

Answer on Question #58654-Physics-Quantum Mechanics

Q. Find frequency, wavelength and momentum of photon whose energy is equal to rest energy of electron.

Solution

$$hf = mc^2$$

$$f = \frac{mc^2}{h} = \frac{9.1 \cdot 10^{-31} \cdot (2.998 \cdot 10^8)^2}{6.626 \cdot 10^{-34}} = 1.2 \cdot 10^{20} \text{ Hz.}$$

A photon whose energy equals the rest energy of an electron, has a wavelength equal to

$$\lambda = \frac{c}{f} = \frac{2.998 \cdot 10^8}{1.2 \cdot 10^{20}} = 2.5 \cdot 10^{-12} \text{ m.}$$

$$p = \frac{h}{\lambda} = \frac{6.626 \cdot 10^{-34}}{2.5 \cdot 10^{-12}} = 2.7 \cdot 10^{-22} \frac{\text{kgm}}{\text{s}}$$