Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic: Fields And Their Consequences(Magnetic Field)

Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

A wire is at right angles to a uniform magnetic field and carries an electric current.
The wire is 150 mm in length.

When the current in the wire is increased by 4.0 A, the force acting on the wire increases by 3.6×10^{-3} N.

What is the magnetic flux density of the field?

A 6.0×10^{-6} T ⬭
B 6.0×10^{-3} T ⬭
C 1.7×10^{2} T ⬭
D 1.7×10^{5} T ⬭

(Total 1 mark)

Q2.

A beam consists of ionised atoms of two isotopes of an element.
When the beam enters a uniform magnetic field, the ions move in circular paths.
The ions have the same charge and travel at the same speed when they enter the magnetic field.

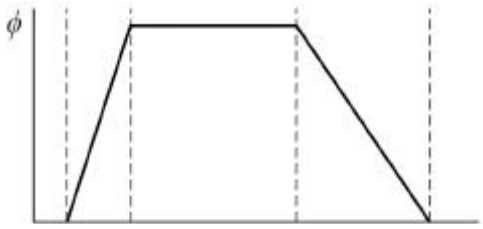
Which statement is true?

A The force acting on an ion is different for each isotope. ⬭
B The radius of the path followed by an ion is different for each isotope. ⬭
C The kinetic energy of an ion increases for both isotopes. ⬭
D The acceleration of an ion is the same for both isotopes. ⬭

(Total 1 mark)

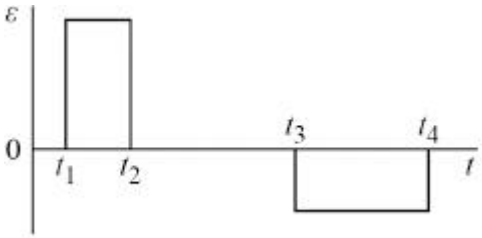
Q3.

The magnetic flux ϕ in a coil varies with time t as shown.



Which graph shows how the emf ε induced in the coil varies with t ?

A



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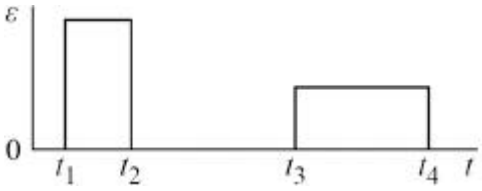

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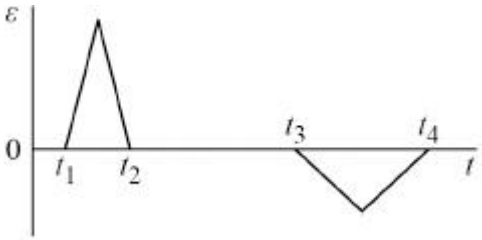

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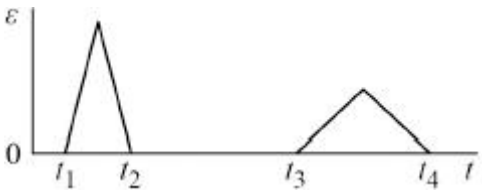


(Total 1 mark)

Q4.

A circular coil with a radius of 0.10 m has 200 turns.
The coil rotates at 50 revolutions per second about an axis which is perpendicular to a uniform magnetic field and in the plane of the coil.
The magnetic flux density of the field is 0.20 T.

What is the maximum emf induced in the coil?

A 63 V

B 126 V

C 195 V

D 395 V ○

(Total 1 mark)

Q5.

The distance between the wing tips of a metal aircraft is 30 m.
The aircraft flies horizontally at a steady speed of 100 m s^{-1}.
The aircraft passes through a vertical magnetic field of flux density 2.0×10^{-7} T.

What is the emf induced between its wing tips?

A 0.2 μV ○

B 20 μV ○

C 300 μV ○

D 600 μV ○

(Total 1 mark)

Q6.

A transformer for use in a 230 V ac supply is 90% efficient.
The transformer provides a current of 3.00 A at 12.0 V.

What is the current in the primary coil?

A 0.141 A ○

B 0.156 A ○

C 0.174 A ○

D 5.75 A ○

(Total 1 mark)

Q7.

When an electron moves at a speed v perpendicular to a uniform magnetic field of flux density B, the radius of its path is R.

A second electron moves at a speed $\frac{v}{2}$ perpendicular to a uniform magnetic field of flux density $4B$.

What is the radius of the path of the second electron?

A $\frac{R}{8}$ ○

B $\frac{R}{4}$ ○

C $4R$ ○

D $8R$ ○

(Total 1 mark)

Q8.

A horizontal wire of length $0.25\ \text{m}$ carrying a current of $3.0\ \text{A}$ is perpendicular to a magnetic field. The mass of the wire is $3.0 \times 10^{-3}\ \text{kg}$ and the weight of the wire is supported in equilibrium by the magnetic field.

What is the flux density of the magnetic field?

A $2.6\ \text{T}$ ⬭

B $3.9 \times 10^{-2}\ \text{T}$ ⬭

C $2.2 \times 10^{-2}\ \text{T}$ ⬭

D $4.0 \times 10^{-3}\ \text{T}$ ⬭

(Total 1 mark)

Q9.

A coil is rotated at frequency f in a uniform magnetic field.
The magnetic flux linking the coil is a maximum at time t_1 and the emf induced in the coil is a maximum at time t_2.

What is the smallest value of $t_1 - t_2$?

A 0 ⬭

B $\frac{1}{4f}$ ⬭

C $\frac{1}{2f}$ ⬭

D $\frac{3}{4f}$ ⬭

(Total 1 mark)

Q10.

Power P is dissipated in a resistor of resistance R carrying a direct current I.

A second resistor of resistance $2R$ carries an alternating current with peak value I.

What is the power dissipated in the second resistor?

A $\sqrt{2}P$ ⬭

B P ⬭

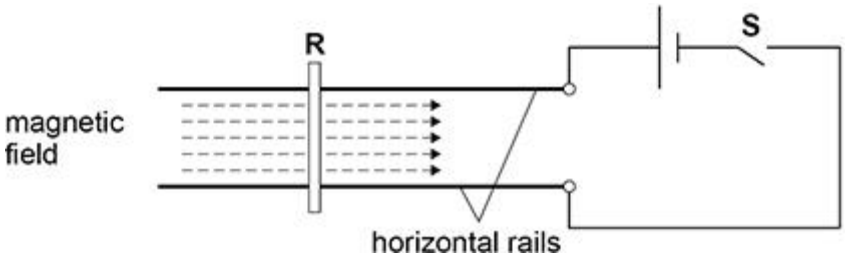
C $2P$ ⬭

D $4P$ ⬭

(Total 1 mark)

Q11.

A short copper rod **R** is placed on a pair of thick horizontal parallel copper rails.
A horizontal magnetic field exists in the direction shown by the dashed arrows.
The diagram shows the apparatus when viewed from directly above.



When switch **S** is closed, **R** will tend to

A lift upwards away from the rails. ⬭

B move to the left. ⬭

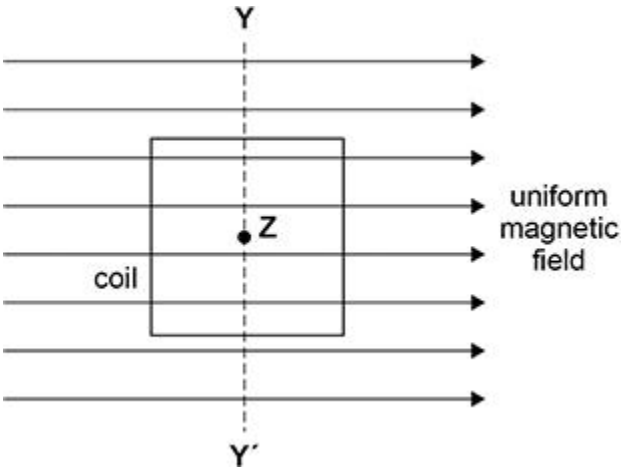
C move to the right. ⬭

D be pressed downwards onto the rails. ⬭

(Total 1 mark)

Q12.

The diagram shows a square coil with its plane parallel to a uniform magnetic field.



The coil always remains within the magnetic field.
There are four possible changes to the position of the coil:

- moving it to the left
- moving it towards **Y**
- rotating it about the axis **YY´**
- rotating it about an axis **Z** that is at its centre and perpendicular to the plane of the coil.

How many of these changes will result in an induced emf in the coil while the change occurs?

A one ⬭

B two ⬭

C three ⬭

D four ⬭

(Total 1 mark)

Q13.

Mains electricity is rated 230 V in the UK.

Which is correct?

A The mean voltage is 163 V. ⬭

B The peak voltage is 230 V. ⬭

C The root mean square voltage is 325 V. ⬭

D The peak-to-peak voltage is 650 V. ⬭

(Total 1 mark)

Q14.

In a resistor of resistance R, a steady current I dissipates a power P.

In a resistor of resistance $\frac{R}{2}$ there is an alternating current of root mean square value $3I$.

What is the mean power dissipated in the resistor of resistance $\frac{R}{2}$?

A $9P$ ⬭

B $\frac{9}{2}P$ ⬭

C $\frac{9}{4}P$ ⬭

D $\frac{3}{2}P$ ⬭

(Total 1 mark)

Q15.

The primary winding of a transformer has 200 turns and the secondary winding has 1600 turns. A root mean square (rms) alternating voltage of 25 V is applied to the primary winding causing a primary rms current of 4.0 A. The transformer is 90% efficient.

What are the rms values of the secondary voltage and the secondary current?

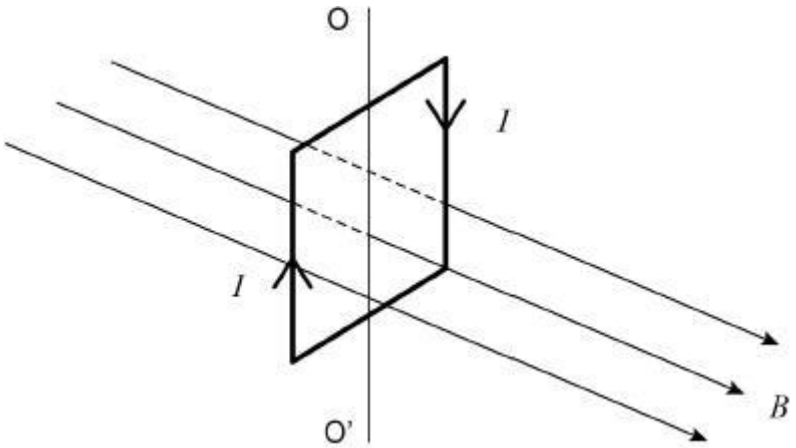
	Secondary voltage / V	Secondary current / A	
A	200	0.50	⬭
B	200	0.45	⬭

C	180	0.50	⬭
D	3.1	29.0	⬭

(Total 1 mark)

Q16.

The diagram shows a current I in a vertical square coil.
The coil can rotate about an axis OO'.
The plane of the coil is at right angles to a uniform horizontal magnetic field of flux density B.



Which statement is correct?

A The forces on the vertical sides of the coil are equal in magnitude and opposite in direction. ⬭

B A non-zero couple acts on the coil. ⬭

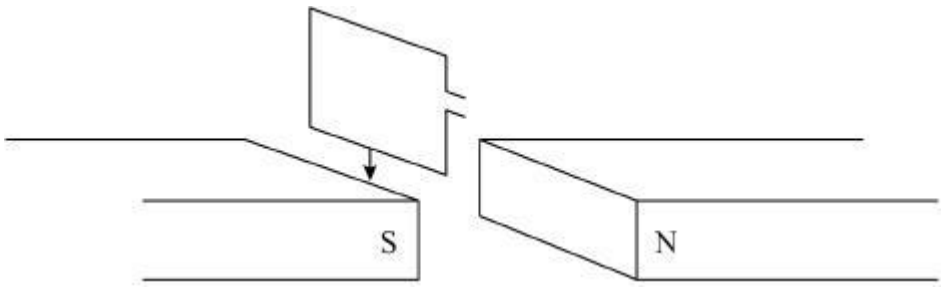
C No forces act on the horizontal sides of the coil. ⬭

D The forces on all sides of the coil act toward the centre of the coil. ⬭

(Total 1 mark)

Q17.

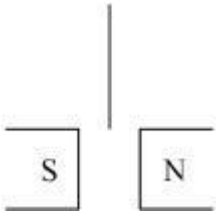
The diagram shows a small rectangular coil falling between two magnetic poles.



The coil is shown at four instants as it passes through the magnetic field.

At which instant will the induced emf be a maximum?

A **B**



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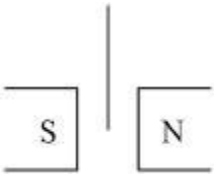

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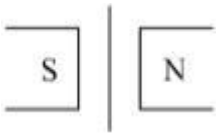
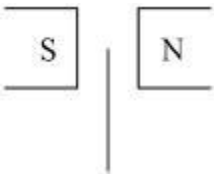




A ⬭

B ⬭

C ⬭

D ⬭

(Total 1 mark)

Q18.

An alternating emf is induced in a coil rotating in a magnetic field.

What is the phase difference between the magnetic flux linkage through the coil and the emf?

A 0 ⬭

B $\frac{\pi}{3}$ rad ⬭

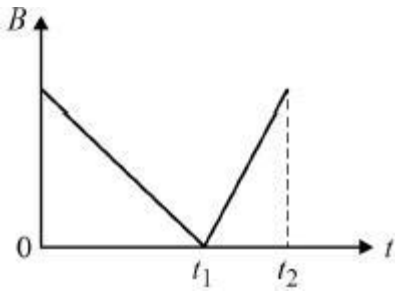
C $\frac{\pi}{2}$ rad ⬭

D π rad ⬭

(Total 1 mark)

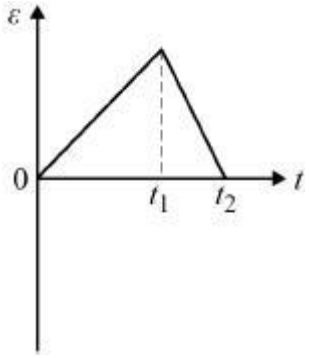
Q19.

The diagram shows the variation with time t of the magnetic flux density B of the field linking a coil.

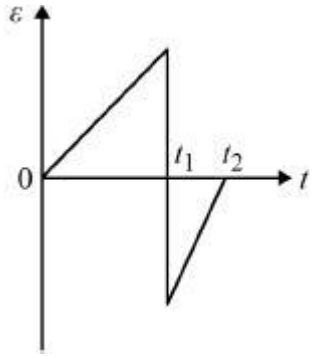


Which graph shows the variation of induced emf ε in the coil during this time interval?

A



B



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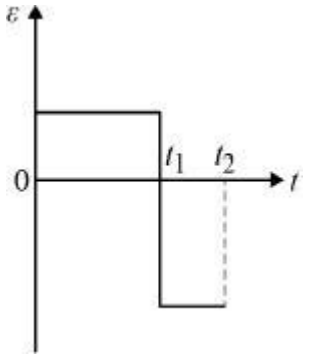

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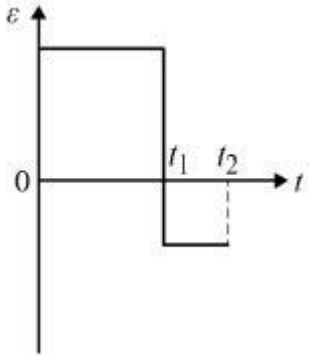


A ⬭

B ⬭

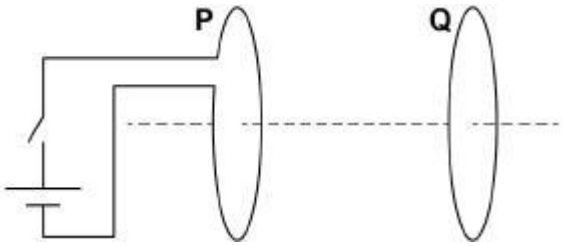
C ⬭

D ⬭

(Total 1 mark)

Q20.

A coil **P** is connected to a cell and a switch.
A closed coil **Q** is parallel to **P** and is arranged on the same axis.



Which describes the force acting on **Q** after the switch is closed?

A steady and directed to the left ⬭

B steady and directed to the right ⬭

C short-lived and directed to the left ⬭

D short-lived and directed to the right ⬭

(Total 1 mark)