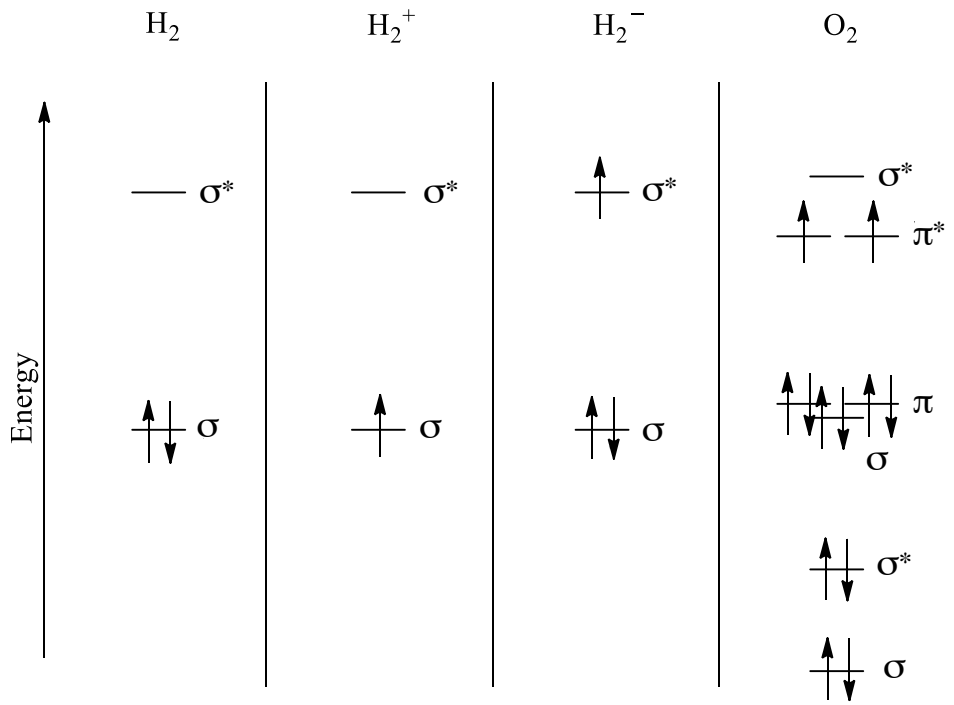
Marks 6

- The molecular orbital energy level diagrams for H_2, H_2^+, H_2^- and O_2 are shown below. Fill in the valence electrons for each species in its ground state and label the types of orbitals (σ, σ*, π, π*).



Give the bond order of each species.

H_2: **½ (2 - 0) = 1**	H_2^+: **½ (1 - 0) = ½**	H_2^-: **½ (2 - 1) = ½**	O_2: **½ (8 - 4) = 2**

Which of the four species are paramagnetic?

H_2^+, H_2^- and O_2

The bond lengths of H_2^+ and H_2^- are different. Which do you expect to be longer? Explain your answer.

H_2^- will be longer. Both have bond order of 0.5, but H_2^- is a multi-electron system so is destabilised by electron-electron repulsion. H_2^+ is single electron system so has no electron-electron repulsion.