- Formed by the “end on” interaction of electrons in an s-orbital or a hybrid orbital
- The electron density is at its greatest on the inter-nuclear axis
- Stronger than pi bonds
- **Single bonds are always sigma bonds.**

**Pi bonds**
- Formed by the “side on” interaction of electrons in p-orbitals
- Low electron density on the inter-nuclear axis, but regions of high electron density on opposite sides of it
- Weaker than sigma bonds
- **Double bonds are always one sigma bond and one pi bond.**
- **Triple bonds are always one sigma bond and two pi bonds with the pi bonds being at 90 degrees to each other.**

- Single bonds are the most stable, have the lowest energy, and have the longest bond length.
- **Resonance structures** have the same sigma bonds but differ in the arrangement of the pi bonds.
  - Are not likely to occur
  - Look at benzene
- **Resonance hybrid**
  - The species that actually exists when there are two or more equivalent structures
  - Less energy, which means that it is more stable than any of the resonance structures
- **Resonance energy**—the difference in stability between a resonance structure and the hybrid (aka delocalization energy and stabilization energy)

**Delocalised pi bond**
- Allows the pi electrons to spread over more than two nuclei
- Gives the species a lower potential energy
- Makes it more stable
- Overlap of p-orbitals

**Bond order**—the average of the number of bonds of the different resonance structures

**Physical properties**—depends primarily on the forces between the particles

**Bond strength**