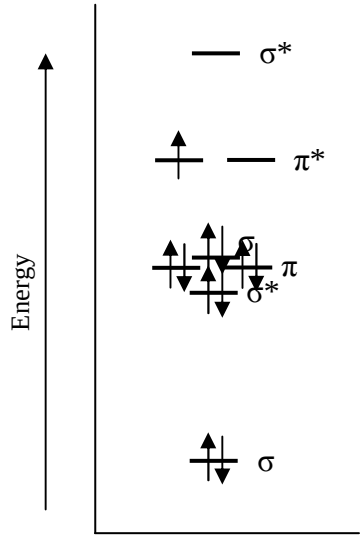
Marks 5

- The following relate to the electronic structure of the N_2^- molecular ion.

How many valence electrons are in N_2^-?

5 × 2 (N) + 1 (charge) = 11

The molecular orbital energy level diagram provided shows the energies of the orbitals for the valence electrons in N_2^-. Indicate on this diagram the ground state electronic configuration of N_2^- using the arrow notation for electron spins.



Calculate the bond order of N_2^-.

½ (bond electrons – antibonding electons)
= ½ (8 – 3) = 2.5

Is the bond strength in N_2^- stronger or weaker than the bond strength in N_2? Why?

The triple bond in N_2 is reduced to a bond order of 2.5 in N_2^- so the bond in N_2 is stronger.

(Equivalently, the extra electron in N_2^- has to occupy an antibonding π^* orbital. This weakens the bond.)

Do you expect N_2^- to be paramagnetic? Explain your answer.

N_2^- has an unpaired electron in the π^* orbital. It is thus expected to be paramagnetic.