- Calculate the energy (in J) and the wavelength (in nm) of the photon of radiation emitted when the electron in Li^{2+} drops from an n = 4 state to an n = 2 state. **2**

As Li^{2+} has 1 electron, its energy levels are described by the equation $E_n = \frac{-E_R Z^2}{n^2}$ where $E_R = 2.18 \times 10^{-18}$ J and Z = 3.

The energies of the n = 4 and n =2 levels are:

$$E_4 = \frac{-E_R(3)^2}{(4)^2} = -\frac{9}{16}E_R \text{ and } E_2 = \frac{-E_R(3)^2}{(2)^2} = -\frac{9}{4}E_R = -\frac{36}{16}E_R$$

The energy separation is:

$$\Delta E = E_4 - E_2 = \left[-\frac{9}{16}E_R\right] - \left[-\frac{36}{16}E_R\right] = \frac{27}{16}E_R$$

$$= \frac{27}{16} \times (2.18 \times 10^{-18}) = 3.68 \times 10^{-18} \text{ J}$$

Using $E = \frac{hc}{\lambda}$, $\lambda = \frac{hc}{E} = \frac{(6.626 \times 10^{-34}) \times (2.998 \times 10^8)}{(3.68 \times 10^{-18})} = 5.40 \times 10^{-8} \text{ m} = 54.0 \text{ nm}$

Energy = **3.68×10^{-18} J**	Wavelength = **54.0 nm**