- \( \text{C}_2 \) is a reaction intermediate observed in flames, comets and circumstellar shells.

How many valence electrons are there in \( \text{C}_2 \)?

Complete the calculated MO diagram for the ground state of \( \text{C}_2 \) by inserting the appropriate number of valence electrons into the appropriate orbitals.

What is the bond order of \( \text{C}_2 \)?

What is the longest wavelength of light that the ground state \( \text{C}_2^+ \) ion will absorb? Show working.

Answer:
• The following relate to the electronic structure of the $\text{O}_2^+$ molecular ion.

How many valence electrons are there in $\text{O}_2^+$?

Complete the MO diagram for the ground state electronic configuration of $\text{O}_2^+$ by inserting an arrow to represent each valence electron.

What is the bond order of $\text{O}_2^+$?

Do you expect $\text{O}_2^+$ to be paramagnetic? Explain your answer.

• Sketch the following wave functions as lobe representations.

(a) a $2p$ atomic orbital

(b) a $\sigma^*$ molecular orbital