

Answer on Question #73729 – Chemistry – General Chemistry

What is the wavelength of an electron moving at a velocity of $0.58 \cdot c$ where c is the speed of light? meters

Solution:

The speed of light $c = 299\,792\,458$ m/s.

The speed of this electron $= 0.58 \times 299\,792\,458$ m/s $= 173\,879\,626$ m/s.

Planck's constant $h = 6.626068 \times 10^{-34}$ m²·kg/s.

Mass of the electron $m = 9.1093829 \times 10^{-31}$ kg

λ is the de Broglie wavelength

$$\begin{aligned}\lambda &= h / (m \times c) = 6.626068 \times 10^{-34} \text{ m}^2 \cdot \text{kg} / \text{s} / (9.1093829 \times 10^{-31} \text{ kg} \times 173\,879\,626 \text{ m/s}) = \\ &= 4.183293 \times 10^{-12} \text{ meter.}\end{aligned}$$

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