Q1.

Which change will increase the efficiency of a transformer?

A increasing the thickness of the iron layers in the laminated core ⬭

B decreasing the frequency of the ac input voltage ⬭

C decreasing the diameter of the copper wire in the primary coil ⬭

D increasing the distance between the primary coil and the secondary coil ⬭

(Total 1 mark)

Q2.

A signal generator supplies a sinusoidal root mean square voltage of 7.0 V.
The sinusoidal voltage is displayed on an oscilloscope screen.
The screen has eight vertical divisions.

Which volts/division setting will display the tallest complete waveform?

A 1.5 V div^{-1} ⬭

B 2.0 V div^{-1} ⬭

C 2.5 V div^{-1} ⬭

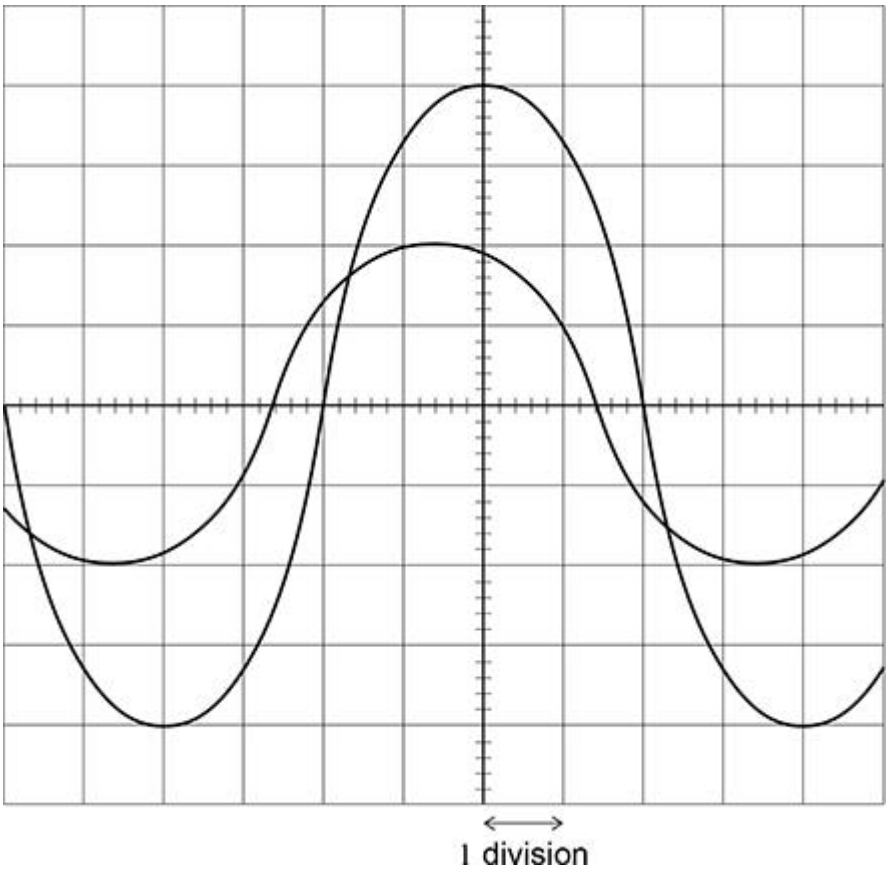
D 3.0 V div^{-1} ⬭

(Total 1 mark)

Q3.

Two signals that have the same frequency are displayed simultaneously on an oscilloscope.

The display is shown with the time-base set to 5 ms div^{-1}.



Which row shows the frequency of both signals and the phase difference between them?

	Frequency of both signals / Hz	Phase difference / rad	
A	50	0.30π	⬭
B	50	0.15π	⬭
C	25	0.30π	⬭
D	25	0.15π	⬭

(Total 1 mark)

Q4.

A transmission cable consists of many strands of wire. Electrical energy is transmitted along the cable at a frequency of 50 Hz.

Which change gives the largest increase in the efficiency of the electrical energy transfer along the cable?

A doubling the transmission voltage of the cable ⬭

B doubling the current in the cable ⬭

C halving the resistivity of the material of the wires ⬭

D halving the number of wires in the cable ⬭

(Total 1 mark)

Q5.

An electron enters a uniform magnetic field at right angles to the field.
The flux density of the field is B.
The electron moves with a non-relativistic speed v in a circular path of radius r.

What is the number of circuits completed by the electron in one second?

A $\frac{2\pi m_e}{Be}$ ⬭

B $\frac{2\pi r}{v}$ ⬭

C $\frac{v}{\pi r}$ ⬭

D $\frac{Be}{2\pi m_e}$ ⬭

(Total 1 mark)

Q6.

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)

Q7.

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. ⬭

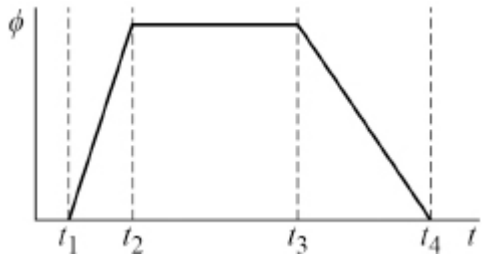
C The kinetic energy of an ion increases for both isotopes. ⬭

D The acceleration of an ion is the same for both isotopes. ⬭

(Total 1 mark)

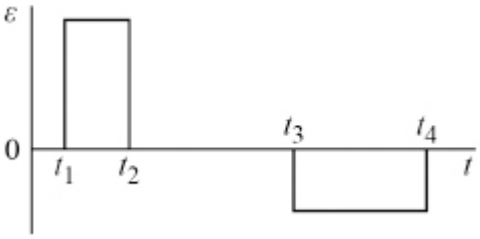
Q8.

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

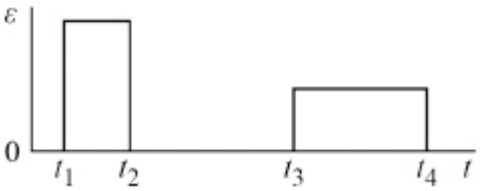


Which graph shows how the emf ε induced in the coil varies with t?

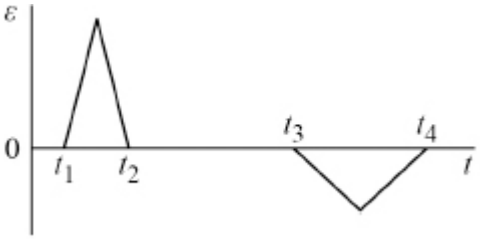
A



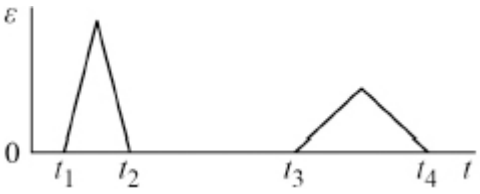
B



C



D



(Total 1 mark)

Q9.

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)

Q10.

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)

Q11.

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)

Q12.

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)

Q13.

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)

Q14.

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)

Q15.

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)