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5.4 Magnetic Effects of Electric Currents

Easy

PHYSICS

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EXAM PAPERS PRACTICE

5.4 Magnetic Effects of Electric Currents

Question Paper

Course	DP IB Physics
Section	5. Electricity & Magnetism
Topic	5.4 Magnetic Effects of Electric Currents
Difficulty	Easy

Time allowed: 20

Score: /10

Percentage: /100

Question 1

A proton with mass, $m = 1.6 \times 10^{-19}$ kg moves parallel to a magnetic field of flux density $B = 0.5$ T with a speed, $v = 200$ m s^{-1}.

What is the magnitude of force exerted on the particle?

A. 0 N

B. 1.6×10^{-14} N

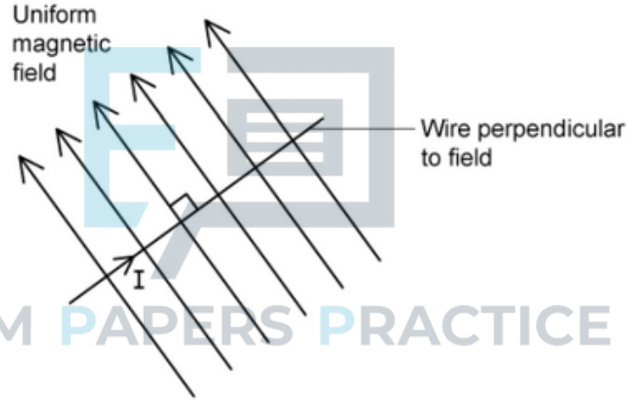
C. 1.6×10^{-11} N

D. 10 N

[1 mark]

Question 2

A horizontal straight wire of mass m and length L is placed in a magnetic field with magnetic field of flux density B. The wire and field are perpendicular, so that $\theta = 90°$ and $\sin\theta = 1$.



What size of current does the wire need to carry in order for it to 'float' above the surface when in the magnetic field?

A. $I = 0$

B. $I = mg$

C. $I = BL\sin\theta$

D. $I = \frac{mg}{BL}$

[1 mark]

Question 3

Which of the following statements about magnetic fields is incorrect?

A. The strength of a magnetic field is also known as the magnetic flux density.

B. There is a force on a conductor carrying a current at 90° to magnetic field lines.

C. The magnetic flux density is measured in units of Tesla, T.

D. A conductor carrying a current parallel to magnetic field lines experiences a magnetic force.

[1 mark]

Question 4

A current of 2.0 A flows in a wire of length 1.5 m. It is placed in a magnetic field of flux density 5 T such that the angle between the current and the field is 90°.

What is the magnitude of the magnetic force on the wire?

A. 0 N

B. 0.15 N

C. 15 N

D. 150 N

[1 mark]

Question 5

Fleming's Left-Hand Rule is a useful method to determine the direction of the force exerted on a current-carrying conductor in a magnetic field.

When used correctly, the direction of the thumb indicates the corresponding direction of which quantity?

A. Conventional current.

B. Electron flow.

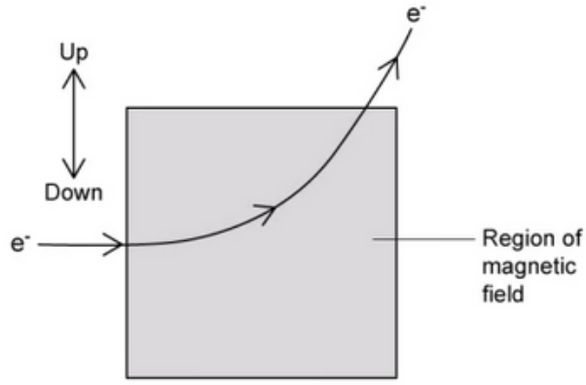
C. Force.

D. Magnetic field.

[1 mark]

Question 6

A beam of electrons enters a uniform magnetic field which causes it to change direction, as shown.



What is the direction of the magnetic field?

A. Out of the page and perpendicular to it.

B. Into the page and perpendicular to it.

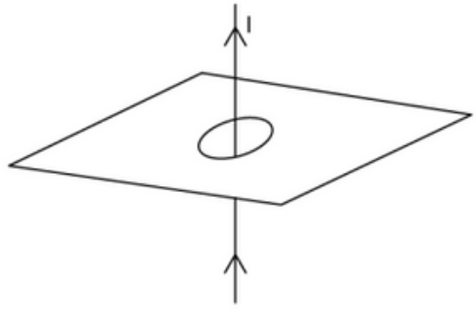
C. In the direction marked Up.

D. In the direction marked Down.

[1 mark]

Question 7

A current is passed through a wire running vertically upwards through a hole in a flat sheet of card, as shown.

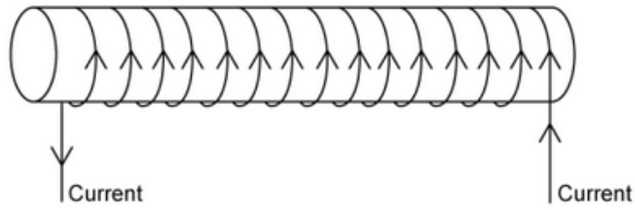


Which line correctly describes the induced magnetic field in terms of its direction and orientation relative to the card?

	Direction	Orientation to card
A.	anti-clockwise	same plane
B.	anti-clockwise	perpendicular
C.	clockwise	same plane
D.	clockwise	perpendicular

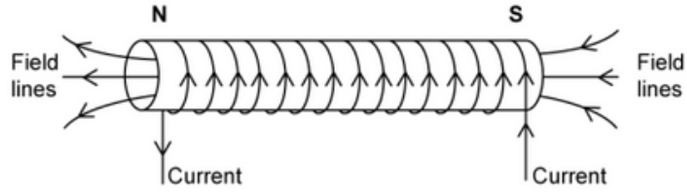
Question 8

A current moves through a solenoid as shown.

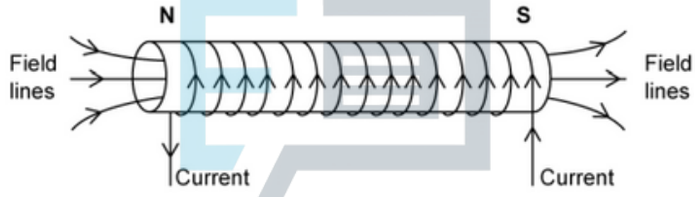


Which diagram has the North and South poles of the solenoid, and the magnetic field lines, all correctly marked?

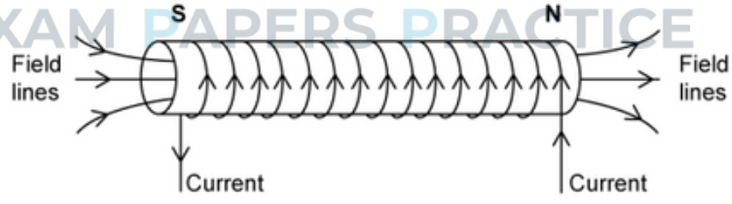
A.



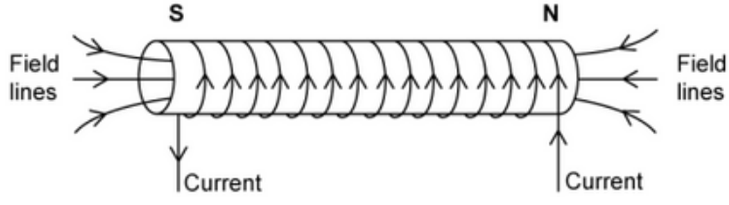
B.



C.



D.



[1 mark]

Question 9

Two current-carrying wires are placed in parallel with each other. Which statements correctly describe the situation?

I. When the conductors attract, the direction of the magnetic forces will be towards each other

II. When the conductors repel, the direction of the magnetic forces will be away from each other

III. The magnitude of each force depends on the amount of current and the length of the wire

A. I only

B. I and II only

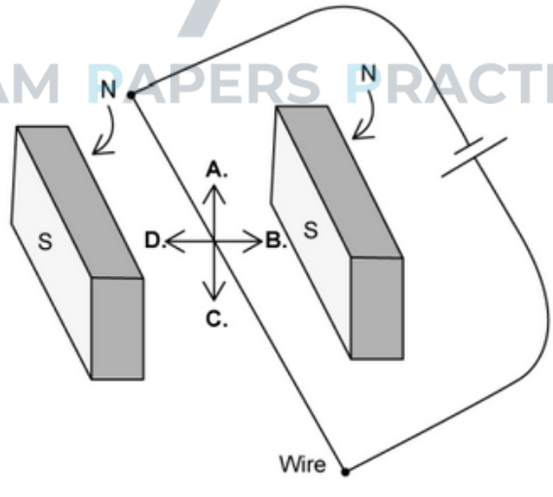
C. II and III only

D. I, II and III

[1 mark]

Question 10

A current-carrying wire is positioned between two magnets as shown. Which arrow shows the direction of the force on the wire?



[1 mark]