

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

.....  
.....  
.....  
.....  
..... [2]  
]

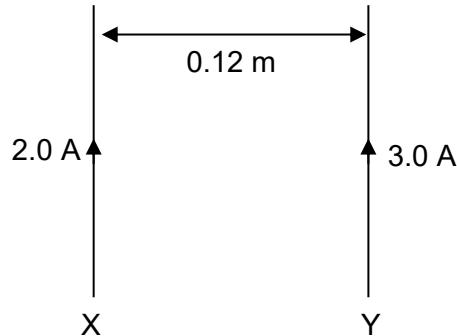
- (b) A long, straight wire carries a current into the page, as shown in Fig. 6.1.



**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.

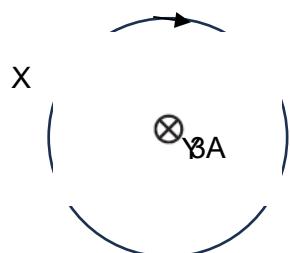
.....  
.....  
.....  
.....  
.....

[2]

- (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.

$$\text{force per unit length} = \dots \text{N m}^{-1} [2]$$

- (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.

.....  
.....  
.....

[1]