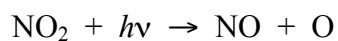


d) When NO<sub>2</sub> absorbs UVA light in the atmosphere, at wavelengths shorter than 400 nm, it dissociates into NO + O:



What is the bond dissociation energy (in kJ mol<sup>-1</sup>) of the N–O bond in NO<sub>2</sub>?

**The energy per molecule required to break the bond is given by Planck's relationship:**

$$\begin{aligned} E &= hc / \lambda \\ &= (6.626 \times 10^{-34} \text{ J s}) \times (2.998 \times 10^8 \text{ m s}^{-1}) / (400 \times 10^{-9} \text{ m}) = 5.0 \times 10^{-19} \text{ J} \end{aligned}$$

**The energy required per mole is therefore:**

$$E = 5.0 \times 10^{-19} \text{ J} \times (6.022 \times 10^{23} \text{ mol}^{-1}) = 300 \text{ kJ mol}^{-1}$$

Answer: **300 kJ mol<sup>-1</sup>**