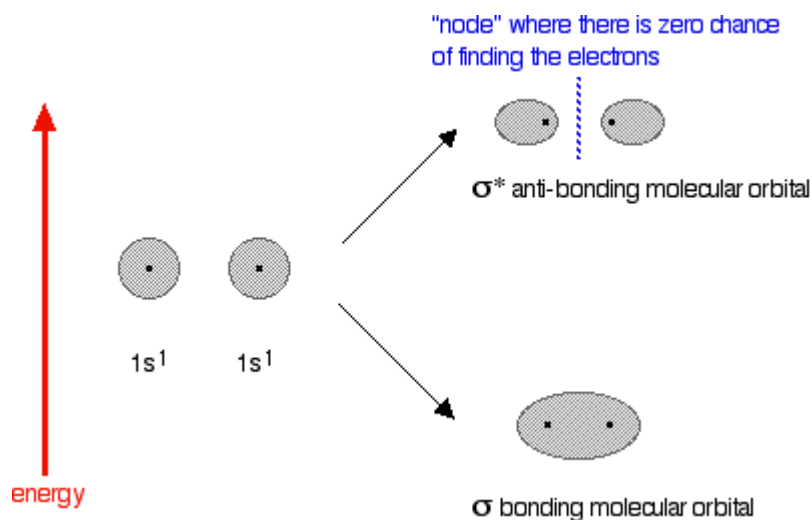


Chemguide – questions

UV-VISIBLE SPECTROSCOPY – BONDING THEORY

1. a) The Chemguide page has this diagram showing what happens when two hydrogen atoms combine to make a molecule:



(i) Explain what a σ bonding molecular orbital is.

(ii) What is an anti-bonding orbital?

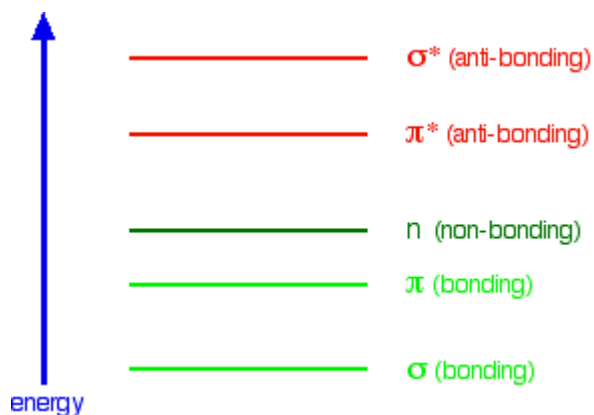
(iii) Why is the anti-bonding orbital at a much higher energy than either the atomic orbitals or the bonding molecular orbital?

(iv) If two hydrogen atoms come together why do they form the σ bonding molecular orbital?

b) Use a similar diagram to explain why helium doesn't form a He_2 molecule.

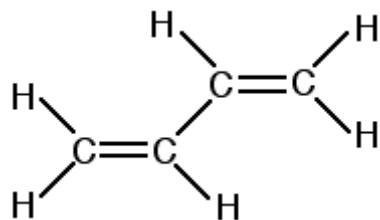
c) When ethene is formed, there are two bonds between the carbon – a σ bond and a π bond, made up of four electrons altogether. What molecular orbitals (including bonding and anti-bonding) will be formed?

d) The relative energies of the various types of orbitals are shown in the diagram (modified from the Chemguide page). What is meant by a *non-bonding* orbital?



Chemguide – questions

2. a) Use the structure of buta-1,3-diene to explain what is meant by conjugated double bonds. You should draw some diagrams to help your explanation.



b) Conjugated double bonds produce delocalisation of electrons in molecules, but other things can also cause delocalisation. In each of the following molecules decide the extent (if any) of the delocalisation, and show it by writing the delocalised parts in red (or some other colour). So, for example, if you were given the molecule $\text{CH}_3\text{-CH=CH-CH=CH}_2$, you would write $\text{CH}_3\text{-CH=CH-CH=CH}_2$.

