

Answer on Question #54319-Physics-Electromagnetism

Find the flux density of magnetic field to cause 62.5eV electron to move in a circular path of radius 5cm.

Solution

Given

$$m = 9.1 \cdot 10^{-31} \text{ kg}; e = 1.6 \cdot 10^{-19} \text{ C}.$$

Here,

$$\frac{1}{2}mv^2 = 62.5 \text{ eV} = 62.5 \cdot 1.6 \cdot 10^{-19} = 10^{-17} \text{ J}$$

or

$$v = \sqrt{\frac{2 \cdot 10^{-17}}{m}} = \sqrt{\frac{2 \cdot 10^{-17}}{9.1 \cdot 10^{-31}}} = 4.69 \cdot 10^6 \frac{\text{m}}{\text{s}}.$$

Now,

$$\frac{mv^2}{r} = Bev$$

or

$$B = \frac{mv}{er} = \frac{9.1 \cdot 10^{-31} \cdot 4.69 \cdot 10^6}{1.6 \cdot 10^{-19} \cdot 5 \cdot 10^{-2}} = 5.335 \cdot 10^{-4} \text{ T}.$$

Answer: $5.335 \cdot 10^{-4} \text{ T}$.