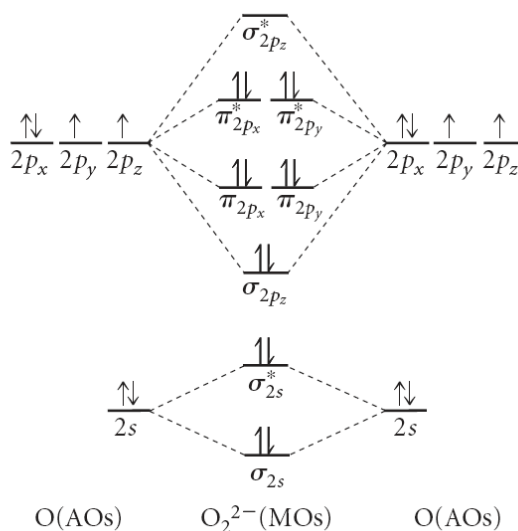


Homework Quiz #5A

solution outlines

- (a) Draw the energy level diagram that shows that the linear combination of atomic orbitals from two atoms of oxygen (O) results in the formation of the stable molecule, O_2^{2-} . The molecular orbitals in O_2^{2-} increase in energy according to the sequence σ_{2s} , σ_{2s}^* , σ_{2p_z} , $\pi_{2p_x,y}$, $\pi_{2p_x,y}^*$, $\sigma_{2p_z}^*$.



- (b) Indium phosphide (InP) is a semiconductor with a band gap, E_g , of 1.27 eV. Calculate the value of the absorption edge of this material. Express your answer in meters.

for absorption of incoming radiation, the following must be true:

$$E_{\text{radiation}} = E_g$$

using the Planck relationship gives the wavelength of the absorption edge

$$E_{\text{radiation}} = \frac{hc}{\lambda}$$

$$\therefore \lambda = \frac{hc}{E_g} = \frac{6.6 \times 10^{-34} \times 3 \times 10^8}{1.27 \times 1.6 \times 10^{-19}} = 9.74 \times 10^{-7} \text{ m}$$