

1 (a) Two straight, vertical wires X and Y pass through holes in a horizontal card.

Fig. 8.1 shows the card viewed from above.



Fig. 8.1

There is a current in each wire in a downward direction (into the page).

(i) The magnetic field at Y due to the current in X produces a force on Y.

Place a tick in each blank column of the table to indicate the direction of this magnetic field and the direction of the force.

	magnetic field at Y	force on Y
towards the top of the page		
towards the bottom of the page		
to the left		
to the right		
into the page		
out of the page		

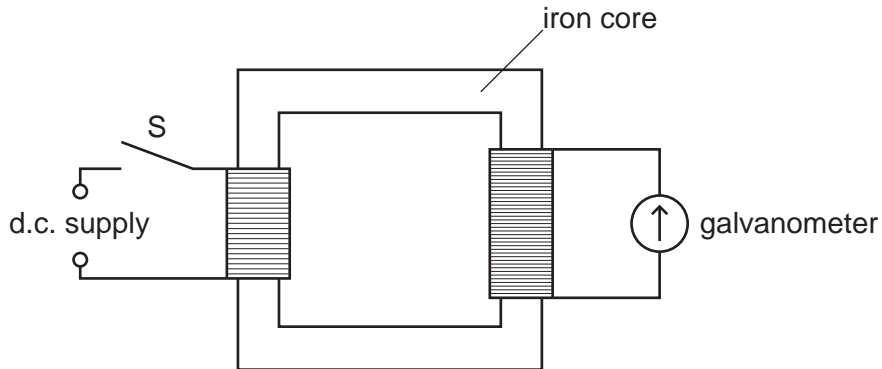
[2]

(ii) State and explain whether there is also a force on wire X.

.....  
.....

[1]

(b) Fig. 8.2 shows a d.c. supply connected to the input of a transformer.



**Fig. 8.2**

When switch S is first closed, the needle of the galvanometer deflects briefly, then returns to zero.

Explain why the brief deflection occurs.

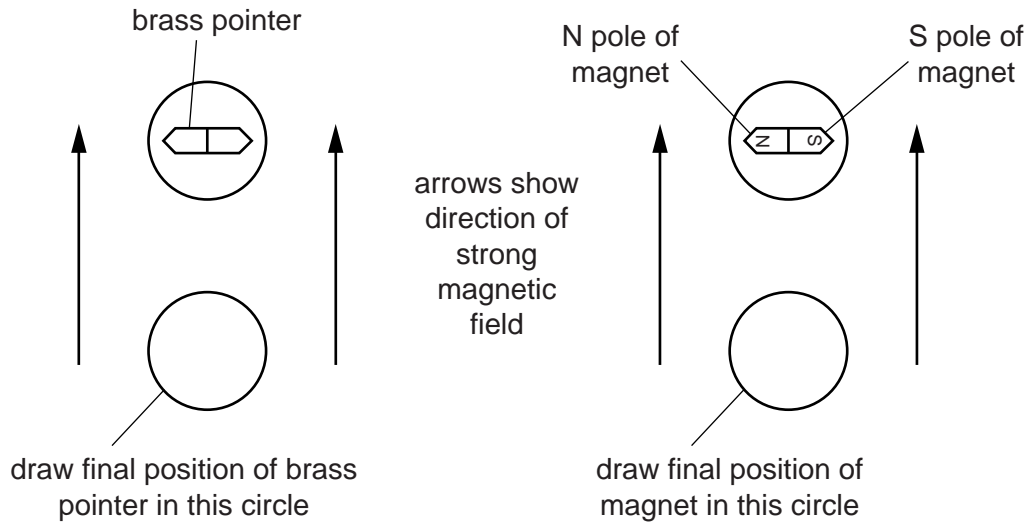
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.....  
.....  
.....  
.....

[3]

[Total: 6]

- 2 A physics teacher suspends two pointers in a magnetic field. One pointer is made of brass and the other is a magnet.

She holds the pointers in the initial positions shown in the two upper circles of Fig. 7.1. She then releases the pointers.



**Fig. 7.1**

- (a) In the lower circles of Fig. 7.1, draw the settled final positions of the two pointers. [2]

- (b) (i) Explain the final position of the brass pointer.

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

- (ii) Explain the final position of the magnet.

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

[2]

- (c) Suggest a material from which the magnet is made.

.....[1]

[Total: 5]

3 Fig. 8.1 shows a vertical current-carrying wire passing through a card at point X.

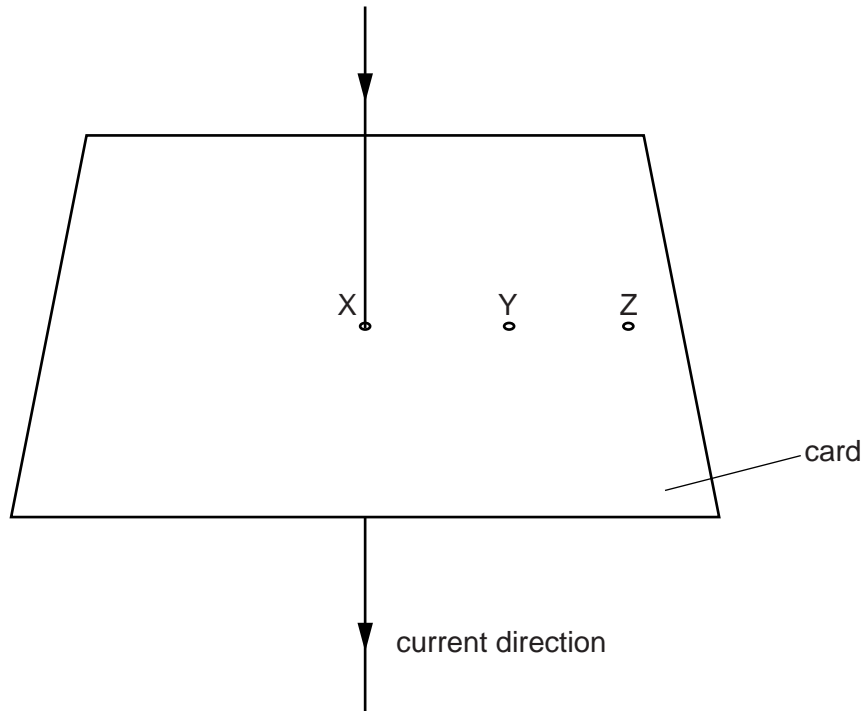


Fig. 8.1

- (a) On Fig. 8.1, sketch on the card the pattern of the magnetic field produced by the current in the wire. The detail of your sketch should suggest the variation in the strength of the field. Show the direction of the field with arrows. [3]
- (b) Using your knowledge of investigating the magnetic field around a bar magnet, suggest an experiment or experiments to confirm that you have drawn the correct pattern and direction in (a).

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[4]

(c) A second current-carrying wire is inserted vertically through the card at Y.

Suggest why there is now a force on the wire at X.

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

(d) The wire at Y is moved to Z. It still carries the same current.

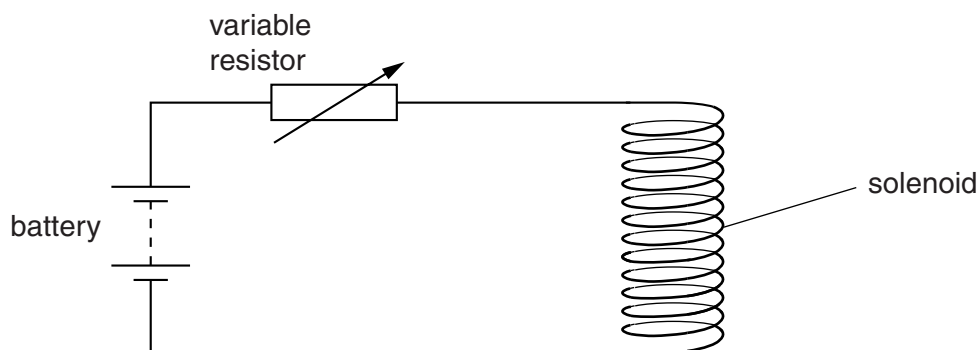
Tick the appropriate box to indicate whether the force on the wire at X is now smaller, greater or the same.

smaller	<input type="checkbox"/>
greater	<input type="checkbox"/>
same	<input type="checkbox"/>

[1]

[Total: 10]

- 4 Fig. 10.1 shows a variable resistor (rheostat) and a solenoid (long coil) connected to a battery.



**Fig. 10.1**

The current in the solenoid produces a magnetic field.

- (a) (i) On Fig. 10.1, draw lines to show the pattern of the magnetic field due to the current. [2]

- (ii) State the feature of the pattern of the magnetic field lines that indicates the strength of the magnetic field at particular points.

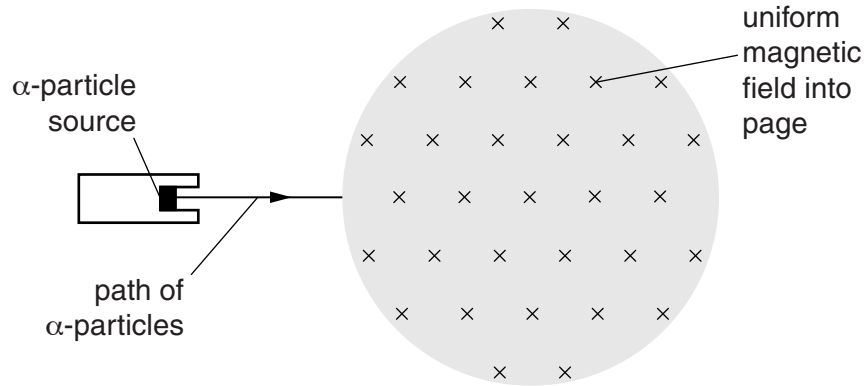
.....  
..... [1]

- (b) State and explain the effect on the magnetic field of increasing the resistance of the variable resistor.

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

- (c) In a laboratory vacuum chamber, some current-carrying coils produce a very strong magnetic field near a source of  $\alpha$ -particles.

Fig. 10.2 shows the arrangement.



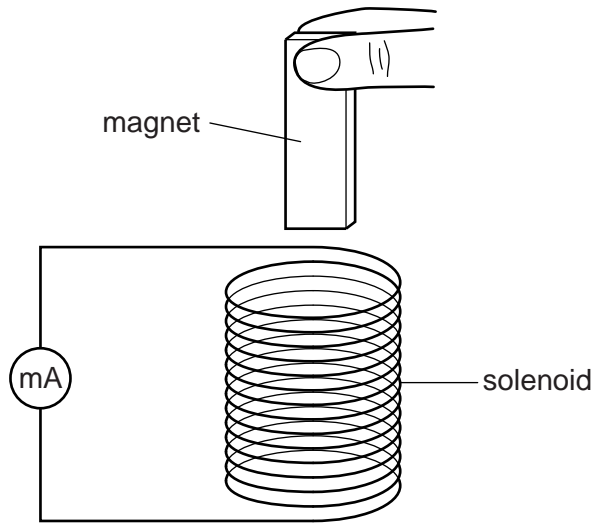
**Fig. 10.2**

- (i) In the shaded region of Fig. 10.2, draw a possible path for the  $\alpha$ -particles in the magnetic field. [2]
- (ii) State and explain the effect on this path of reversing the current in the coils.

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

[Total: 9]

- 5 A student holds a magnet above a solenoid, which is connected to a centre-zero milli-ammeter as shown Fig. 8.1.



**Fig. 8.1**

- (a) The student drops the magnet so that it falls through the solenoid.

State and explain what would be observed on the milliammeter

- (i) as the magnet enters the solenoid,

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

- (ii) as the magnet speeds up inside the solenoid.

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



**(b)** As the magnet passes into the coil in part **(a)**, the coil exerts a force on the magnet even though there is no contact between them.

**(i)** State the direction of this force.

.....

**(ii)** Explain how this force is caused.

.....

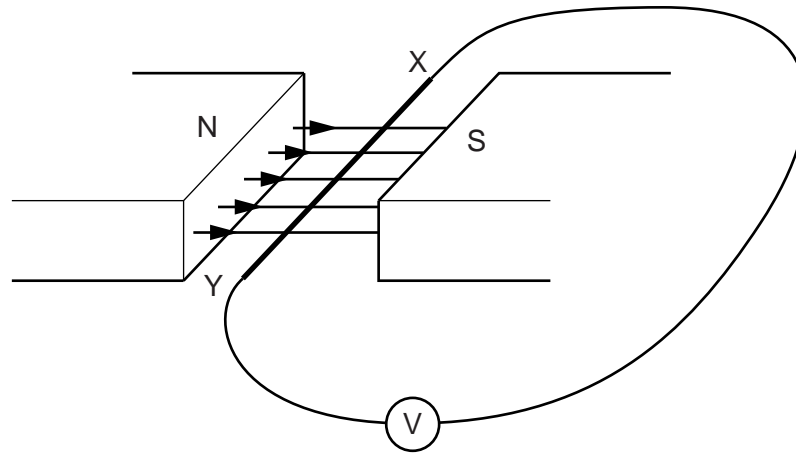
.....

.....

[3]

[Total: 7]

- 6 Fig. 9.1 shows a thin, straight rod XY placed in the magnetic field between the poles of a magnet. The wires from the ends of XY are connected to a centre-zero voltmeter.



**Fig. 9.1**

**(a)** When XY is moved slowly upwards the needle of the voltmeter shows a small deflection.

**(i)** State how XY must be moved to produce a larger deflection in the opposite direction.

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

**(ii)** XY is now rotated about its central point by raising X and lowering Y. Explain why no deflection is observed.

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

**(b)** The effect of moving XY can be seen if the wires are connected to the terminals of a cathode-ray oscilloscope instead of the voltmeter.

**(i)** State the parts inside the oscilloscope tube to which these terminals are connected.

..... [1]

**(ii)** The spot on the oscilloscope screen moves up and down repeatedly. State how XY is being moved.

..... [1]

**(iii)** State the setting of the time-base of the oscilloscope during the process described in **(ii)**.

..... [1]

[Total: 7]