

Answer on Question #61353-Physics-Electromagnetism

11) A rectangular coil of dimensions 20cm by 15cm lies with its plane parallel to a magnetic field of 0.5W/\$m^2\$. The coil, carrying a current of 10A experiences a torque of 4.5Nm in the field. How many loops have the coil?

a) 100

b) 60

c) 30

d) 20

Solution

Ampère's force law for one side:

$$F = IBa$$

where a is side's length of coil, B is magnetic field, I current.

Considering that we have 2 sides and N loops:

$$F = 2IBaN$$

Therefore torque equals:

$$M = 2IBaN \frac{b}{2} = IBNab$$

And number of loops:

$$N = \frac{M}{IBab} = \frac{4.5}{(10)(0.5)(0.2)(0.15)} = 30$$

12) An electric field of 50kV/m is perpendicular to a magnetic field 0.25T. What is the velocity of a charge whose initial of motion is perpendicular to both fields and which passes through the fields undeflected?

a) 3×10^6 m/s

b) 2×10^6 m/s

c) 4×10^6 m/s

d) 5×10^6 m/s

Solution

Charged particles are undeflected when the electric and magnetic deflecting forces are equal (and opposite in direction).

$$qE = Bqv$$

$$v = \frac{E}{B} = \frac{50000}{0.25} = 2 \cdot 10^5 \frac{m}{s}$$

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