O Level Combined Physics Structured

Electromagnetism Test 2.0

Q1

b) **Fig. 13.3** shows a light aluminum rod resting between the poles of a magnet. A current is passed through the rod from two brass strips connected to a power supply.

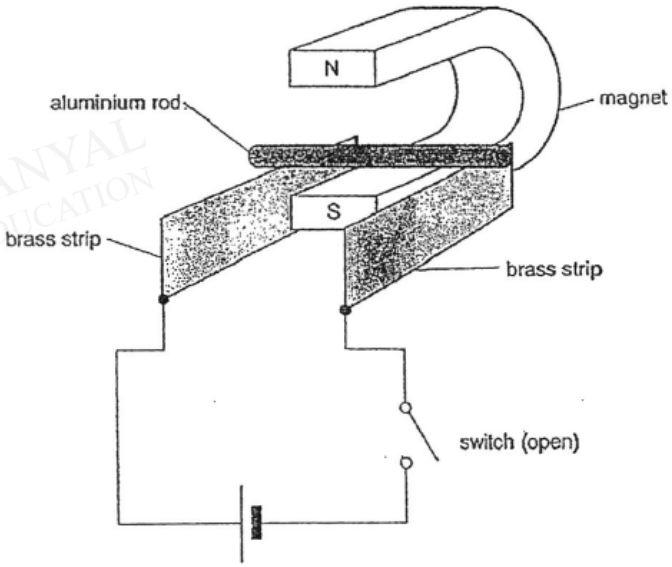
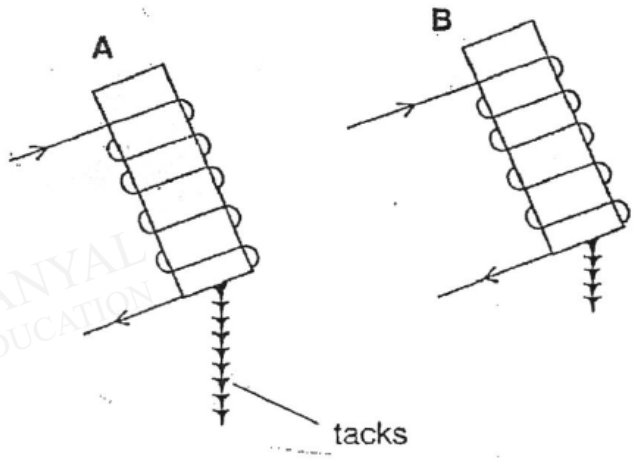


Fig. 13.3

i) State and explain what happens to the rod when the switch is closed. [2]
ii) Suggest a way to increase the speed of movement of the rod. [1]
iii) State the effects on the motion of the rod if the separation between the brass strips is increased. [1]

Q2

The diagram shows two identical coils A and B. Each has the same current passing through it but one of the coils has a steel rod inside it while the other coil has a soft iron rod inside.



(a) Which of the coils has the soft iron rod inside? Explain your choice

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.....

..... [2]

(b) What would happen to the tacks at the end of coil A if the current was switched off? Explain your answer.

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.....

..... [2]

Q3

Fig. 9.1 shows two electromagnets placed next to each other.

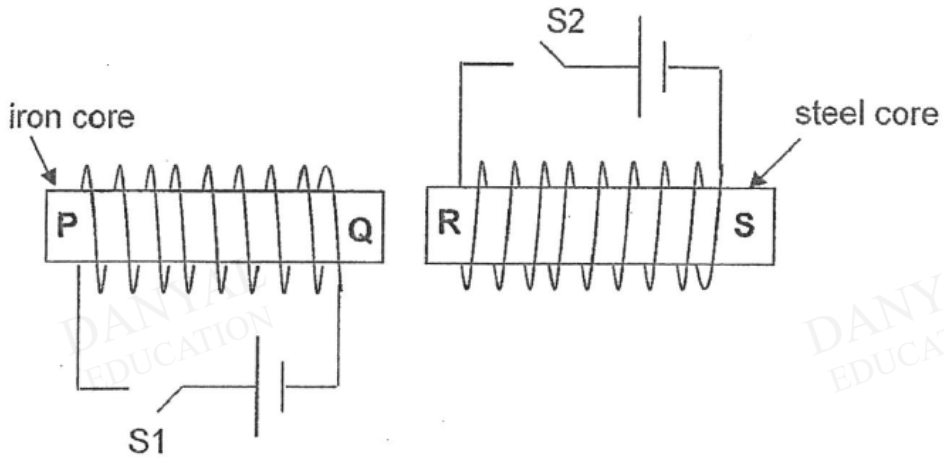

Fig. 9.1

(a) When both switches S1 and S2 are closed, ends **Q** and **R** will repel. What are the polarities of ends **Q** and **R**?

Both end **Q** and end **R** have ..... poles. [1]

(b) When both switches are open, state and explain what will be observed.

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..... [2]

Q4

(a) Fig 12.1 shows a current being passed through a long wire A.

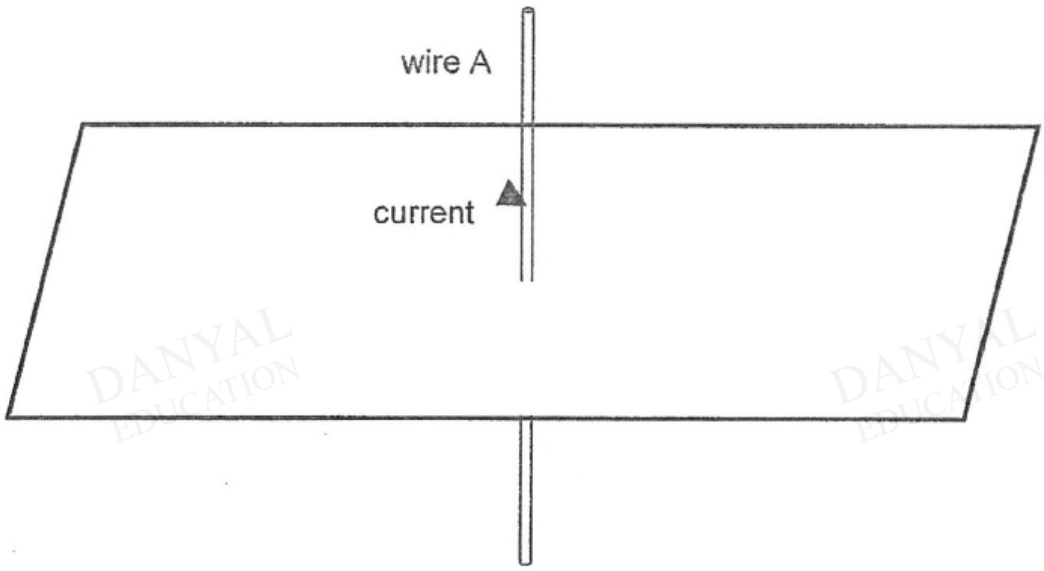

Fig 12.1

Explain how the magnetic field caused by the current in wire A can be plotted using a plotting compass

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.....[2]

(b) On Fig. 12.1, sketch the magnetic field pattern caused by the current in wire A on the sheet [2]

(c) Suggest how the diagram showing the magnetic field will change when the current in wire A increases in magnitude. Explain your answer.

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.....[2]

(d) Fig 12.2 shows a long wire B, with the current flowing in the same direction as wire A.

(X) is the magnetic field produced by wire A

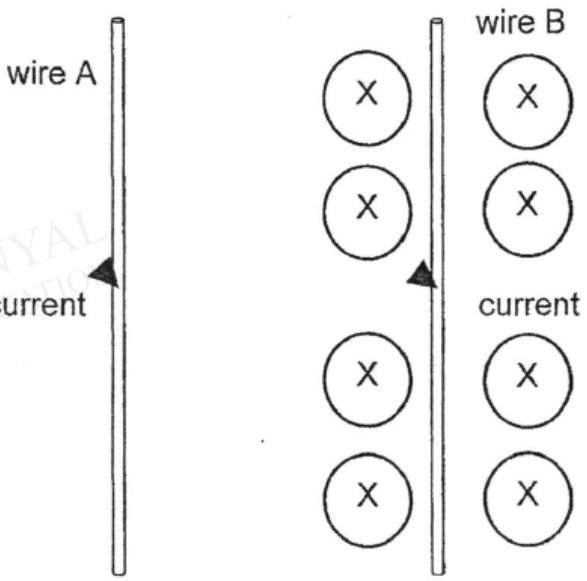

Fig 12.2

(i) Determine the direction of force acting on Wire B due to the magnetic field.

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.....[2]

(ii) Describe and explain what happens to the direction of force acting on wire B when:

1. the direction of current in wire B is reversed.

.....

.....[1]

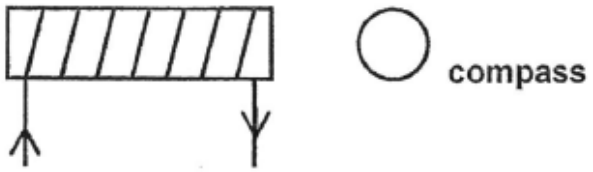
2 the current in wire A is increased.

.....

.....[1]

Q5

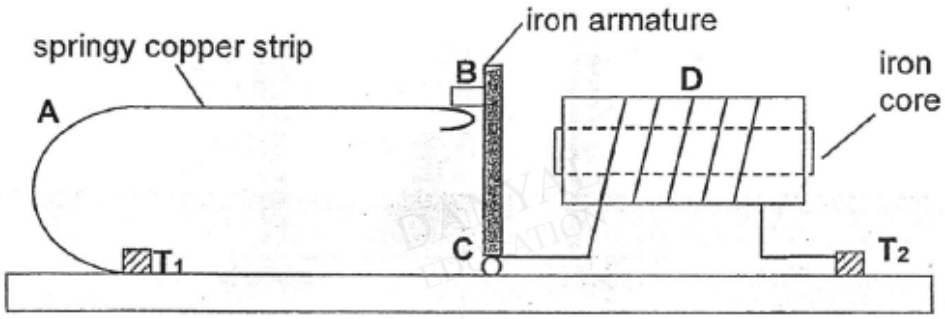
(a) The figure shows a length of wire wound around a soft iron core. A current is passed through the coil in the direction indicated by the arrows.



(i) Mark, on the figure, the **N** and **S** poles produced in the iron core. [1]

(ii) In the figure, draw an arrow to indicate the direction in which the compass needle would point when placed at the position shown. [1]

(b) The figure shows a model circuit breaker designed to switch off the current in a circuit when it exceeds a certain value. The current enters the circuit breaker at T_1, passes along the copper strip **A**, the iron armature **BC**, the coil **D**, and leaves at terminal T_2. The iron armature **BC** is pivoted at **C**.



(i) Describe how the circuit breaker works and state how it is reset.

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..... [4]

(ii) Explain if a steel armature can be used to replace the iron armature.

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..... [1]

(c) The figure shows a current carrying wire placed in between the North and South poles of a permanent magnet.

(i) Indicate on the wire the direction of force clearly. [1]

(ii) In the figure, draw magnetic field lines of the magnetic field produced <u>by current</u> flowing through the wire only. [2]

Answers

Electromagnetism Test 2.0

Q1

b) i) The rod will towards the magnet[1]. Using fleming's left hand rule, when current flows through the rod, the force induced will result in the rod moving inwards.

ii) Increase the current / increase the strength of the magnet

iii) No effect

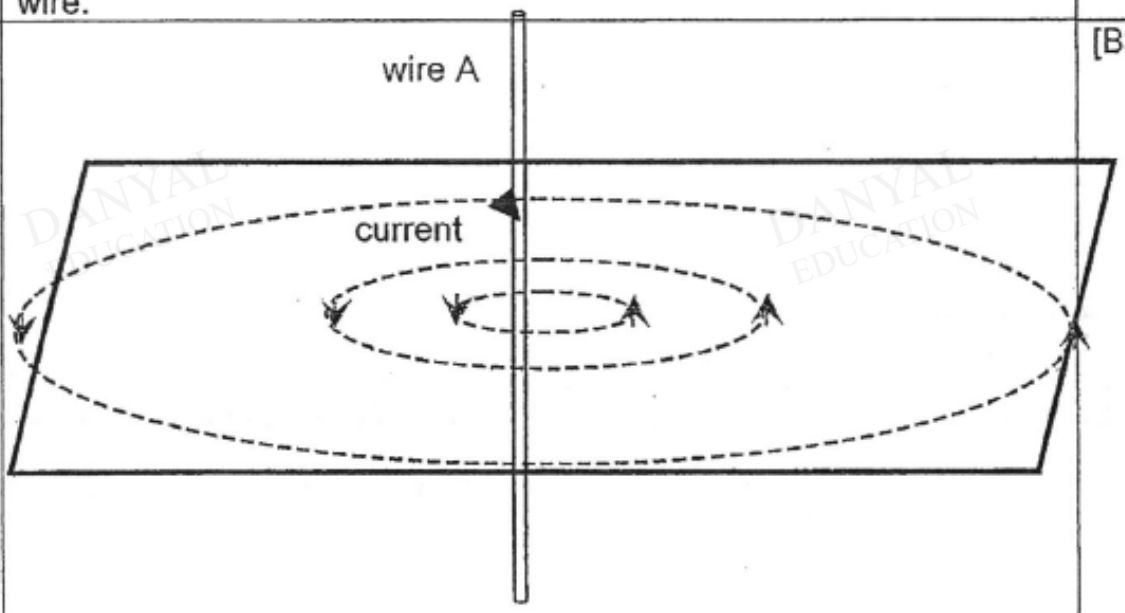
Q2

(a)	Coil A has a soft iron inside as it is more strongly magnetized than B	[1] [1]
(b)	All the tacks will dropped off when the current is switched off as iron loses its magnetism easily.	[1] [1]

Q3

(a) North	1
(b) Q will be attracted to R. When the switches are open, the steel core is permanently magnetized but the iron core loses its magnetism.	1 1

Q4

(a)	Place compass on the sheet. Mark the positions of the S and N ends of the compass needle Move the compass so that the S end of the need is at the previous N Repeat until a circle is formed. Repeat for different distances from wire.	[B1] [B1]
(b)	 (1 for direction) (1 for circle) (1 for near circles closer together)	[B3]
(c)	Circles become closer together. As the current in wire A increases in magnitude, the magnetic field becomes stronger.	[B1] [B1]
(di)	the force acts towards wire A or acts to the left	[B1]
(dii)	1. The force changes direction and points away from A by FLHR	[B1]
	2. Force does NOT change direction, still points towards wire A. Force increases as the strength of magnetic field by A increases.	[B1]

Q5

(a)	(i)	N is left, S is right.	1
	(ii)	Points towards the iron core.	1
(b)	(i)	When current becomes too large, the electromagnet becomes strong and attracts the iron armature more. This will cause the springy copper strip to be released, resulting in an open circuit. The iron armature will then return to its original position.	1 1 1 1
	(ii)	No, as steel reacts slowly to become a magnet and thus is not able to break the circuit fast enough.	1
(c)	(i)	Force pointing upwards	1
	(ii)	Magnetic field lines in an anti-clockwise direction. Magnetic field lines closer when nearer the wire.	1 1