**Marks**
**3**

- Moseley discovered experimentally in 1913 that the atomic number, $Z$, of an element is inversely proportional to the square root of the wavelength, $\lambda$, of fluorescent X-rays emitted when an electron drops from the $n = 2$ to the $n = 1$ shell.

$$i.e. \quad \frac{1}{\sqrt{\lambda}} = kZ$$

What element would emit such X-rays with a wavelength one-quarter that of zirconium?

**From Moseley's equation, the atomic number is inversely proportional to the square root of the atomic number. The ratio of the wavelengths emitted by two elements is therefore:**

$$\frac{Z_1}{Z_2} = \sqrt{\frac{\lambda_2}{\lambda_1}}$$

**As zirconium has $Z_1 = 40$ and $\dfrac{\lambda_2}{\lambda_1} = \dfrac{1}{4}$, the element has $Z = 80$. This corresponds to mercury.**

Answer: **mercury**

- Many plants are green due to their high chlorophyll content. Draw on the diagram below the absorption spectrum of a green pigment such as chlorophyll.

**2**