5

Fig. 5.1 shows the cross-section of two long conductors, P and Q, carrying identical currents flowing into the page.

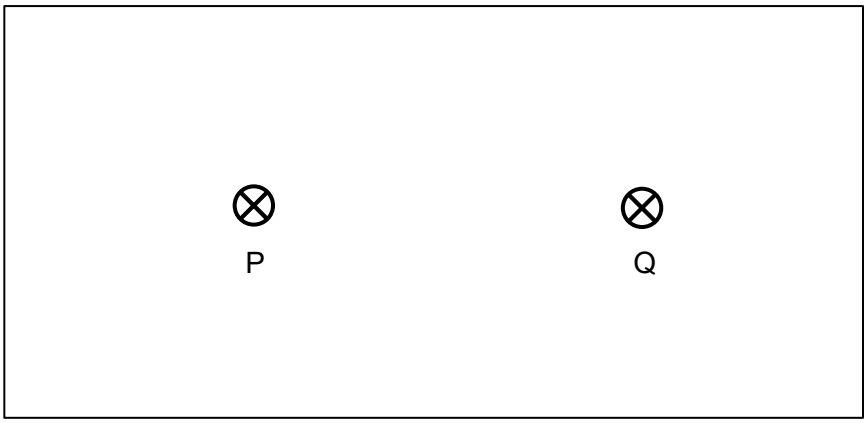


Fig. 5.1

(a)

Sketch the resultant magnetic field pattern around the wires within the box in Fig. 5.1. Indicate direction arrows on the field lines. [2]

(b)

Fig. 5.2 shows P and Q from the side view. They are 0.30 m apart.

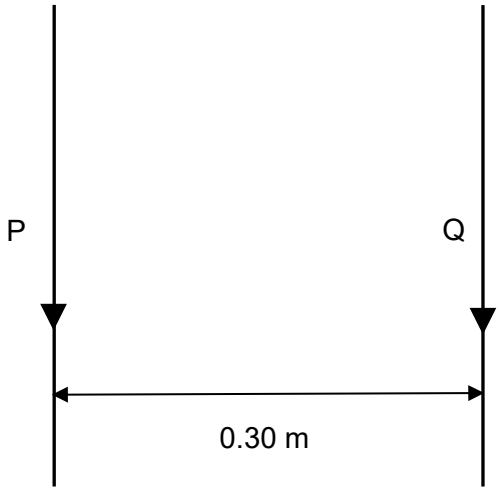


Fig. 5.2

State and explain the direction of the force that P exerts on Q.

.....

.....

.....

…….....

[2]

(c)

Fig. 5.3 shows an electron moving parallel to the conductors with a speed of 4.0×10^{6} m s^{-1}, at a position of 0.12 m away from Q.

It experiences a horizontal magnetic force *F* of magnitude 6.4×10^{-18} N directed leftwards.

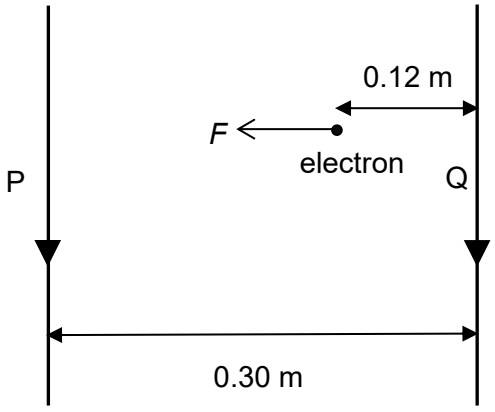


Fig. 5.3

(i)

State the direction in which the electron is moving.

.....

[1]

(ii)

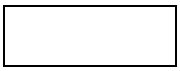
Calculate the magnitude of magnetic flux density at the position of the electron.

magnitude of magnetic flux density = …… T

[3]

(iii)

Calculate the current in each conductor.



current = …… A

[2]