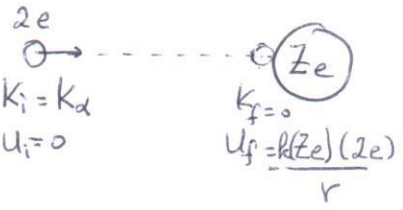
King Fahd University of Petroleum & Minerals
Physics Department
Phys212- Quiz#4

Name: Key ID#:

1. In 1919, Rutherford was able to show a breakdown in his scattering theory for 7.7 MeV α particles scattered at large angles from aluminum nuclei (Z = 13). From this information, estimate the radius of aluminum nucleus.



$$U = -k\frac{q_1 q_2}{r}$$

$$\Delta K + \Delta U = 0$$

$$(0 - K_\alpha) + \left(+\frac{k(Ze)(2e)}{r} - 0\right) = 0$$

$$K_\alpha = \frac{2kZe^2}{r} \Rightarrow r = \frac{2kZe^2}{K_\alpha} = \frac{2\times 9\times 10^{9}\times 13\times (1.6\times 10^{-19})^2}{7.7\times 10^{6}\times (1.6\times 10^{-19})}$$

$$\boxed{r = 4.86\times 10^{-15}\ m}$$

2. Calculate the convergence limit for the Blamer series.

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

Convergence limit is λ_{min} when $n_i = \infty$

$$\frac{1}{\lambda_{min}} = R\left(\frac{1}{4} - \frac{1}{\infty}\right) = \frac{R}{4}$$

$$\lambda_{min} = \frac{4}{R} = \frac{4}{1.097\times 10^{7}} = 3.646\times 10^{-7}\ m$$

$$= \boxed{365\ nm}$$

This is in UV region.