Answer on Question #59072, Physics / Electromagnetism |

An electron enters a uniform magnetic field 0.20T at an angle of 30° the field. Determine the pitch of the helical path assuming its speed is 3×10^7 m/s

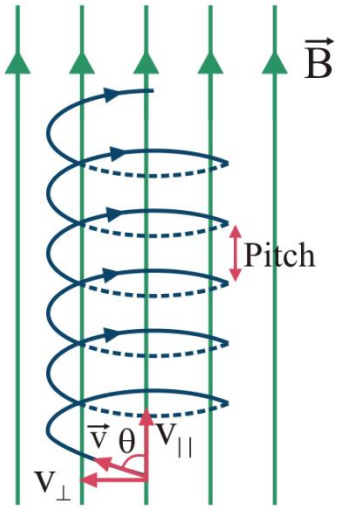
90.6m

37.8m

56.1m

46.5m

Solution:



The radius of helical path is

$$r = \frac{mv_\perp}{qB}$$

$$r = \frac{mv\sin\theta}{qB} = \frac{9.11\cdot10^{-31}\cdot3\cdot10^7\cdot\sin30°}{1.6\cdot10^{-19}\cdot0.2} = 4.27\cdot10^{-4}\ \text{m}$$

Time period of helical path

$$T = \frac{2\pi r}{v_\perp}$$

$$T = \frac{2\pi r}{v\sin\theta} = \frac{2\cdot3.14\cdot4.27\cdot10^{-4}}{3\cdot10^7\cdot\sin30°} = 1.788\cdot10^{-10}\ \text{s}$$

Pitch of the helix

$$p = v_{||}T = v\cdot\cos\theta\cdot T$$

$$p = 3\cdot10^7\cdot\cos30°\cdot1.788\cdot10^{-10} = 0.00465\ \text{m} = 4.65\ \text{mm}$$

Output: 4.65 mm