



Magnetic Field

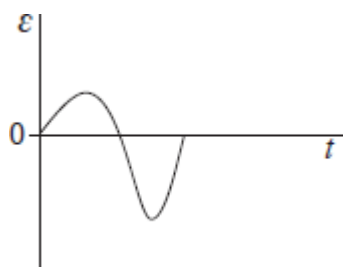
TOPIC QUESTIONS

Level	AS Level
Subject	Physics
Exam Board	AQA
Paper Type	Multiple Choice

Time Allowed : 30min

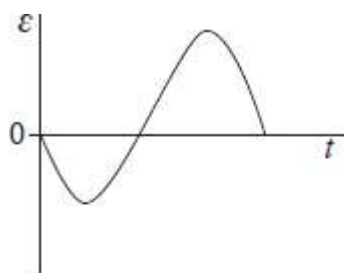
1. In which one of the following applications does electromagnetic induction **not** take place?
- A the generators at a nuclear power station
 - B the ac power adapter for a laptop computer
 - C the wings of an aircraft cutting through the Earth's magnetic field
 - D the back up capacitor of an electric timer

2. When a magnet is dropped through an aluminium ring an emf is induced. A data logger connected to the ring records the variation of the induced emf \mathcal{E} with time t as shown below.

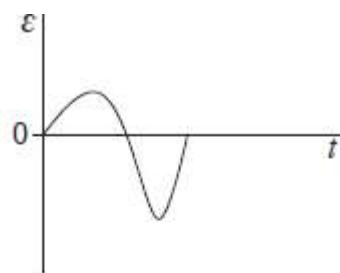


In a second experiment, the magnet is dropped from a greater height.

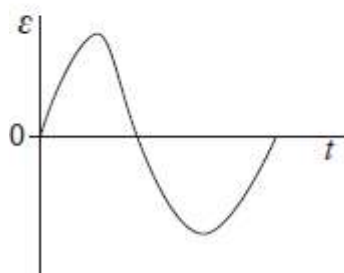
Which one of the following graphs best represents the induced emf in the second experiment?



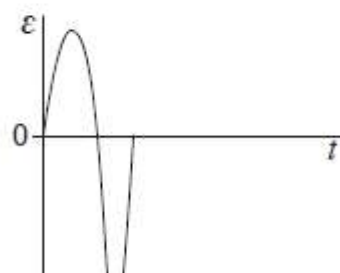
A



B



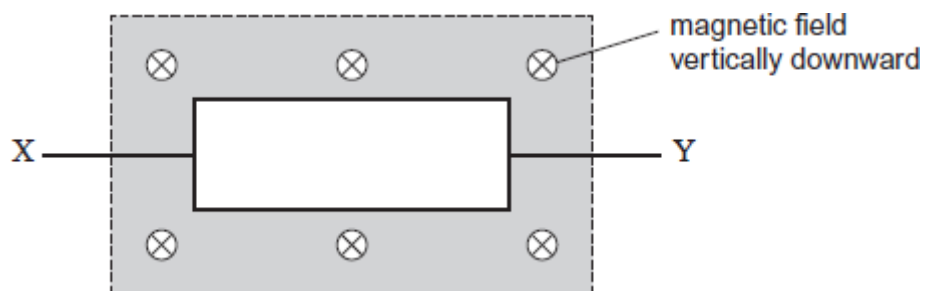
C



D

3. A rectangular coil of area A has N turns of wire. The coil is in a uniform magnetic field, as shown in the diagram.

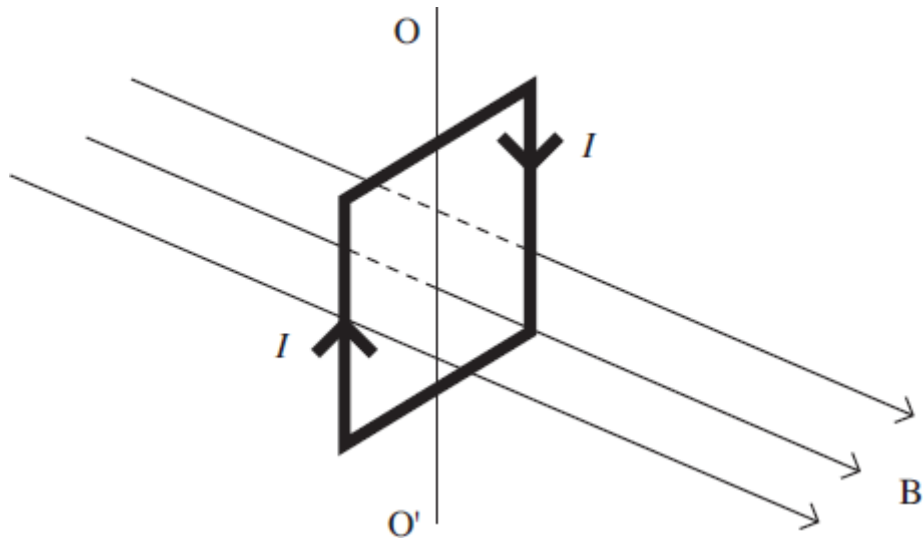
When the coil is rotated at a constant frequency f about its axis XY , an alternating emf of peakvalue \mathcal{E}_0 is induced in it.



What is the maximum value of the magnetic flux linkage through the coil?

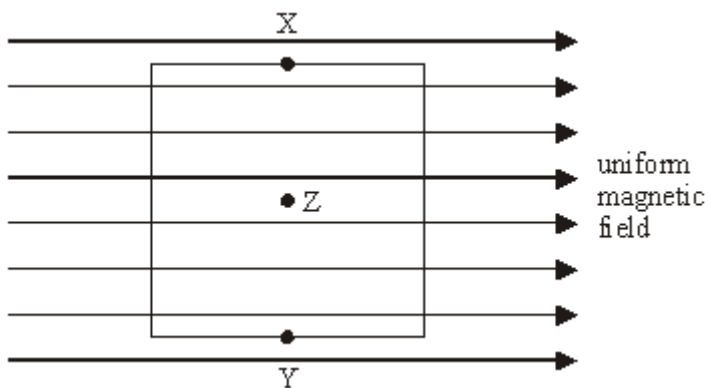
- A $\frac{\mathcal{E}_0}{2\pi f}$
- B $\frac{\mathcal{E}_0}{\pi f}$
- C $\pi f \mathcal{E}_0$
- D $2\pi f \mathcal{E}_0$
4. A transformer has 1150 turns on the primary coil and 500 turns on the secondary coil. The primary coil draws a current of 0.26 A from a 230 V ac supply. The current in the secondary coil is 0.50 A. What is the efficiency of the transformer?
- A 42%
- B 50%
- C 84%
- D 100%

5. The diagram shows a vertical square coil whose plane is at right angles to a horizontal uniform magnetic field B . A current, I , is passed through the coil, which is free to rotate about a vertical axis OO' .



Which one of the following statements is correct?

- A The forces on the two vertical sides of the coil are equal and opposite.
 - B A couple acts on the coil.
 - C No forces act on the horizontal sides of the coil.
 - D If the coil is turned through a small angle about OO' and released, it will remain in position.
- 6.



The diagram shows a square coil with its plane parallel to a uniform magnetic field. Which one of the following would induce an emf in the coil?

- A movement of the coil slightly to the left
- B movement of the coil slightly downwards

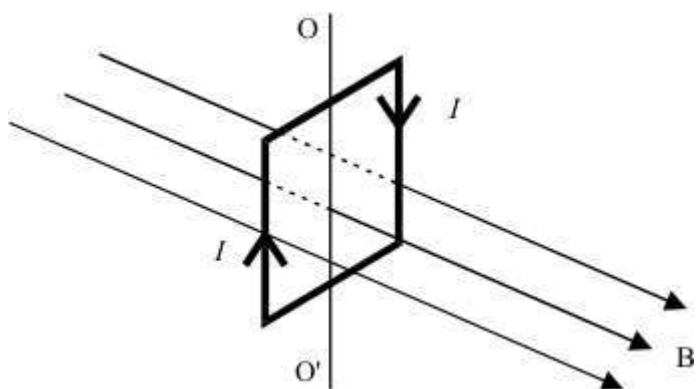
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- C rotation of the coil about an axis through XY
- D rotation of the coil about an axis perpendicular to the plane of the coil through Z

7. Which line, **A** to **D**, correctly describes the trajectory of charged particles which enter, at right angles, (a) a uniform electric field, and (b) a uniform magnetic field?

	(a) uniform electric field	(b) uniform magnetic field
A	circular	circular
B	circular	paraboli
C	paraboli	ccircular
D	c	paraboli
		c

8. The diagram shows a vertical square coil whose plane is at right angles to a horizontal uniform magnetic field B . A current, I , flows in the coil, which can rotate about a vertical axis OO' .



Which one of the following statements is correct?

- A The forces on the two vertical sides of the coil are equal and opposite.
- B A couple acts on the coil.
- C No forces act on the horizontal sides of the coil.
- D If the coil is turned through a small angle about OO' , it will remain in position.

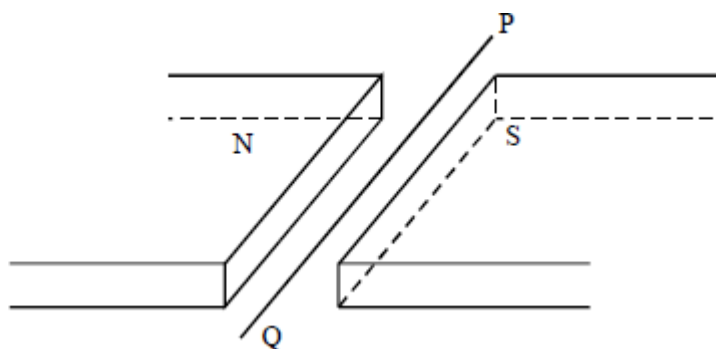
9. An α particle and a β^- particle both enter the same uniform magnetic field, which is perpendicular to their direction of motion. If the β^- particle has a speed 15 times that of the α particle, what is the value of the ratio

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

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



10.

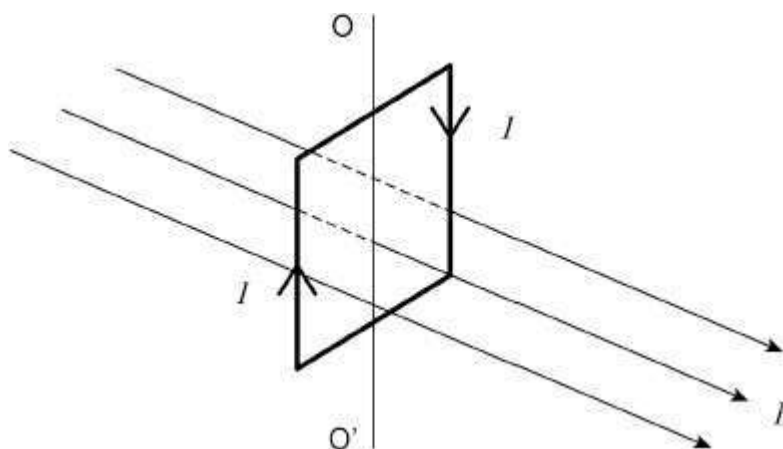


A wire lies perpendicularly across a horizontal uniform magnetic field of flux density 20×10^{-3} T so that 0.30 m of the wire is effectively subjected to the field. If the force exerted on this length of wire due to a current in it is 30×10^{-3} N downward, what is the current in the wire?

- 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

11. 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 .

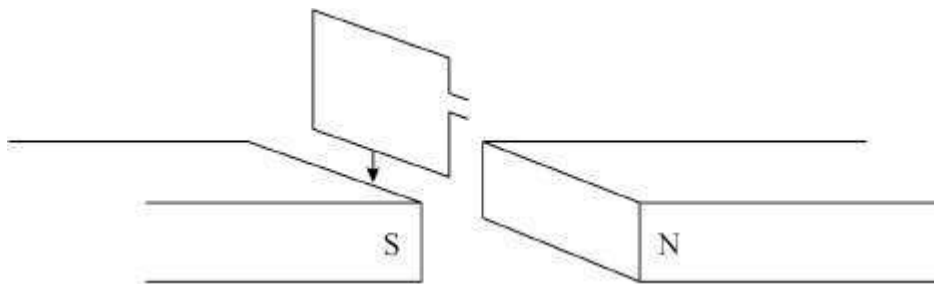


Which statement is correct?

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

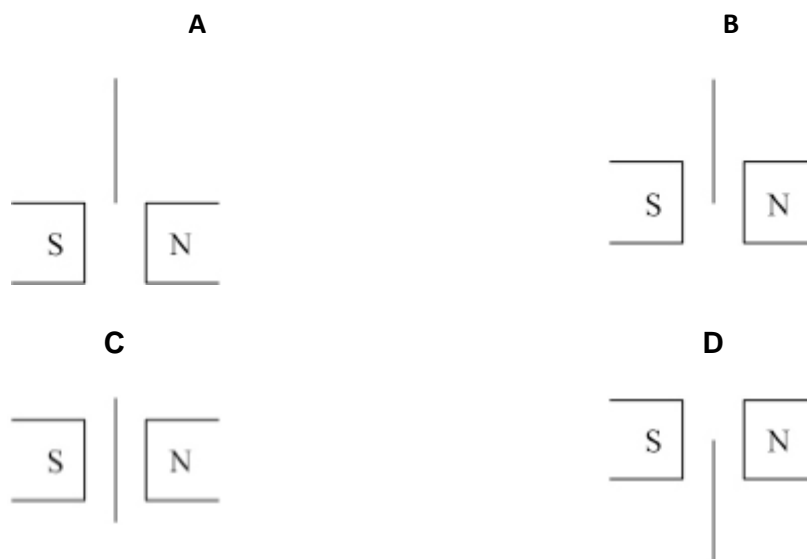
- B** A non-zero couple acts on the coil.
- C** No forces act on the horizontal sides of the coil.
- D** The forces on all sides of the coil act toward the centre of the coil.

12. 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?

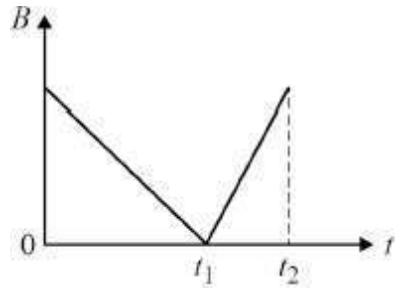


13. An alternating emf is induced in a coil rotating in a magnetic field.

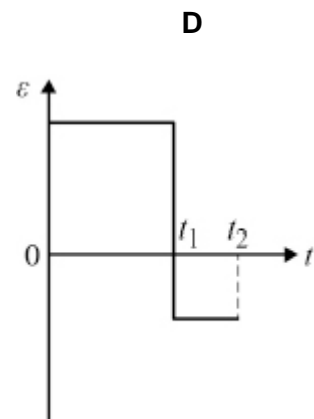
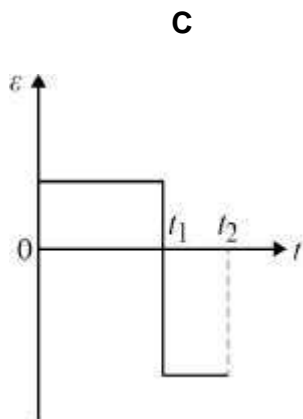
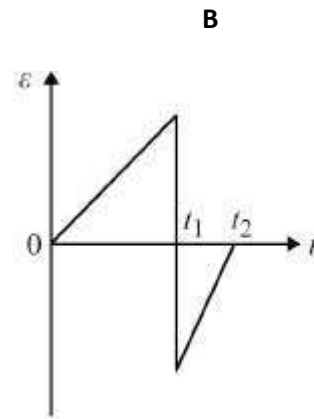
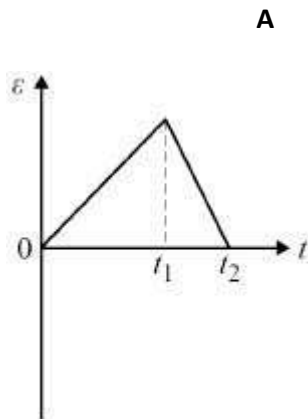
What is the phase difference between the magnetic flux linkage through the coil and the emf?

- A 0
- B $\frac{\pi}{3}$ rad
- C $\frac{\pi}{2}$ rad
- D π rad

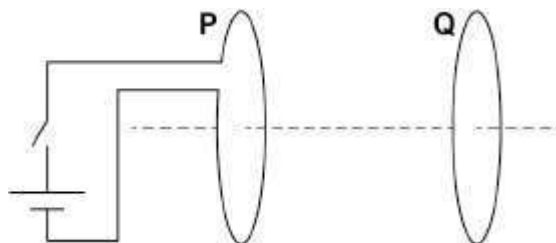
14. The diagram shows the variation with time t of the magnetic flux density B of the field linking a coil.



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



15. 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

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C short-lived and directed to the left

D short-lived and directed to the right

16. The magnetic flux through a coil of 5 turns changes uniformly from 15×10^{-3} Wb to 7.0×10^{-3} Wb in 0.50 s. What is the magnitude of the emf induced in the coil due to this change in flux?

A 14 m V

B 16 m V

C 30 m V

D 80 m V

17. Which one of the following statements concerning power losses in a transformer is incorrect?

Power losses can be reduced

by

A laminating the core.

B using high resistance

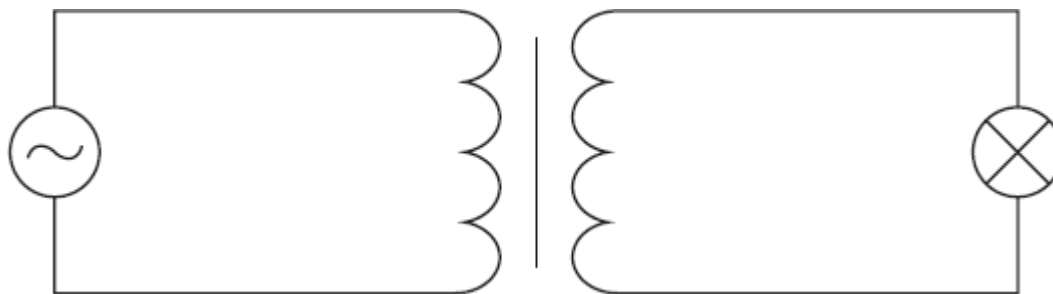
windings.

C using thick wire.

D using a core made of special iron alloys which are easily magnetised.

18. A transformer with 3000 turns in its primary coil is used to change an alternating pd from an rms value of 240 V to an rms value of 12 V.

When a 60 W, 12 V lamp is connected to the secondary coil, the lamp lights at normal brightness and a rms current of 0.26 A passes through the primary coil.



Which line, A to D, in the table gives correct values for the number of turns on the secondary coil and for the transformer efficiency?

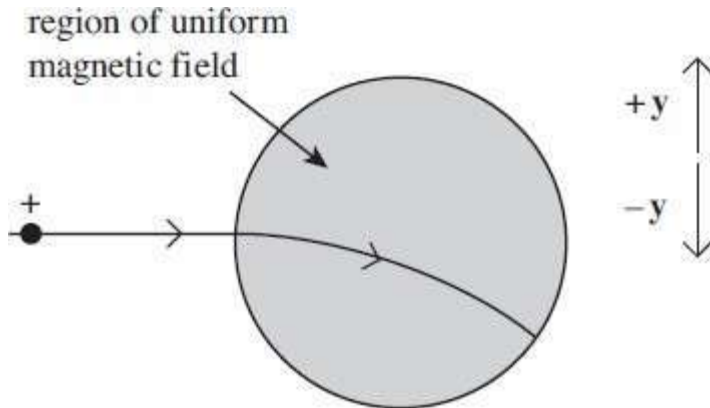
	number of turns on the secondary coil	efficiency
A	150	96%
B	60 000	96%
C	150	90%
D	60 000 90%	

19. A section of current-carrying wire is placed at right angles to a uniform magnetic field of flux density B . When the current in the wire is I , the magnetic force that acts on this section is F .

What force acts when the same section of wire is placed at right angles to a uniform magnetic field of flux density $2B$ when the current is $0.25 I$?

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

20. A beam of positive ions enters a region of uniform magnetic field, causing the beam to change direction as shown in the diagram.



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 indicated by +y**
- D in the direction indicated by -y**