3

- Calculate the energy (in J) and the wavelength (in nm) of the photon of radiation emitted when the electron in Be^{3+} drops from an $n = 3$ state to an $n = 2$ state.

Be^{3+} has only 1 e^- so the equation $E_n = \frac{-E_R Z^2}{n^2}$ where $E_R = 2.18 \times 10^{-18}$ J can be used. Be has Z = 4.

The energy of the n = 3 and n =2 levels are:

$$E_3 = \frac{-E_R (4)^2}{(3)^2} = -\frac{16}{9} E_R \text{ and } E_2 = \frac{-E_R (4)^2}{(2)^2} = -\frac{16}{4} E_R = -4E_R$$

The energy separation is $\frac{20}{9} E_R = \frac{20}{9} \times (2.18 \times 10^{-18}) = 4.84 \times 10^{-18}$ J

As $E = \frac{hc}{\lambda}$,

$$\lambda = \frac{hc}{E} = \frac{(6.634 \times 10^{-34}) \times (2.998 \times 10^8)}{(4.84 \times 10^{-18})} = 4.11 \times 10^{-8} \text{ m} = 41.1 \text{ nm}$$

Energy = **4.84×10^{-18} J**	Wavelength = **41.1 nm**