Answer on question #61355, Physics / Electromagnetism

15) A positive ion passes through an electric and magnetic fields which are mutually perpendicular. The electric field strength is 20.0kV/m while the magnetic flux density is 0.40T. At what speed will the ion pass through undeflected?

a) 6.0×104 m/s
b) 5.0×104m/s
c) 7.0×104m/s
d) 8.0×104m/s

Solution:

On charged particles are act two electric and magnetic forces

$$F = qE \text{ and } F = qvB$$

Where, F is the force (N); q is the electronic charge (1.6 x 10-19 C)
The charged particles are undeflected when the electric and magnetic deflecting forces are equal and opposite in direction

$$qE = qvB$$

Finally,

$$v = \frac{E}{B} = \frac{20 \cdot 10^3}{0.40} = 5 \cdot 10^4 ms^{-1}$$

Answer: b) 5.0×104m/s

16) For how long must a steady current of 2A flow through a copper voltameter to deposit 10À3 kg of copper? Z for coper is 0.000329g/C

a) 42.1min
b) 22.6min
c) 30.2min
d) 25.3min

Solution:

The Faraday's First Law of Electrolysis

$$m = z \cdot I \cdot t$$

Finally,

$$t = \frac{m}{zI} = \frac{1g}{0.00039g/C \times 2C/s} = 1520s = 25.3\,min$$

Answer: d) 25.3min