

HW3-1 Soln)

$$\omega_o = \sqrt{\frac{\frac{k_e e^2}{R^3}}{m_{\text{electron}}}}$$

$$\lambda_o = \frac{c}{f_o} = \frac{2\pi c}{\omega_o} = 2\pi c \sqrt{\frac{m_{\text{electron}} R^3}{k_e e^2}}$$

For He, $d = 2.4 \text{ \AA}$ so $r = 1.2 \text{ \AA}$:

$$\lambda_o = 2\pi(3 \times 10^8) \sqrt{\frac{9.11 \times 10^{-31} (1.2 \times 10^{-10})^3}{9 \times 10^9 (1.6 \times 10^{-19})^2}} = 1.56 \times 10^{-7} \text{ m} .$$

For Xe, $d = 5.2 \text{ \AA}$ so $r = 2.6 \text{ \AA}$:

$$\lambda_o = 2\pi(3 \times 10^8) \sqrt{\frac{9.11 \times 10^{-31} (2.6 \times 10^{-10})^3}{9 \times 10^9 (1.6 \times 10^{-19})^2}} = 4.97 \times 10^{-7} \text{ m} .$$