

6 **(a)** Define *magnetic flux density*.

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.....[2

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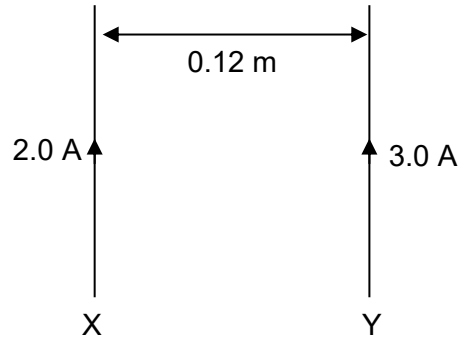
(b) A long, straight wire carries a current into the page, as shown in Fig. 6.1.



Fig. 6.1

On Fig. 6.1, draw field lines to represent the magnetic field around the wire due to the current. [2]

- (c) Two long straight, current carrying wires, X and Y are carrying current. They are parallel and separated by a distance of 0.12 m. The current in wire X is 2.0 A and the current in wire Y is 3.0 A as shown in Fig. 6.2.

**Fig. 6.2**

- (i) Explain why the two wires exert a magnetic force on each other.

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- (ii) On Fig. 6.2, draw an arrow to show the direction of the magnetic force exerted on wire X. Label your arrow F. [1]
- (iii) Calculate the magnetic force per unit length on wire X.

force per unit length = N m^{-1} [2]

- (iv) Wire X forms a circular loop centred at wire Y. Wire X carries a current in a clockwise direction and wire Y carries a current into the page, as shown in Fig. 6.3. Current in wire X and wire Y remain the same.

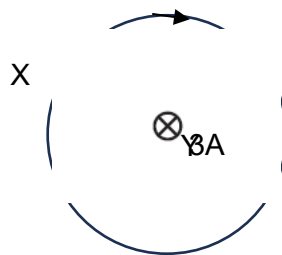


Fig. 6.3

The magnitudes of the currents in wire X and wire Y remain the same.

Explain why no force acts on wire Y.

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