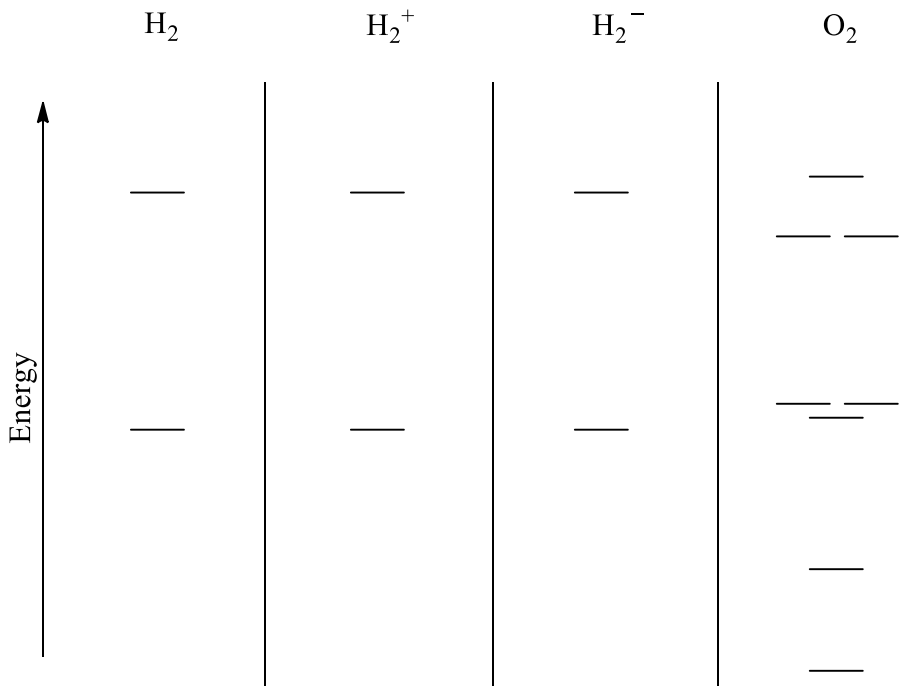
**Marks 6**

- 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.

| $H_2$: | $H_2^+$: | $H_2^-$: | $O_2$: |
|---|---|---|---|

Which of the four species are paramagnetic?

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