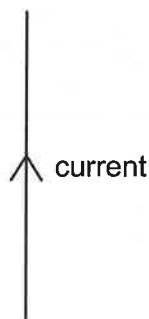


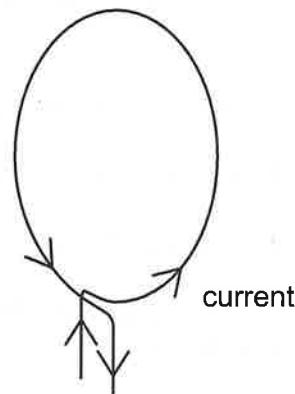
1 (a) Draw field lines to show the magnetic flux pattern due to the current in:

- (i) a long straight wire



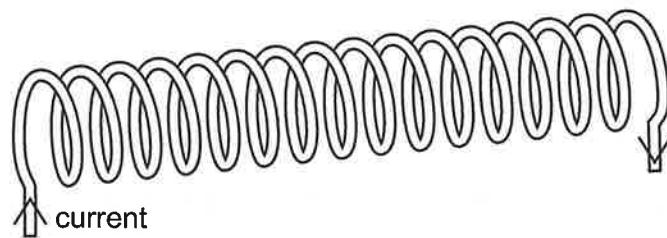
[2]

- (ii) a flat circular coil



[2]

- (iii) a long solenoid.

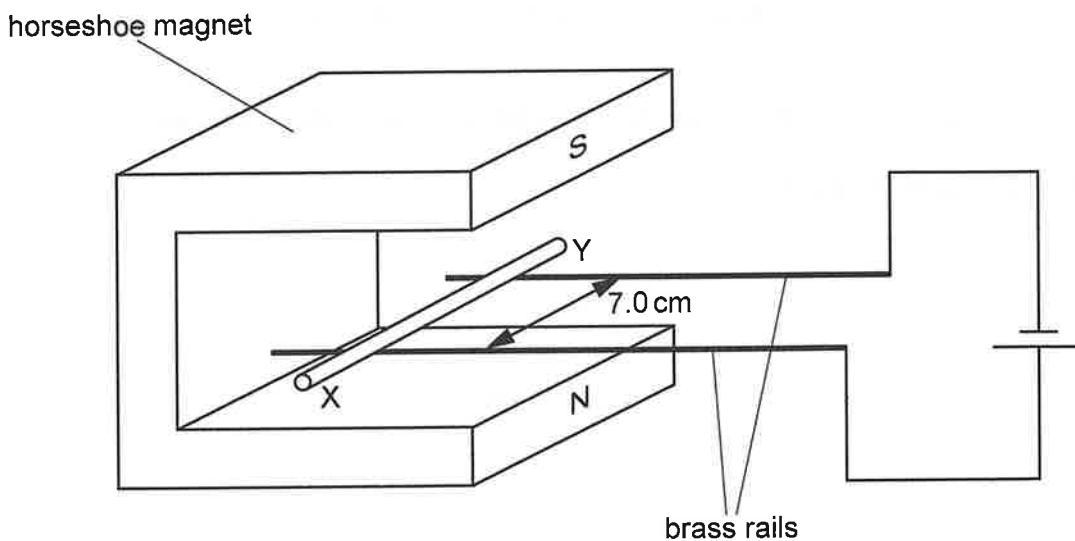


[2]





- (b) To demonstrate electromagnetism, a student sets up the equipment shown in Fig. 1.1.



**Fig. 1.1**

A copper rod XY is placed on top of two horizontal, frictionless brass rails in a magnetic field created by a horseshoe magnet. The brass rails are connected to a cell that causes a current in the copper rod.

A uniform magnetic field of flux density 0.56 T causes the copper rod to accelerate.

The current in the copper rod is 2.4 A and the mass of the copper rod is 0.0052 kg.

The length of the copper rod between the rails within the magnetic field is 7.0 cm.

- (i) Use Fleming's left-hand rule to determine the direction in which the copper rod accelerates. Explain your use of the rule.

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

[4]

- (ii) Calculate the magnitude of the initial acceleration of the rod.

$$\text{acceleration} = \dots \text{ ms}^{-2} [3]$$

[Total: 13]

