Answer on Question #54055, Physics Nuclear Physics

The ratio of wavelength of a proton and electron of same energy will be?

Solution:

De Broglie wavelength is given by Eq.(1)

$$\lambda_{Di} = \frac{h}{p} = \frac{h}{\sqrt{2m_i E}} \tag{1}$$

where h is the Planck's constant; m_i is the mass of the particle; E is the energy of the particle.

The ratio of wavelength of a proton and electron of same energy will be

$$\lambda_{Dp} / \lambda_{De} = \sqrt{\frac{m_e}{m_p}} = \sqrt{\frac{9.1 \cdot 10^{-31}}{1.66 \cdot 10^{-27}}} = 0.023$$

where $m_p = 1.66 \cdot 10^{-27} kg$ is the mass of the proton, $m_e = 9.1 \cdot 10^{-31} kg$ the mass of the electron.

Answer: $\lambda_{Dp} / \lambda_{De} = \sqrt{\frac{m_e}{m_p}} = 0.023$