

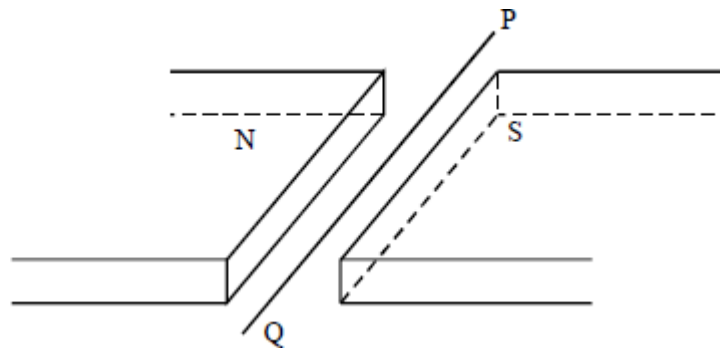
- 1 An α particle and a β^- particle both enter the same uniform magnetic field, which is perpendicular to their direction of motion. If the β^- particle has a speed 15 times that of the α particle, what is the value of the ratio

$\frac{\text{magnitude of force on } \beta^- \text{ particle}}{\text{magnitude of force on } \alpha \text{ particle}}$?

- A 3.7
- B 7.5
- C 60
- D 112.5

(Total 1 mark)

2



A wire lies perpendicularly across a horizontal uniform magnetic field of flux density 20×10^{-3} T so that 0.30 m of the wire is effectively subjected to the field. If the force exerted on this length of wire due to a current in it is 30×10^{-3} N downward, what is the current in the wire?

- A 0.45 A from P to Q
- B 0.45 A from Q to P
- C 5.0 A from P to Q
- D 5.0 A from Q to P

(Total 1 mark)

- 3 An electron moves due North in a horizontal plane with uniform speed. It enters a uniform magnetic field directed due South in the same plane. Which one of the following statements concerning the motion of the electron in the magnetic field is correct?

- A It continues to move North with its original speed.
- B It slows down to zero speed and then accelerates due South.
- C It is accelerated due West.
- D It is accelerated due North.

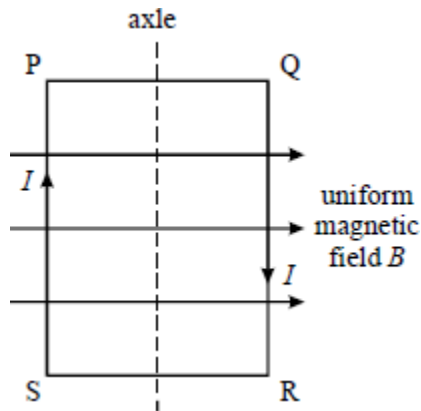
(Total 1 mark)

4

Which line, **A** to **D**, gives correct units for both magnetic flux and magnetic flux density?

	magnetic flux	magnetic flux density
A	Wb m^{-2}	Wb
B	Wb	T
C	Wb m^{-2}	T m^{-2}
D	T m^{-2}	Wb m^{-2}

(Total 1 mark)

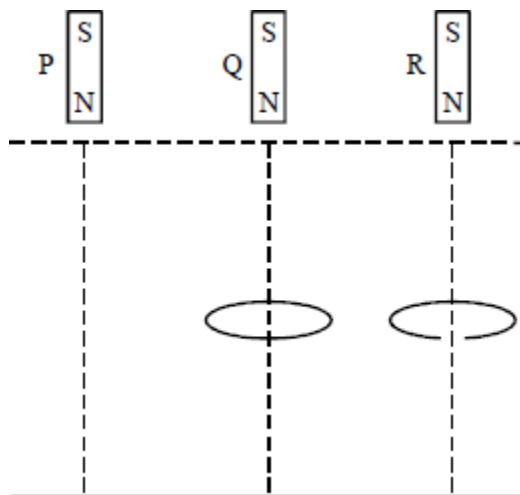
5

A coil, mounted on an axle, has its plane parallel to the flux lines of a uniform magnetic field B , as shown. When a current I is switched on, and before the coil is allowed to move,

- A** there are no forces due to B on the sides SP and QR.
- B** there are no forces due to B on the sides PQ and RS.
- C** sides SP and QR tend to attract each other.
- D** sides PQ and RS tend to attract each other.

(Total 1 mark)

6



Three identical magnets P, Q and R are released simultaneously from rest and fall to the ground from the same height. P falls directly to the ground, Q falls through the centre of a thick conducting ring and R falls through a ring which is identical except for a gap cut into it. Which one of the statements below correctly describes the sequence in which the magnets reach the ground?

- A P and R arrive together followed by Q.
- B P and Q arrive together followed by R.
- C P arrives first, followed by Q which is followed by R.
- D All three magnets arrive simultaneously.

(Total 1 mark)

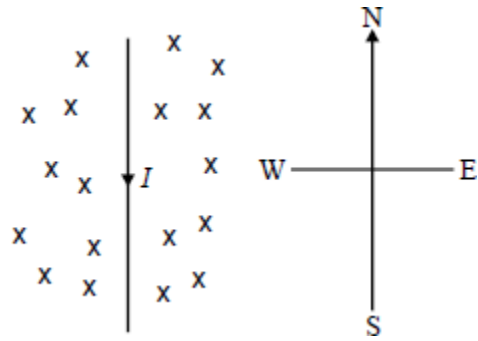
7

The magnetic flux threading a coil of 100 turns drops from 5×10^{-3} Wb to zero in 0.1 s. The average induced e.m.f., in V, is

- A 0.05
- B 0.5
- C 5
- D 20

(Total 1 mark)

8



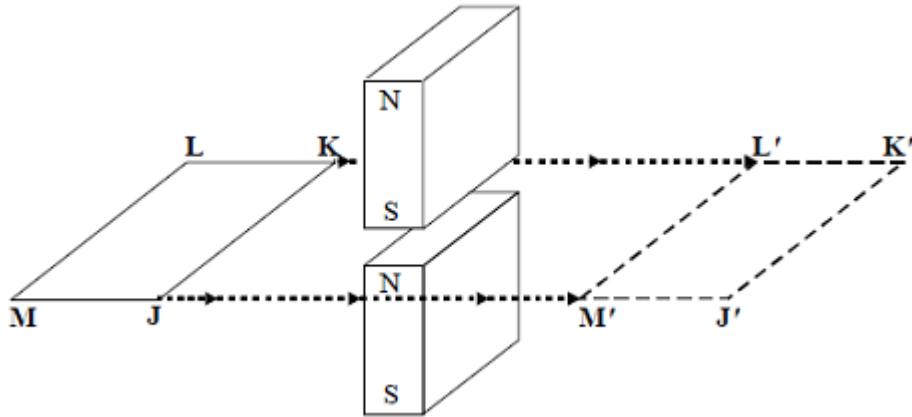
The diagram shows a wire carrying a current, I , in the plane of the paper and in the south direction. A magnetic field is applied perpendicularly to the paper and acts into the paper. What is the direction of the force acting on the wire?

- A north
- B south
- C east
- D west

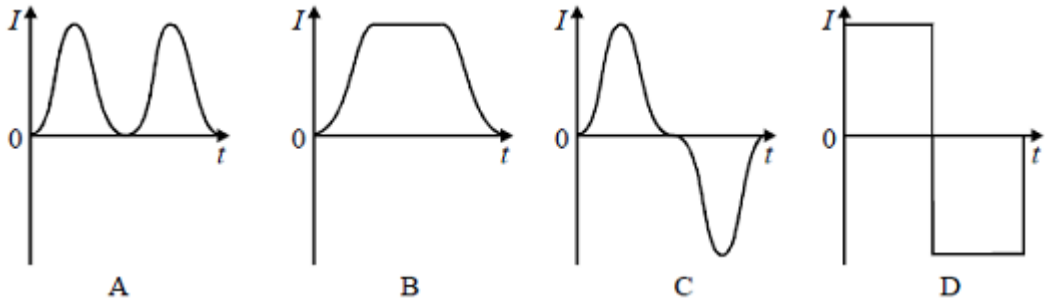
(Total 1 mark)

9

A rectangular conducting loop is pulled horizontally through the gap between two vertical magnets as shown in the diagram.



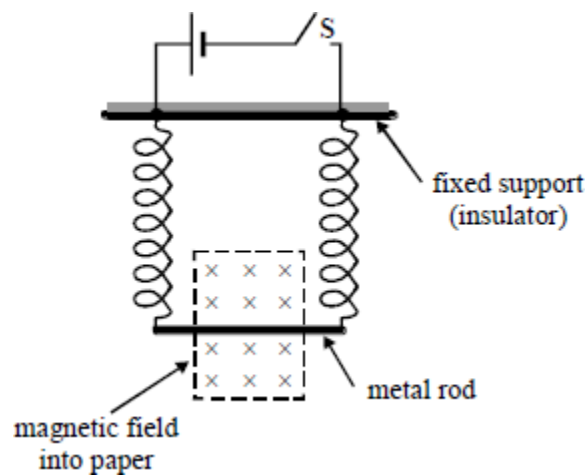
Which one of the graphs best represents the variation of loop current I with time t as the loop moves at a constant speed from $JKLM$ to $J'K'L'M'$?



(Total 1 mark)

10

The diagram shows a metal rod suspended in a magnetic field by two vertical conducting springs. The cell and rod have negligible resistance. When the switch **S** is closed the effect of the magnetic field is to displace the rod vertically a distance y .



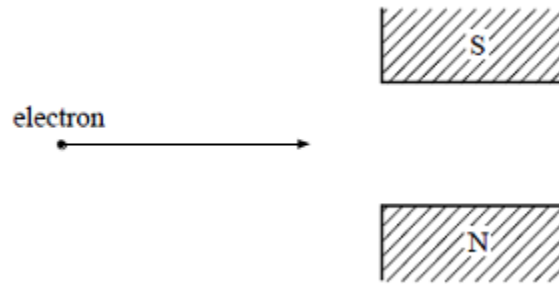
When both the spring constant and electrical resistance of **each** spring is doubled, closing the switch would now cause the rod to be displaced a distance

- A $\frac{y}{2}$
- B $\frac{y}{4}$
- C y
- D $4y$

(Total 1 mark)

11

An electron moves into a region of uniform magnetic flux density between the poles of a magnet as shown in the diagram.



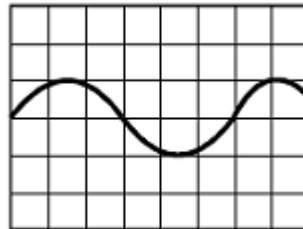
The deflection of the electron will be

- A towards the pole marked **S**
- B towards the pole marked **N**
- C perpendicular to the plane of the paper towards you
- D perpendicular to the plane of the paper away from you

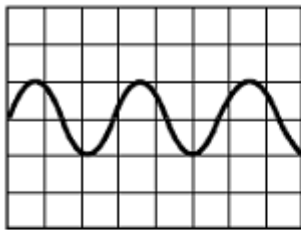
(Total 1 mark)

12

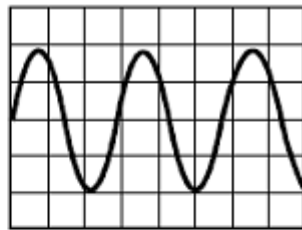
The diagram below shows the waveform obtained when the output of an alternator is connected to a cathode ray oscilloscope.



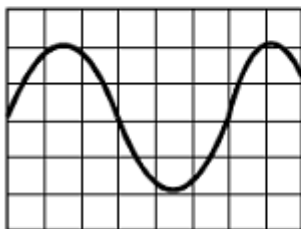
Which one of the following best represents the output when the speed of rotation of the generator is doubled and no adjustment is made to the oscilloscope?



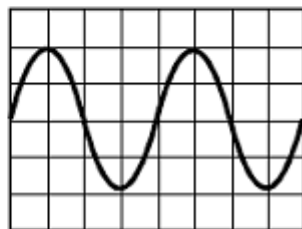
A



B



C



D

(Total 1 mark)

13

An alpha particle moves at one-tenth the velocity of a beta particle. They both move through the same uniform magnetic field at right angles to their motion.

The magnitude of the ratio $\frac{\text{force on the alpha particle}}{\text{force on the beta particle}}$ is

A $\frac{1}{4}$

B $\frac{1}{5}$

C $\frac{1}{10}$

D $\frac{1}{20}$

(Total 1 mark)

Mark schemes

1	B	[1]
2	D	[1]
3	A	[1]
4	B	[1]
5	B	[1]
6	A	[1]
7	C	[1]
8	C	[1]
9	C	[1]
10	B	[1]
11	D	[1]
12	B	[1]
13	B	[1]

Examiner reports

- 1 This question required candidates to recall the charges of α and β -particles, as well as to be familiar with $F = BQv$. Both the facility (54%) and the discrimination were an improvement on the pre-examination values. 24% of the candidates chose distractor C (presumably because $15 \times 4 = 60$). This suggests these candidates had difficulty with the physics as well as the arithmetic.