



**2022 Sec 4 AP2B Magnetic Fields
Answers to EX2B**

- 1 Let the length of the wire be L and the magnetic flux density be B

$$\begin{aligned}F_B &= \text{difference in reading} \\BIL &= \text{difference in reading} \\B(2.0)L &= (144.6 - 142.0)(10^{-3})(10) \\BL &= 0.013 \text{ T m}\end{aligned}$$

$$\begin{aligned}\text{New reading} &= W - F_B \\&= mg - BIL \\&= [(142.0)(10^{-3})(10) - (0.013)(3.0)] / 10 \\&= 0.1381 \text{ kg} \\&= 138.1 \text{ g}\end{aligned}$$

- 2 (a) Apply Fleming's left hand rule: **out of the plane of the page**

(b)

$$\begin{aligned}F_C &= F_B \\mv^2 / r &= Bqv \\r &= mv / Bq \\&= (1.67 \times 10^{-27})(4.5 \times 10^6) / (0.12)(1.60 \times 10^{-19}) \\&= 0.3914 \\&= 0.39 \text{ m (2 sf)}\end{aligned}$$

- (c) (i) As magnetic force is downwards, electric force must be downward. Therefore, direction of electric field is **upwards**.

(i)

$$\begin{aligned}F_E &= F_B \\Eq &= Bqv \\E &= Bv \\&= (0.12)(4.5 \times 10^6) \\&= 5.4 \times 10^5 \text{ N C}^{-1}\end{aligned}$$