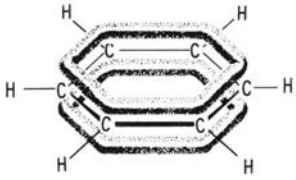
Name …… Form ……

- Benzene has the formula C_6H_6.
- Its basic structure is six C atoms in a hexagonal ring, with one H atom bonded to each C atom.
- The molecule is planar, and the six C-C bonds are the same length – intermediate between single and double.
- Each C atom is bonded to two other C atoms and one H atom by single covalent σ-bonds.
- This leaves one unused electron on each C atom in a p orbital, perpendicular to the plane of the ring.
- Each p orbital overlaps with the neighbouring p orbitals to form a π-bond.
- The overall result is a ring of negative charge ("electron cloud") above and below the plane of the ring.

the six p orbitals before overlap



the π system formed



- The electrons in the π system do not belong to any particular C atom (or to a bond between two C atoms) - they are free to move throughout the whole π system - they are **delocalised**.
- Due to this, the structure of benzene is represented by:

- There are some key pieces of evidence to support this structure, in particular how they fit this structure and not a structure with three C=C bonds and three C-C bonds, that of a "triene" - 1,3,5-cyclohexatriene.

1) C-C bond length

2) Addition reactions

3) Enthalpy of hydrogenation