Answer on #72154, Physics / Electromagnetism

Question:
Electron move with an initial speed of 4×10^7 m/s. enter perpendicular 0.1T magnetic field

a. Explain the particles traces

b. Find the circle radius

Answer:
a) The only force acting on the electron (neglecting the gravitational force) is Lorentz force:
$$\vec{F} = e[\vec{v}, \vec{B}]$$
This force is always directed perpendicular to the speed, so it will rotate the electron.
In general electron will move along the spiral trajectory.

b) If the velocity of the electron is perpendicular to the magnetic field:
$$F = evB$$
As electron rotates: $F = ma_{centripedal} = \dfrac{mv^2}{r}$, $where\ r - radius\ of\ the\ circle$

$$So, F = evB = \frac{mv^2}{r} \rightarrow r = \frac{mv}{eB}$$

$$r = \frac{mv}{eB} = \frac{9.1 * 10^{-31} * 4 * 10^7}{1.6 * 10^{-19} * 0.1} = 22{,}75 * 10^{-4}m = \boldsymbol{2{,}275\ mm}$$

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