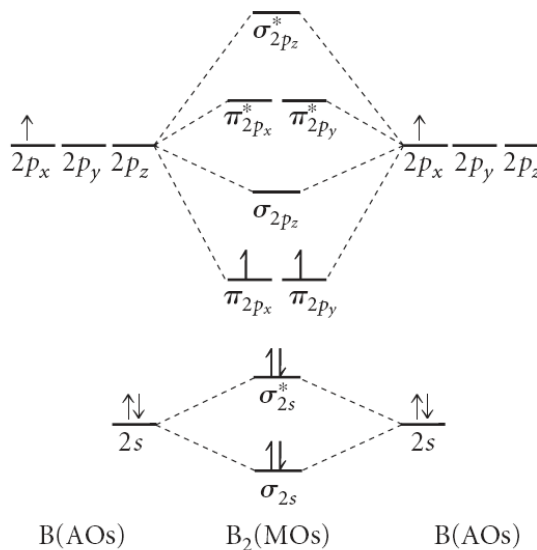


Homework Quiz #5B

solution outlines

- (a) Draw the energy level diagram that shows that the linear combination of atomic orbitals from two atoms of boron (B) results in the formation of the stable molecule, B₂. The molecular orbitals in B₂ increase in energy according to the sequence σ_{2s} , σ_{2s}^* , $\pi_{2p_{x,y}}$, σ_{2p_z} , $\pi_{2p_{x,y}}^*$, $\sigma_{2p_z}^*$.



- (b) Cadmium sulfide (CdS) is a semiconductor with a band gap, E_g , of 2.45 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

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

$$\therefore \lambda = \frac{hc}{E_g} = \frac{6.6 \times 10^{-34} \times 3 \times 10^8}{2.45 \times 1.6 \times 10^{-19}} = 5.05 \times 10^{-7} \text{ m}$$