b # 26.

For Lyman series $n_f = 1$ $n_i = 2, 3, 4, \ldots$

Longest wavelength corresponds to the smallest ΔE

$\Rightarrow$ it is the transition $n_f = 1$ $n_i = 2$

n general $\frac{1}{\lambda} = R\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)$

$$\Rightarrow \frac{1}{\lambda_{max}} = R\left(\frac{1}{1} - \frac{1}{4}\right) = \frac{3R}{4} \Rightarrow \lambda_{max} = \frac{4}{3R}$$

$$\lambda_{max} = \frac{4}{3 \times 1.097 \times 10^7} = \boxed{121.51\ nm}$$

Shortest wavelength corresponds to the largest ΔE

$\Rightarrow$ it is the transition with $n_f = 1$ $n_i = \infty$

$$\frac{1}{\lambda_{min}} = R\left(\frac{1}{1} - \frac{1}{\infty}\right) = R \Rightarrow \lambda_{min} = \frac{1}{R}$$

$$\lambda_{min} = \frac{1}{1.097 \times 10^7} = \boxed{91.13\ nm}$$

Both of these wavelengths are in the U.V. region

b # 36.

a) $f_n = \frac{1}{T_n} = \frac{v_n}{2\pi r_n}$ $v_n = \sqrt{\frac{ke^2}{m_e r_n}}$ and $r_n = a_0 n^2$

$$\Rightarrow f_n = \frac{1}{2\pi}\sqrt{\frac{ke^2}{m_e r_n^3}}$$

$n = 100$ $r_{100} = 0.0529 \times 10^{-9}\,(100)^2 = 0.0529 \times 10^{-5}\ m$

$f_{100} = 6.58 \times 10^9\ HZ$