Q- In the Bohr model of the hydrogen atom, the speed of the electron is approximately 2.20 X 10^6 m/s. Find

(a) The force acting on the electron as it revolves in a circular orbit of radius 0.530 X 10^{-10} m and

(b) The centripetal acceleration of the electron.

Here the force on the electron will be the centripetal force (due to nucleus) and is given by

$$F = \frac{m_e v^2}{R}$$

Mass of the electron $m_e = 9.1*10^{-31}$ kg

(a standard constant given every book that is why not given with question)

Speed of electron $v = 2.20*10^6$ m/s

Radius of the circular path $R = 0.530*10^{-10}$ m

Substituting in above formula we get

$$F = \frac{m_e v^2}{R} = \frac{(9.11*10^{-31})*(2.20*10^6)^2}{0.530*10^{-10}} = 8.319*10^{-8}\,\text{N}$$

(Centripetal hence towards the center of the circular path)

The acceleration of the electron is given by the result of Newton's second law of motion as

F = ma

Hence centripetal acceleration of the electron is given by

$a = F/m = v^2/R$

Or $$a = \frac{v^2}{R} = \frac{(2.20*10^6)^2}{0.530*10^{-10}} = 9.132*10^{22}\ \text{m/s}^2$$