5. Find the largest and shortest wavelengths in the Lyman series for hydrogen. In what region of the electromagnetic spectrum does each series lie?

$= 0.12 \times 10^{-112}$

The transition equation for Lyman series is given by

$$\frac{1}{\lambda} = R\left(\frac{1}{1^2} - \frac{1}{n^2}\right), n = 2, 3, \ldots$$

The largest wavelength is corresponding to $n = 2$

$$\therefore \quad \frac{1}{\lambda_{max}} = 1.097 \times 10^7 \left(\frac{1}{1} - \frac{1}{4}\right)$$

$$= 0.823 \times 10^7$$

$$\Rightarrow \quad \lambda_{max} = 1.2154 \times 10^{-7} \text{ m} = 1215 \text{ Å}$$

The shortest wavelength corresponds to $n = \infty$

$$\therefore \quad \frac{1}{\lambda_{min}} = 1.097 \times 10^7 \left(\frac{1}{1} - \frac{1}{\infty}\right)$$

or $\quad \lambda_{min} = 0.911 \times 10^{-7} \text{ m} = 911 \text{ Å}$

Both of these wavelengths lie in the ultraviolet (UV) region of electromagnetic spectrum.