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

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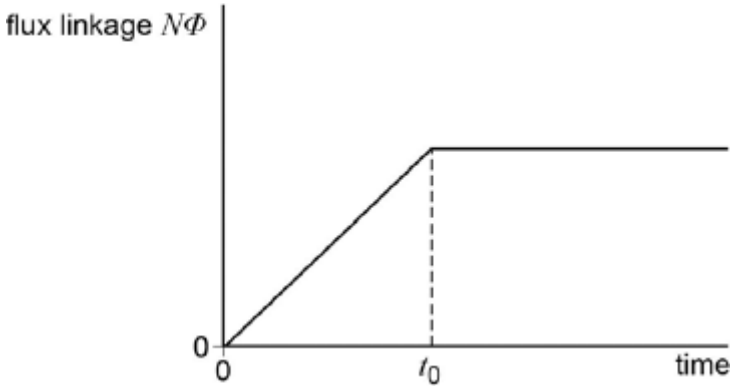
Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

The graph shows how the flux linkage, $N\Phi$, through a coil changes when the coil is moved into a magnetic field.



The emf induced in the coil

A decreases then becomes zero after time t_0. ⬭

B increases then becomes constant after time t_0. ⬭

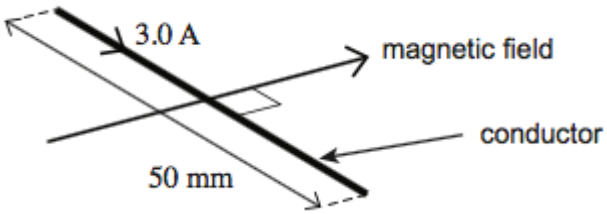
C is constant then becomes zero after time t_0. ⬭

D is zero then increases after time t_0. ⬭

(Total 1 mark)

Q2.

The diagram shows a horizontal conductor of length 50 mm carrying a current of 3.0 A at right angles to a uniform horizontal magnetic field of flux density 0.50 T.



What is the magnitude and direction of the magnetic force on the conductor ?

A 0.075 N vertically upwards
B 0.075 N vertically downwards

C 75 N vertically upwards
D 75 N vertically downwards

(Total 1 mark)

Q3.

A train is travelling at 20 m s^{-1} along a horizontal track through a uniform magnetic field of flux density 4.0×10^{-5} T acting vertically downwards.

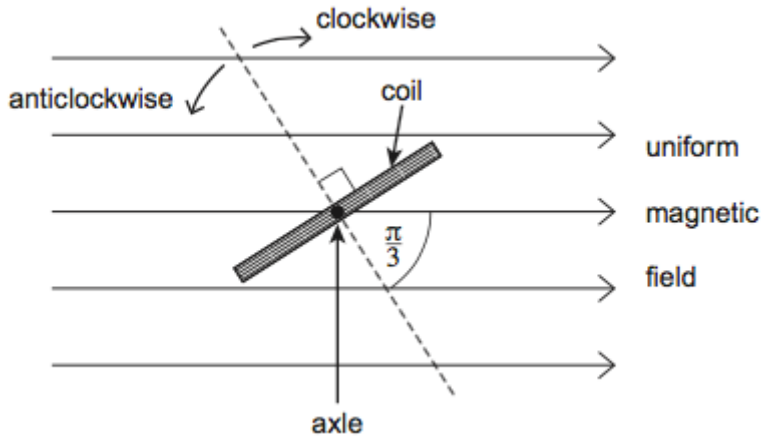
What is the emf induced between the ends of an axle 1.5 m long?

A 3.0×10^{-6}V
B 5.3×10^{-4}V
C 1.2×10^{-3}V
D 7.5×10^{5}V

(Total 1 mark)

Q4.

The diagram shows a coil placed in a uniform magnetic field. In the position shown, the angle between the normal to the plane of the coil and the magnetic field is $\frac{\pi}{3}$ rad.



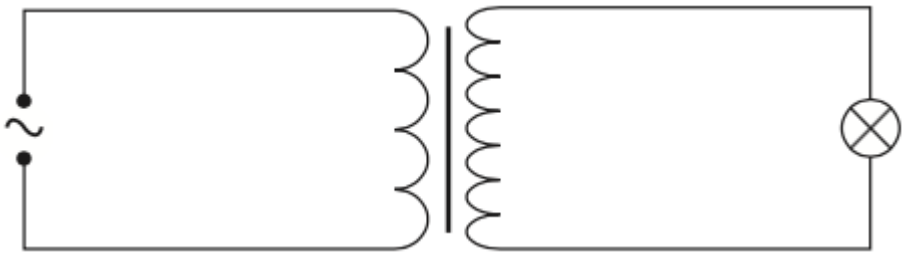
Which line, **A** to **D**, in the table shows the angles through which the coil should be rotated, and the direction of rotation, so that the flux linkage becomes (i) a maximum, and (ii) a minimum?

	Angle of rotation / rad	
	(i) for maximum flux linkage	**(ii) for minimum flux linkage**
A	$\frac{\pi}{6}$ clockwise	$\frac{\pi}{3}$ anticlockwise
B	$\frac{\pi}{6}$ anticlockwise	$\frac{\pi}{3}$ clockwise
C	$\frac{\pi}{3}$ clockwise	$\frac{\pi}{6}$ anticlockwise
D	$\frac{\pi}{3}$ anticlockwise	$\frac{\pi}{6}$ clockwise

(Total 1 mark)

Q5.

The primary coil of a step-up transformer is connected to a source of alternating pd.
The secondary coil is connected to a lamp.



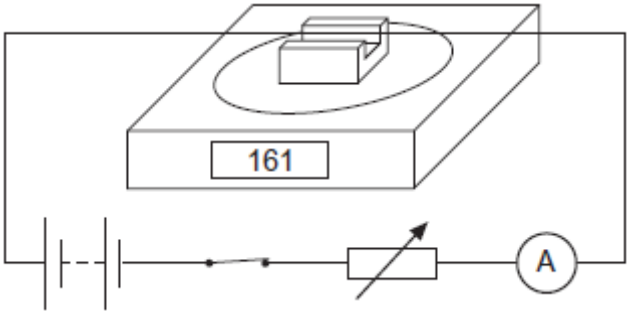
Which line, **A** to **D**, in the table correctly describes the ratios of flux linkages and currents through the secondary coil in relation to the primary coil?

	Secondary magnetic flux linkage / Primary magnetic flux linkage	**Secondary current / Primary current**
A	< 1	< 1
B	> 1	< 1
C	> 1	> 1
D	< 1	> 1

(Total 1 mark)

Q6.

The diagram shows a rigidly-clamped straight horizontal current-carrying wire held mid-way between the poles of a magnet on a top-pan balance. The wire is perpendicular to the magnetic field direction.



The balance, which was zeroed before the switch was closed, read 161 g after the switch was closed. When the current is reversed and doubled, what would be the new reading on the balance?

A −322 g

B −161 g

C zero

D 322 g

(Total 1 mark)

Q7.

Which one of the following statements is the main reason for operating power lines at high voltage?

A Transformers are never perfectly efficient.
B High voltages are required by many industrial users of

electricity.

C Electrical generators produce alternating current.

D For a given amount of transmitted power, increasing the voltage decreases the current.

(Total 1 mark)

Q8.

Two electrons, X and Y, travel at right angles to a uniform magnetic field.
X experiences a magnetic force, F_{X}, and Y experiences a magnetic force, F_{Y}.

What is the ratio $\frac{F_X}{F_Y}$ if the kinetic energy of X is half that of Y?

A $\frac{1}{4}$

B $\frac{1}{2}$

C $\frac{1}{\sqrt{2}}$

D 1

(Total 1 mark)

Q9.

Which one of the following statements is correct?

An electron follows a circular path when it is moving at right angles to

A a uniform magnetic field.

B a uniform electric field.

C uniform electric and magnetic fields which are perpendicular.

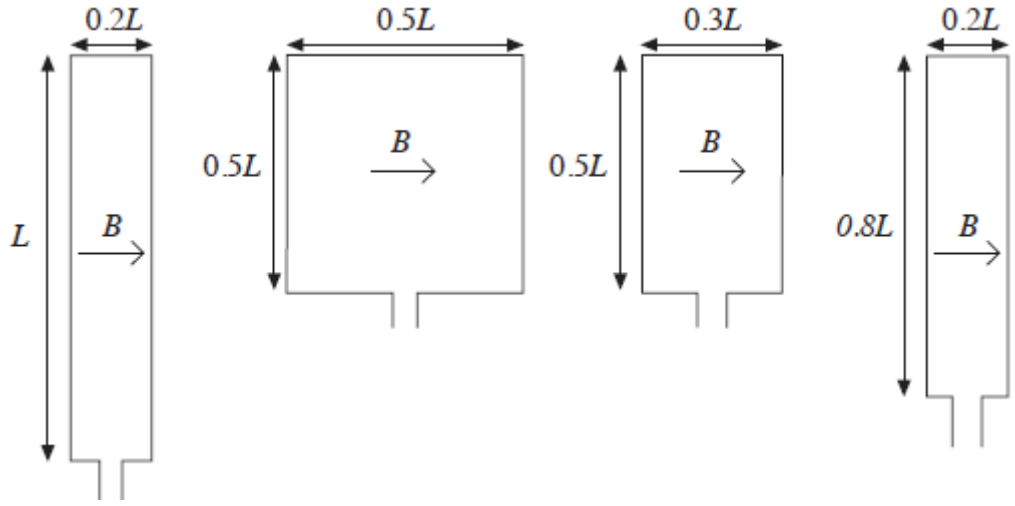
D uniform electric and magnetic fields which are in opposite directions.

(Total 1 mark)

Q10.

Four rectangular loops of wire **A**, **B**, **C** and **D** are each placed in a uniform magnetic field of the same flux density B. The direction of the magnetic field is parallel to the plane of the loops as shown.

When a current of 1 A is passed through each of the loops, magnetic forces act on them. The lengths of the sides of the loops are as shown.
Which loop experiences the largest couple?



A **B** **C** **D**

(Total 1 mark)

Q11.

A lamp rated at 12 V 60 W is connected to the secondary coil of a step-down transformer and is at full brightness. The primary coil is connected to a supply of 230 V. The transformer is 75% efficient. What is the current in the primary coil?

A 0.25 A

B 0.35 A

C 3.75 A

D 5.0 A

Q12.

The path followed by an electron of momentum p, carrying charge $-e$, which enters a magnetic field at right angles, is a circular arc of radius r.

What would be the radius of the circular arc followed by an α particle of momentum $2p$, carrying charge $+2e$, which entered the same field at right angles?

A $\frac{r}{2}$

B r

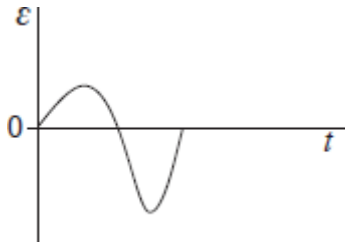
C $2r$

D $4r$

(Total 1 mark)

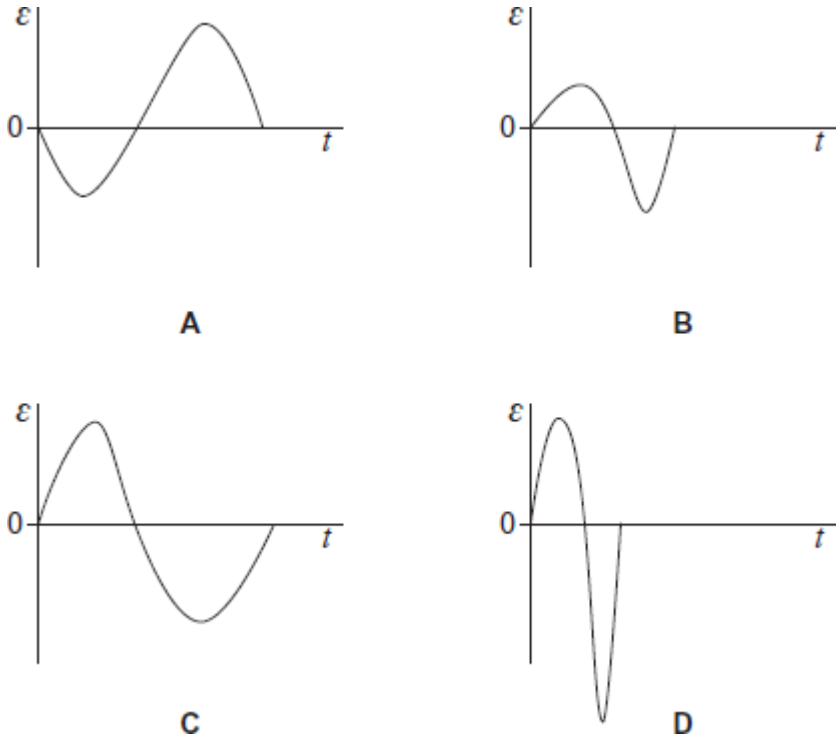
Q13.

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 ε 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?



(Total 1 mark)

Q14.

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

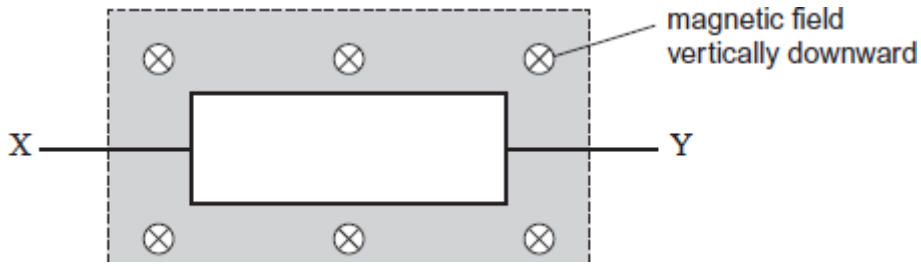
D the back up capacitor of an electric timer

(Total 1 mark)

Q15.

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 peak value ε_0 is induced in it.



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

A $\frac{\varepsilon_0}{2\pi f}$

B $\frac{\varepsilon_0}{\pi f}$

C $\pi f \varepsilon_0$

D $2\pi f \varepsilon_0$

(Total 1 mark)

Q16.

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%

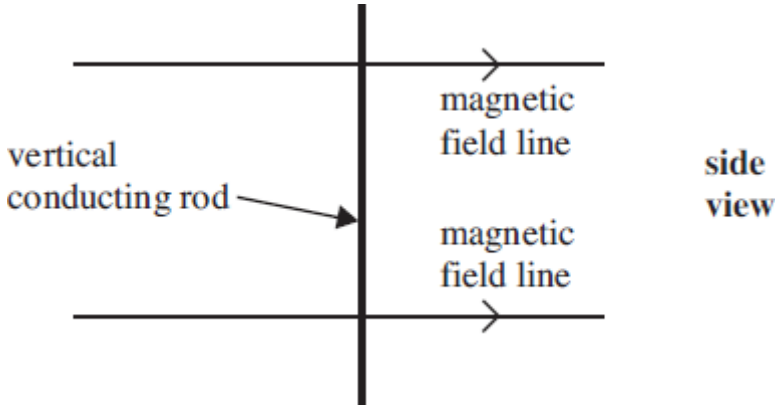
C 84%

D 100%

(Total 1 mark)

Q17.

A vertical conducting rod of length l is moved at a constant velocity v through a uniform horizontal magnetic field of flux density B.



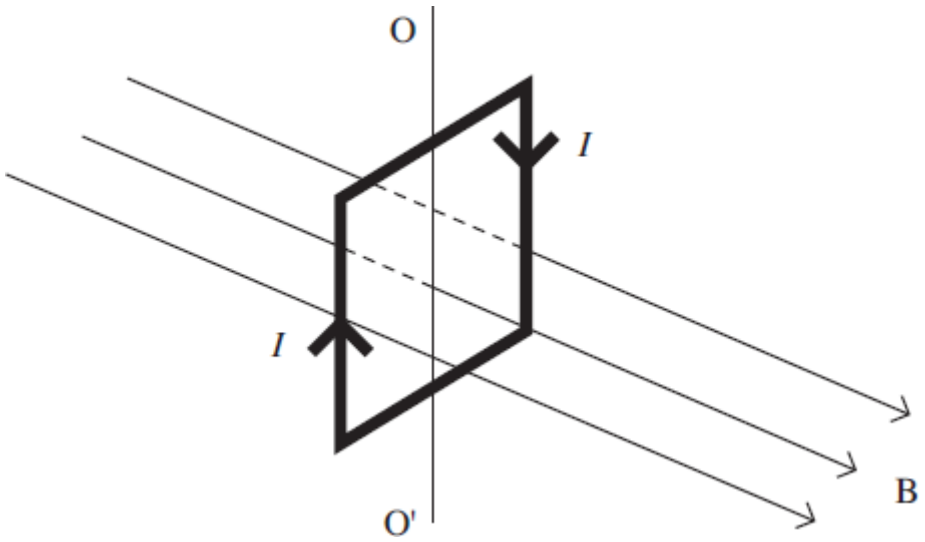
Which line, **A** to **D**, in the table gives a correct expression for the induced emf for the stated direction of the motion of the rod?

	direction of motion	induced emf
A	vertical	$\frac{B}{lv}$
B	horizontal at right angles to the field	Blv
C	vertical	Blv
D	horizontal at right angles to the field	$\frac{B}{lv}$

(Total 1 mark)

Q18.

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.

(Total 1 mark)

Q19.

A transformer, which is not perfectly efficient, is connected to a 230 V rms mains supply and is used to operate a 12 V rms, 60 W lamp at normal brightness. The secondary coil of the transformer has 24 turns.

Which line, **A** to **D**, in the table is correct?

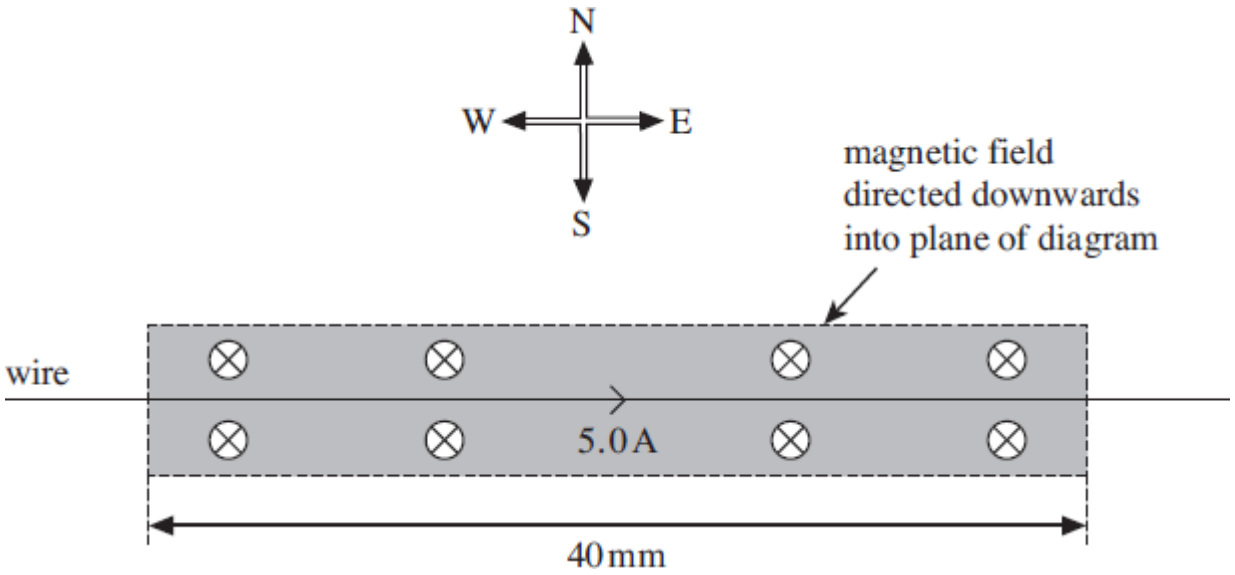
	number of turns on primary coil	rms current in primary coil

A	92	less than 0.26 A
B	92	more than 0.26 A
C	460	less than 0.26 A
D	460	more than 0.26 A

(Total 1 mark)

Q20.

A horizontal straight wire of length 40 mm is in an east-west direction as shown in the diagram. A uniform magnetic field of flux density 50 mT is directed downwards into the plane of the diagram.



When a current of 5.0 A passes through the wire from west to east, a horizontal force acts on the wire. Which line, **A** to **D**, in the table gives the magnitude and direction of this force?

	magnitude / mN	**direction**
A	2.0	north
B	10.0	north
C	2.0	south
D	10.0	south

(Total 1 mark)