

- 6 Two long, straight, current-carrying conductors, PQ and XY, are held a constant distance apart, as shown in Fig. 6.1.



**Fig. 6.1**

The conductors each carry the same magnitude current in the same direction.

A plan view from above the conductors is shown in Fig. 6.2.



**Fig. 6.2**

- (a) On Fig. 6.2 draw arrows, one in each case, to show the direction of
- (i) the magnetic field at Q due to the current in wire XY (label this arrow B), [1]
  - (ii) the force at Q as a result of the magnetic field due to the current in wire XY (label this arrow F). [1]

- (b) (i) State Newton's third law of motion.

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..... [1]

- (ii) Use this law and your answer in (a)(ii) to state the direction of the force on wire XY.

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..... [1]

- (c) The magnetic flux density  $B$  at a distance  $d$  from a long straight wire carrying a current  $I$  is given by

$$B = 2.0 \times 10^{-7} \times \frac{I}{d}.$$

Use this expression to explain why, under normal circumstances, wires carrying alternating current are not seen to vibrate. Make reasonable estimates of the magnitudes of the quantities involved.

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..... [4]