ملزمة مراجعة نهاية وفق الهيكل الوزاري منهج انسباير

إعداد: أحمد التميمي

THE GARDEN ACADEMY

Your Guide to Success

هيكل 12ADV

EOT Term 3
2023/2024

المادة: الفيزياء
المدرس: أحمد التميمي

EoT Coverage-12 Advanced-Term 3

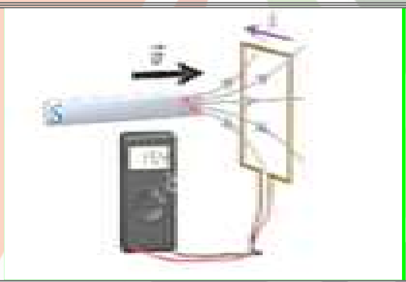
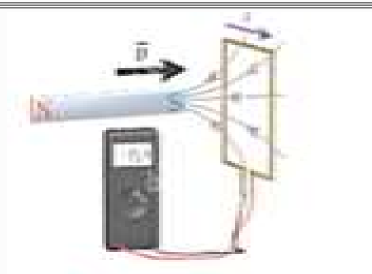
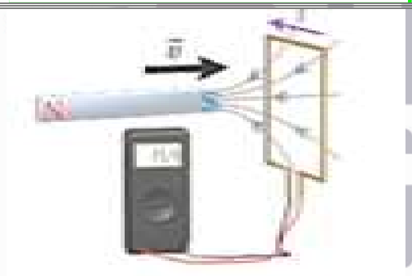
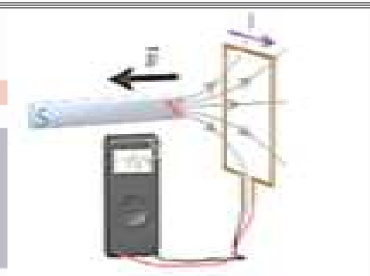
1	Describe experiments to show that changing magnetic field inside a conducting loop induces a current in the loop.	As mentioned in the textbook Q. 9.5	226 251

Question 1

Which of the following figures is correct based on Faraday's experiments?

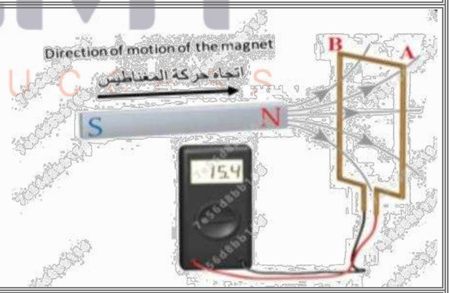
على اعتبار ان الاتجاه يحدد بناءً على الوجه المقابل

	N	S
Towards	CCW	CW
Away	CW	CCW

A		B	
C		D	

Question 2

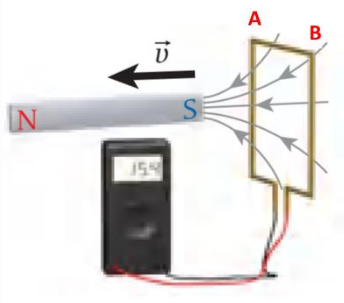
Depending on the adjacent figure if the magnet is moved towards the ring .
The direction of the current in the part at the top of the ring is:



A	From B to A	B	It can be in any direction
C	Perpendicular the plane of the ring	D	From A to B

Question 3

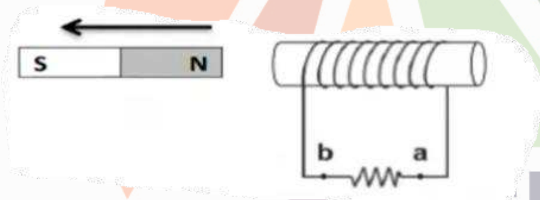
Depending on the adjacent figure if the magnet is moved away from ring . The direction of the current in the part at the top of the ring is:

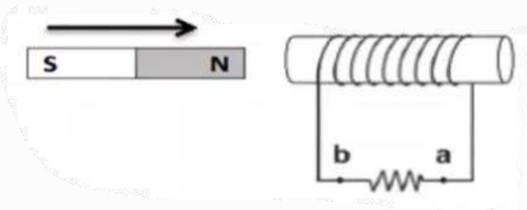


A	From B to A	B	It can be in any direction
C	Perpendicular the plane of the ring	D	From A to B

Question 4

identify the direction of the current in the resistor in the following cases:



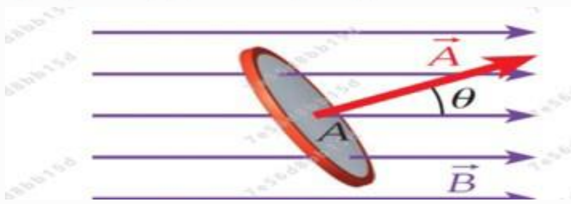


A		B	

2	Calculate the magnetic flux ϕ B through a given surface.	As mentioned in the textbook	227-228

Question 5

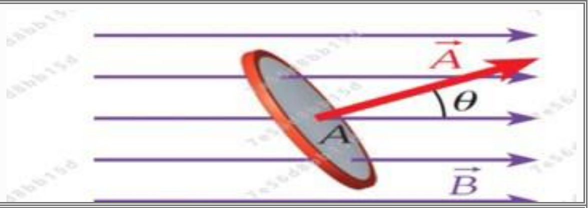
Suppose there is a flat ring with area a The magnetic field that is constant as shown in the figure . The magnetic field makes an angle θ with the vector of the normal surface of the ring. Which of the following diagrams represent the magnetic flux passing through the area A in the figure?



A	$\varphi_B = \frac{dB}{dt}$	B	$\varphi_B = \iint \vec{B}.d\vec{A}$
C	$\varphi_B = BA\,sin\theta$	D	$\varphi_B = \iint \vec{B}x d\vec{A}$

Question 6

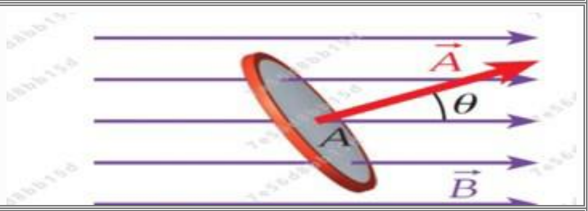
Based on the figure, at any angle θ the value of the magnetic flux will be approximately (0.8 AB)



A	15^o	B	27^o
C	37^o	D	53^o

Question 7

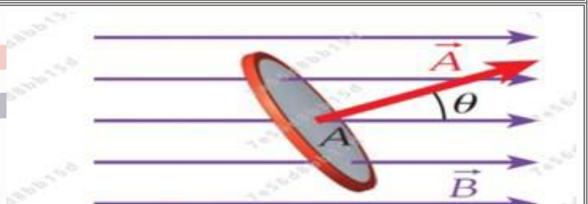
Based on the figure, at any angle θ the value of the magnetic flux will be approximately (0.5 AB)



A	30^o	B	60^o
C	75^o	D	0^o

Question 8

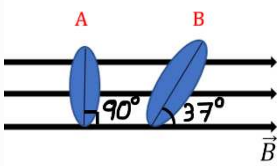
Suppose there is a flat ring with area A. The magnetic field is constant as shown in the figure. The magnetic field makes an angle θ with the area vector. What can be done to increase the magnetic flux in the loop?



A	Rotate the loop so that the normal $\vec{A}$ to the surface becomes parallel to the magnetic field $\vec{B}$.	B	Rotate the loop so that the normal $\vec{A}$ to the surface becomes perpendicular to the magnetic field $\vec{B}$.
C	Decrease the intensity of the magnetic field $\vec{B}$.	D	Rotate the loop so that the normal $\vec{A}$ to the surface makes an angle 45° with the magnetic field $\vec{B}$.

Question 9

The loop in position (A) has its surface perpendicular to the lines of a uniform magnetic field, and the flux passing through its surface is $\varphi_B = 2 \times 10^{-4}\, Wb$. If the loop is placed in position (B) where its surface makes an angle of 37° with the magnetic field lines. The flux through its surface is:



A	$1.2 \times 10^{-4}\, Wb$	B	$0.8 \times 10^{-4}\, Wb$
C	$1.6 \times 10^{-4}\, Wb$	D	0

3	Describe, based on the equation of Faraday's Law, that potential difference could be induced in a loop either by varying the magnetic field 'B' with time (A and Θ are constant), changing the area 'A' of the loop with time (B and Θ are constant), or changing the angle 'Θ' between the magnetic field and the normal to the loop with time (A and B are constant), and demonstrate that by mathematical equations	As mentioned in the textbook	229-230

Question 10

Faraday's law of electromagnetic induction states that a voltage difference is induced in the presence of a changing magnetic flux. Which of the following equations represents this law?

A	$w = \oint \vec{F} \cdot d\vec{s}$	B	$\Delta V_{\text{ind}} = -\frac{d\phi}{dt}$
C	$\phi_B = \iint \vec{B} \cdot d\vec{A}$	D	$q = q_0 e^{-\frac{t}{\tau}}$

Question 11

The magnetic flux (ϕ_B) through a wire loop changes over time (t) according to the equation $\phi_B = -2t^2$. What is the induced voltage (ΔV_{ind}) in the wire loop at $t = 3\,\text{sec}$?

A	-12 V	B	-18 V
C	12 V	D	18 V

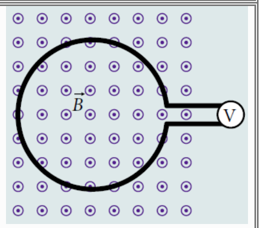
Question 12

When can we use the relationship $\Delta V_{\text{ind}} = wAB\sin\theta$ to find the induced voltage difference?

A	When the area, magnetic field, and angle (A, B, θ) are constant	B	When the area and the magnetic field (A and B) are constant
C	When the angle and the magnetic field (θ and B) are constant	D	When the area and the angle (A and θ) are constant

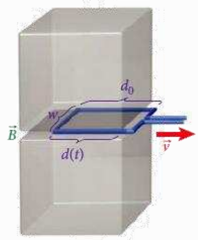
Question 13

The plane of the circular loop shown in the figure is perpendicular to a magnetic field with magnitude B = 0.800 T. The magnetic field goes to zero at a constant rate in 0.150 s. The induced voltage in the loop is 1.5 V during that time. What is the radius of the loop?



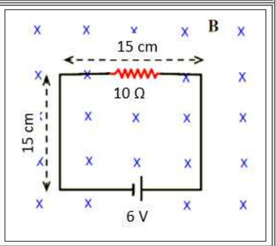
Question 14

A rectangular wire loop of width w = 3.1 cm and depth d_0 = 4.8 cm is pulled out of the gap between two permanent magnets. A magnetic field of magnitude B = 0.073 T is present throughout the gap as shown in figure. If the loop is removed at a constant speed of 1.6 cm/s, what is the induced voltage in the loop as a function of time?



Question 15

in the attached figure the magnetic field decreases with a rate of (100 T/s). Calculate the current flowing through the resistance during the time of reducing the magnetic field intensity.

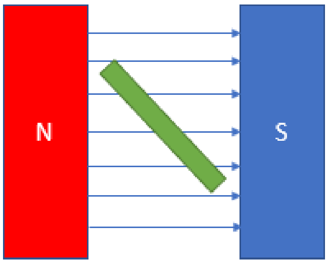


Question 16

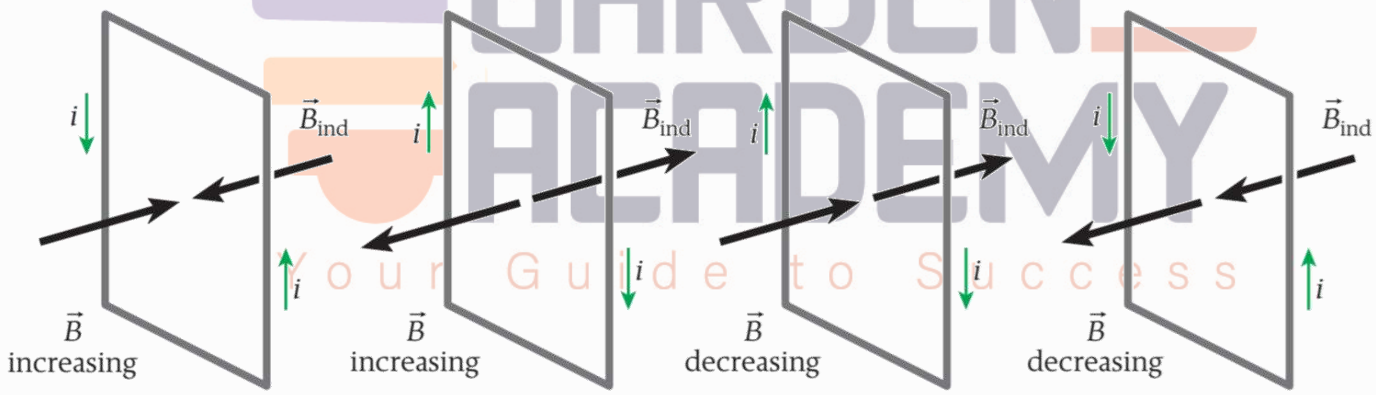
A12-turn coil with square loops measuring 150.0 cm along a side, placed in a magnetic field that makes an angle of 30.0° with the plane of each loop. The magnitude of the magnetic field varies with time according to $B(t) = 2.0\ t^2$, where t is measured in seconds and B in Tesla.

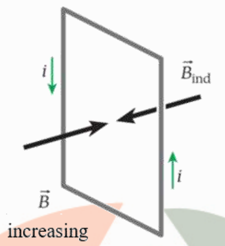
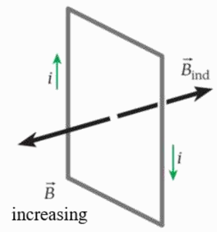
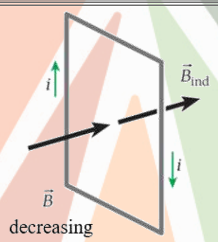
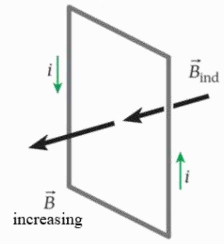
1. Calculate the induced potential difference in the loop at t = 2.00 s.

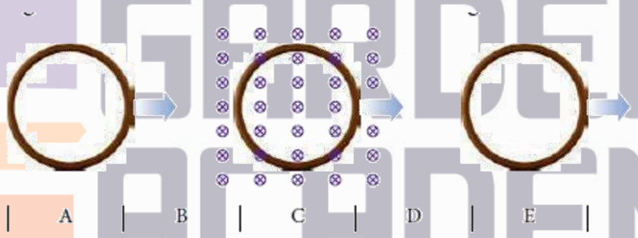
2. Determine the induced current in the coil at t = 2.00 s if the resistance in the wires is equal to 0.8 Ω.



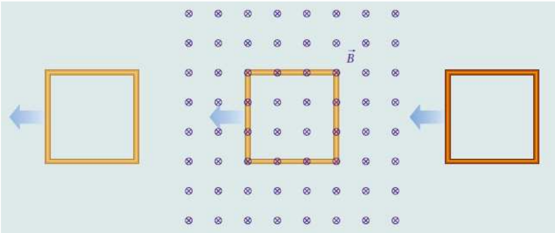
4	State Lenz's Law as: 'An induced current in a loop will have a direction such that the magnetic field due to the induced current opposes the change in the magnetic flux that induces the current' Induced Potential Difference on a Wire Moving in a Magnetic Field Solve problems related to Lenz's Law, and motional emf	As mentioned in the textbook FIGURE 9.10	232-235



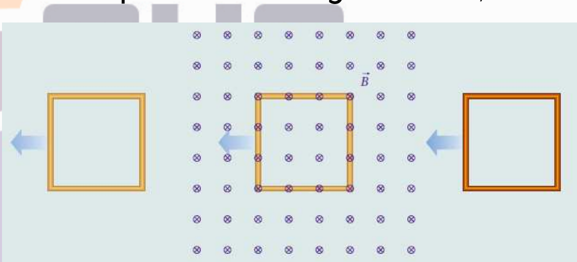
Question 17			
Which of the following is incorrect based on Lez's law?			
A		B	
C		D	

Question 18			
A conducting ring is moving from left to right through a uniform magnetic field, as shown in the figure. In which regions is there an induced current in the ring? 			
A	A and B	B	B, C, and D
C	A through E	D	B and D

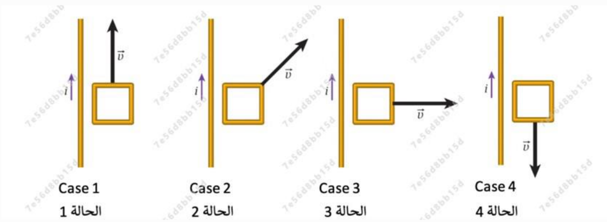
Question 19			
A square conducting loop with very small resistance is moved at constant speed from a region with no magnetic field through a region of constant magnetic field and then into a region with no magnetic field, as shown in the figure. As the loop enters the magnetic field, what is the direction of the induced current?			
A	Clockwise	B	Counterclockwise
C	Perpendicular to the plane	D	Parallel to the plane



Question 20			
A square conducting loop with very small resistance is moved at constant speed from a region with no magnetic field through a region of constant magnetic field and then into a region with no magnetic field, as shown in the figure. As the loop exists the magnetic field, what is the direction of the induced current?			
A	Clockwise	B	Counterclockwise
C	Perpendicular to the plane	D	Parallel to the plane

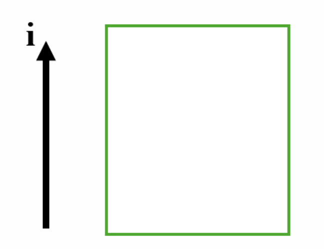


Question 21			
In the following figures, the straight wire carries an electric current (i) and the wire loop moves with a constant speed (v) in the same plane as the straight wire. In which of the following cases will the maximum amount of electric current be induced in the loop?			
A	Case 1	B	Case 2
C	Case 3	D	Case 4



Question 22

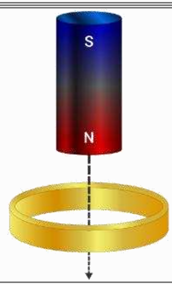
In the figure below, there is a loop adjacent to a wire. Determine the direction of the current in the loop when the current in the wire increases.



A	No induced current will flow	B	Perpendicular to the plane of the loop
C	Clockwise	D	Counterclockwise

Question 23

This magnet is moving into a metallic ring as shown. Choose a correct statement about what happens in the ring, using your understanding of Lenz's law.

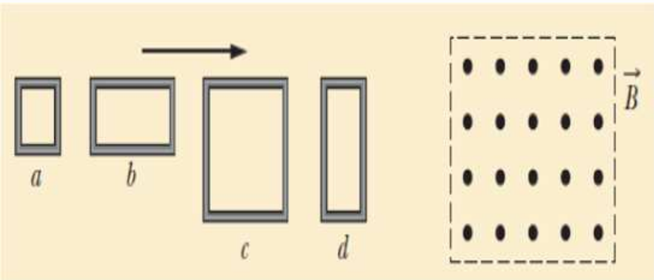


A	The induced magnetic field has North pole points towards upward direction.	B	The induced magnetic field has North pole points towards downward direction.
C	The induced current is in clockwise direction in the ring.	D	No current flows in the ring but there is an induced EMF.

5	Induced Potential Difference on a Wire Moving in a Magnetic Field Solve problems related to Lenz's Law, and motional emf Induced potential difference as a function of time for a generator	As mentioned in the textbook	235-237
		EXAMPLE 9.4 Q. 9.9	236 251

Question 24

The adjacent figure shows four loops made of a conductive material entering a uniform magnetic field at the same speed. Which of the loops generates the highest value of induced electromotive force EMF?



A	a	B	b
C	c	D	d

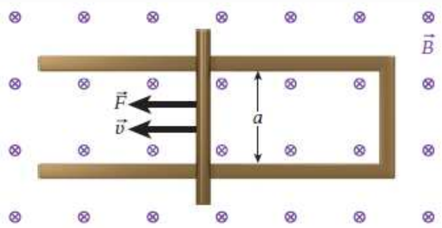
Question 25

Calculate the potential difference induced between the tips of the wings of a Boeing 747-400 with a wingspan of 64.67 m when it is in level flight at a speed of 913 km/h. Assume that the magnitude of the downward component of the Earth's magnetic field is B = 5.00 x10^{-5} T

A	0.82 V	B	1.2 V
C	2.2 V	D	0 V

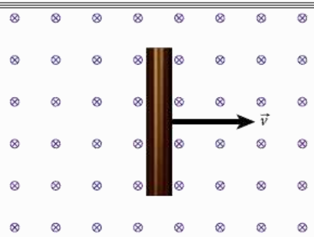
Question 26

Example: Rod A conducting rod is pulled horizontally by a constant force of magnitude, F = 5.00 N, along a set of conducting rails separated by a distance a = 0.500 m. The two rails are connected, and no friction occurs between the rod and the rails. A uniform magnetic field with magnitude B = 0.500 T is directed into the page. The rod moves at constant speed, v = 5.00 m/s. What is the magnitude of the induced potential difference in the loop formed by the connected rails and the moving rod?



Question 27

A metal bar is moving with constant velocity $\vec{v}$ through a uniform magnetic field pointing into the page, as shown in the figure.



Which of the following most accurately represents the charge distribution on the surface of the metal bar?

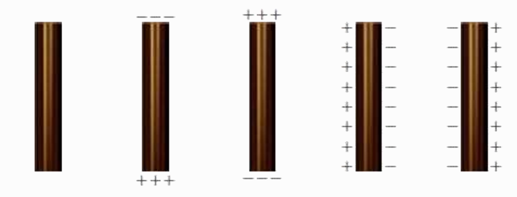
a) distribution 1

b) distribution 2

c) distribution 3

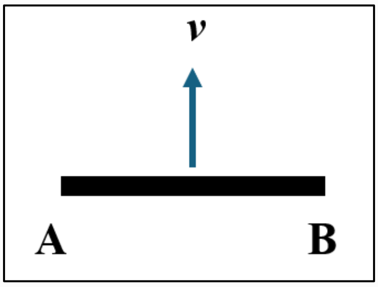
d) distribution 4

e) distribution 5



Question 28

The adjacent figure shows a conductor wire (AB) perpendicular to the magnetic field, being moved at a constant speed through a uniform magnetic field. Negative charges accumulate at B and positive charges accumulate at A. The direction of the magnetic field is:

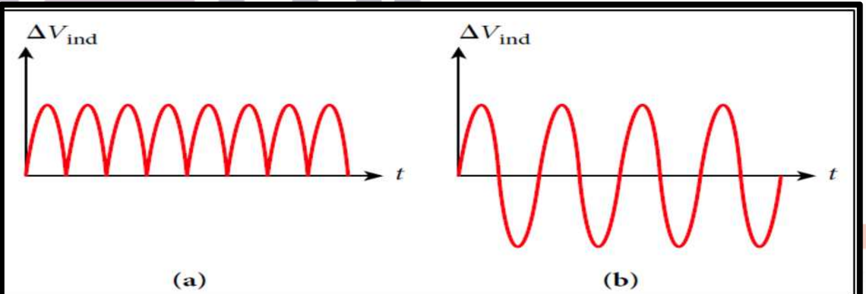


A	Outward	B	Inward
C	Upward	D	Downward

6	Generators and Motors Identify electric generators and electric motors as everyday applications of electromagnetic induction and electromagnetic force.	As mentioned in the textbook FIGURE 9.20	239-240 240

Question 29

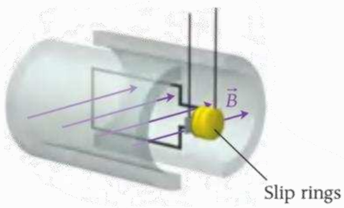
The figure shows two graphs representing the induced potential difference as a function of time for two generators. Which of the following rows indicates the correct type of generator under each graph?



	(a)	(b)
A	A simple alternating-current generator	A simple direct-current generator
B	A simple direct-current generator	A simple direct-current generator
C	A simple alternating-current generator	A simple alternating-current generator
D	A simple direct-current generator	A simple alternating-current generator

Question 30

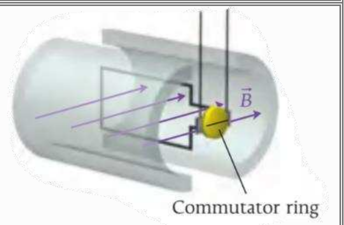
What type of generators is shown in the image?



A	Step-up Transformer	B	Step-down Transformer
C	A simple direct-current (DC) generator/motor.	D	A simple alternating-current (AC) generator/motor

Question 31

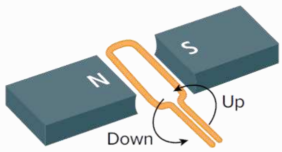
What is the name of the device shown in the image?



A	Step-up Transformer	B	Step-down Transformer
C	A simple direct-current (DC) generator/motor.	D	A simple alternating-current (AC) generator/motor

Question 32

The image shows an armature inside a generator. At the position shown, what induced current flows in the armature?



A	Maximum current	B	Effective current
C	zero	D	A value that is more than zero and less than maximum.

Question 33

At the moment when the magnetic flux penetrating the generator coil reaches its maximum value, the induced electromotive force (emf) in the generator coil:

A	Reaches its maximum positive value	B	Reaches its maximum negative value
C	Is zero	D	Reaches half its maximum positive value

Question 34

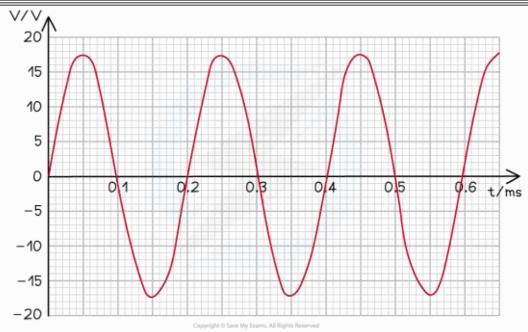
An electric generator with 400 turns produces an alternating electromotive force (emf) according to the equation $V_{emf} = 150\sin(50\pi t)$.

What is the frequency of the alternating emf?

A	0 Hz	B	25 Hz
C	50 Hz	D	100 Hz

Question 35

a plot shows the relationship between induced voltage and time of a 0.1 m2 coil and number of windings is 200 winding:



- Write the equation of induced potential difference equation as a function of time.

- Calculate the magnetic field in which the coil is rotating.

- Find the induced potential difference at t = 0.05 seconds.

7	Induced Electric Field	As mentioned in the textbook	240-241
	Solve problems related to induced electric field by changing magnetic flux.		

Question 36

In the following equation: $X = q \oint E.ds$. What does X represent?

A	work	B	Induced voltage
C	Energy	D	Power

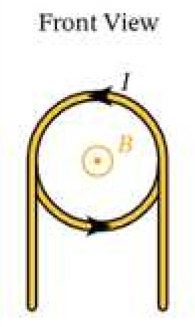
Question 37

One of the results of Faraday's law of electromagnetic induction is that an electric field is induced in the presence of a changing magnetic flux. Which of the following equations represents this effect?

A	$P = IV$	B	$V = IR$
C	$\oint \vec{E} \cdot d\vec{s} = -\frac{d\phi_B}{dt}$	D	$F = ma$

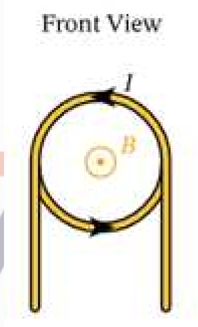
Question 38

current flowing in a solenoid of length l=20 cm, radius 2 cm, and number of windings of 500 turn. The current is decreasing from 3 A to 1 A in 0.1s. Find the induced electric field at a distance of 3 cm from the center of the solenoid.



Question 39

current flowing in a solenoid of length l=20 cm, radius 2 cm, and number of windings of 500 turn. The current is decreasing from 3 A to 1 A in 0.1s. Find the induced electric field at a distance of 1 cm from the center of the solenoid.



8	Unit of inductance Define the inductance of a device as a measure of its opposition to changes in current flowing through it, measured in henry (H)	As mentioned in the textbok	240-241

$Li = N\Phi$	$H.A = T.m^2 \rightarrow H = \frac{T.m^2}{A} = \frac{Wb}{A}$
$\Delta V_{ind} = -L\frac{di}{dt}$	$V = H \cdot \frac{A}{s} \rightarrow H = \frac{V \cdot s}{A}$
$\tau_{RL} = \frac{L}{R}$	$s = \frac{H}{\Omega} \rightarrow H = \Omega \cdot s$
$U_B = \frac{1}{2}Li^2$	$J = H.A^2 \rightarrow H = \frac{J}{A^2} = \frac{N \cdot m}{A^2}$

Question 40

What is the definition of the inductance of a device?

A	A measure of its ability to store electric charge, measured in farads (F)	B	A measure of its opposition to changes in current flowing through it, measured in henry (H)
C	A measure of its ability to conduct electric current, measured in siemens (S)	D	A measure of its resistance to the flow of electric current, measured in ohms (Ω)

Question 41

Which of the following is not a unit for measuring the inductance coefficient?

A	$Wb \cdot s/C$	B	A/J
C	$V \cdot s/A$	D	$T.m^2/A$

9	constant (T) in RL circuit	As mentioned in the textbook	245-246
	Calculate the inductive time constant τRL for an RL circuit	SOLVED PROBLEM 9.3 Q. 9.49	246 254

Question 42

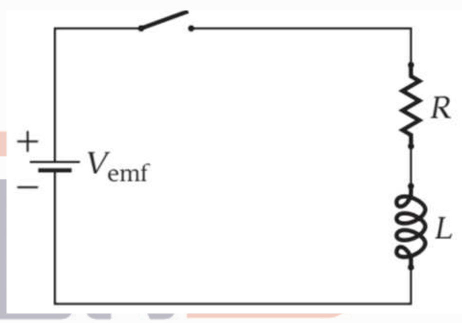
Consider an RL circuit with resistance R = 1.00 MΩ and inductance L = 1.00 H, which is powered by a 10.0-V battery.

a) What is the time constant of the circuit?

b) If the switch is closed at time t = 0, what is the current just after that time? After 2.00 μs? When a long time has passed?

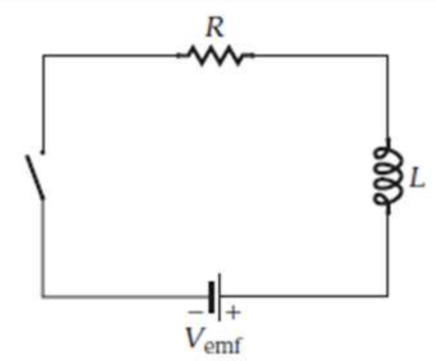
Question 43

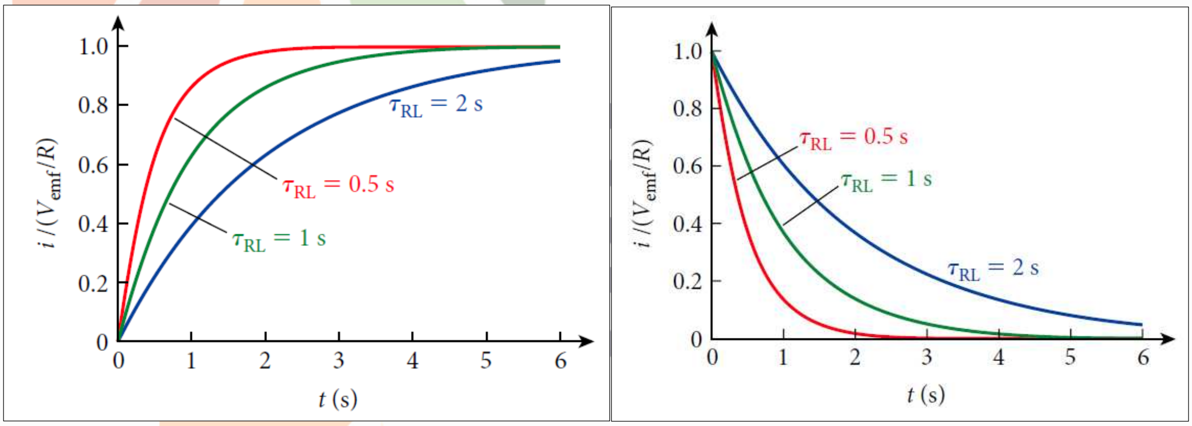
In the circuit in the figure, R = 120. Ω, L = 3.00 H, and V= 40.0 V. After the switch is closed, how long will it take the current in the inductor to reach 300. mA?



Question 44

a series circuit contains a battery that supplies Vemf = 40.0 V, an inductor with L = 2.20 H, a resistor with R = 160.0 Ω, and a switch, connected as shown in Figure. The switch is closed at time t = 0. How much work is done by the battery between t = 0 and t = 1.6x10^{-2} s?





	LC Circuits	As mentioned in the textbook	258-260
10	Recall that the energy stored in the electric field of a capacitor of capacitance C, at any instant, is given by $U_E = \frac{1}{2}\frac{q^2}{C}$ Recall that the energy stored in the magnetic field of an inductor with inductance L, at any instant, is given by $U_B = \frac{1}{2}Li^2$	Q. 10.28 Q. 10.29	285

- Energy stored in a capacitor: $U_E = \frac{q^2}{2C} = \frac{1}{2}C\Delta V^2 = \frac{1}{2}q\Delta V$
- Energy stored in an inductor: $U_B = \frac{1}{2}Li^2$
- Total energy sotored in LC circuit: $U = U_E + U_B = U_{E,\,max} = U_{B,\,max}$

Question 45
2.00-μF capacitor is fully charged by being connected to a 12.0 V battery. The fully charged capacitor is then connected to a 0.250-H inductor. Calculate the maximum current in the inductor.

Question 46
What is the amount of energy stored in an inductor with an inductance of 45mH and a current of 15A?

Question 47
What is the current flowing in a continuous current circuit with an inductor of 1.2H that stores energy of 375J?

11	Self-Induction Define self-induction and mutual induction	As mentioned in the textbook	242

Question 48			
The ratio between the induced electromotive force generated in a coil and the rate of change of current is:			
A	Mutual inductance	B	Self-inductance
C	Magnetic flux	D	Impedance

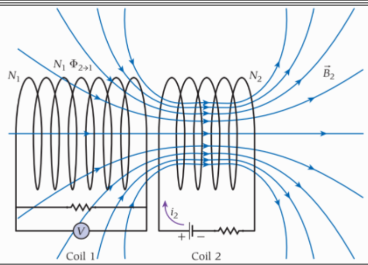
Question 49

Based on the given equation: $\Delta V_{ind,1} = -MX$. What does X represent.

A	Rate of change of the current in the first coil	B	Rate of change of the current in the second coil
C	Rate of change of flux in the first coil	D	Rate of change of flux in the second coil

Question 50

Based on the given equation: $\Delta V_{ind,1} = -X\frac{d\varphi_2}{dt}$. What does X represent according to the image?



A	Mutual inductance M	B	Self-inductance coefficient L
C	Number of turns of the first coil	D	Rate of change of flux in the second coil

Question 51

According to Faraday's Law of Induction, the self-induced potential difference for any inductor is given by:

A	$\Delta V_{\text{ind,L}} = -L\frac{dI}{dt}$	B	$\Delta V_{\text{ind,L}} = L\frac{dI}{dt}$
C	$\Delta V_{\text{ind,L}} = -N\frac{d\Phi_B}{dt}$	D	$\Delta V_{\text{ind,L}} = \frac{d(N\Phi_B)}{dt}$

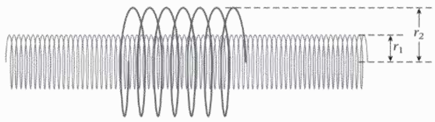
Question 52

A constant current passing through a coil whose intensity changes according to the equation : $[\, i(t) = 5 + 3t - 4t^2 \,]$. at the moment **(t = 2.0 s)** the induced potential difference generated in a coil **(ΔV_L= 0.024 V)**. Calculate **the inductance** (**L**) of the coil .

12	Mutual Induction Solve problems related to self-induction and mutual induction	As mentioned in the textbook SOLVED PROBLEM 9.2	242-244

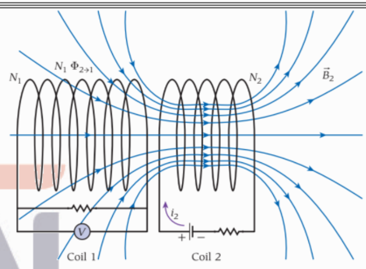
Question 53

A long solenoid with a circular cross section of radius r= 2.80 cm and n = 290 turns/cm is inside and coaxial with a short coil that has a circular cross section of radius r= 4.90 cm and N = 31 turns. The current in the solenoid is increased at a constant rate from zero to i = 2.20 A over a time interval of 48.0 ms. What is the potential difference induced in the short coil while the current is changing?



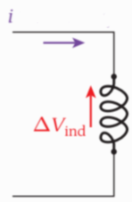
Question 54

In the following figure, the electric current i_2 in coil 2 increases from 0 to $2.0\ \mathrm{A}$ in a time period of $50\ \mathrm{ms}$. The self-inductance of coil 1 is $0.20\ \mathrm{H}$ and the self-inductance of coil 2 is $0.10\ \mathrm{H}$. The induced voltage in coil 1 is $-1.6\ \mathrm{V}$. What is the mutual inductance between the two coils?



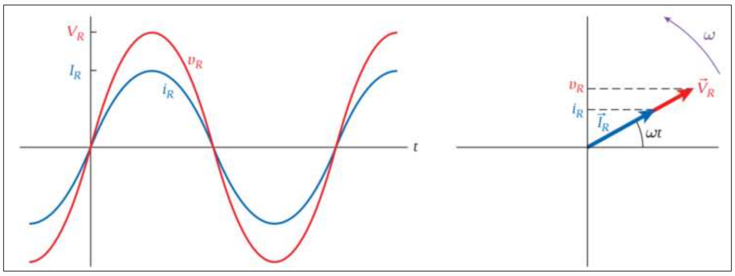
Question 55

Based on Lenz's law, the current in the circuit shown has to __________ to get the depicted induced potential difference.



A	Stay the same	B	Be decreasing
C	Be increasing	D	Change direction

13	Alternating current circuit Describe the alternating sinusoidal current, induced in a circuit containing a sinusoidal time varying sou	As mentioned in the textbook FIGURE 10.8	264-265



Question 56

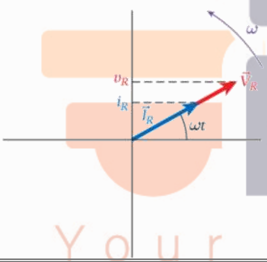
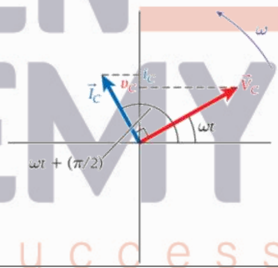
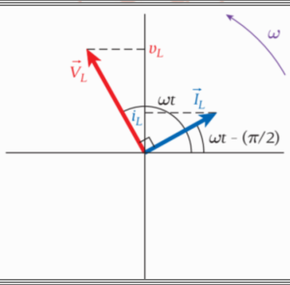
the shown equation represents the current flowing in a simple circuit that consists of a varying emf source and a resistor. In this case, ∅ equals:

$$i = I\sin(\omega t - \phi)$$

A	0	B	90
C	45	D	60

Question 57

Which of the following graphs represent the phasor diagram of simple AC circuit that consists of a varying EMF source and a resistance?

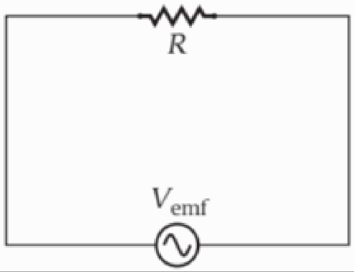
A		B	
C		D	All of the above.

14	Single-loop circuit with a resistor and a source of time-varying emf varying voltage across the resistor, for a circuit consisting of a resistor and a source of time varying emf.	As mentioned in the textbook	264-265

15	Derive an expression for the current across the resistor, in a circuit consisting of a resistor and a source of time varying emf, as $i_R = \frac{v_R}{R} = \frac{V_R}{R}\sin(\omega t) = I_R \sin(\omega t)$	As mentioned in the textbook	264-265

Question 58

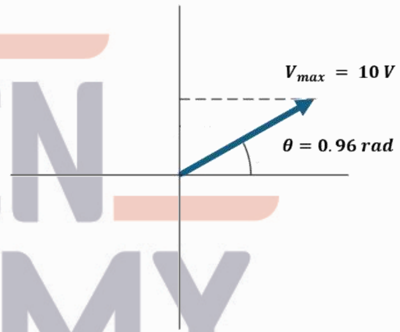
What does he image represent?



A	Single-loop circuit with a resistor and a source of time-varying EMF.	B	Single-loop circuit with a resistor and a source of direct EMF source.
C	Single-loop circuit with an inductor and a source of time-varying EMF.	D	Single-loop circuit with an inductor and a source of direct EMF source.

Question 59

The graph represent a voltage phasor through a resistor at some instant.
What is the potential difference across the resistor at this instant?

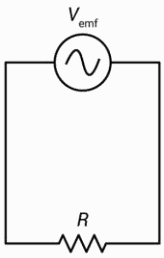


A	10 V	B	5.7 V
C	8.2 V	D	0

Question 60

In the shown circuit, the resistance is R = 10Ω, connected to an emf source that is capable of producing a maximum voltage of V_{max} = 60V at a frequency of 60 Hz. Find:

1- The maximum current flowing in the circuit
2- Write the equation of current as a funtion of time.
3- What happens to the resistance if the frequency is doubled ?



Question 61

A resistor of $R = 8.0\,\Omega$ is in series with an alternating emf given by $V_{\text{emf}} = 12\sin\left(1000\pi t + \frac{\pi}{2}\right)$.

Determine the expression for the current in the circuit and the phase relationship between current and voltage in a resistor-only circuit.

A	$i = 1.5\sin\left(1000\pi t + \frac{\pi}{2}\right)$ • In a circuit with only resistors, i and V_{emf} are in phase.	B	$i = 0.50\sin\left(1000\pi t - \frac{\pi}{2}\right)$ • In a circuit with only resistors, i lags V_{emf}.
C	$i = 12\sin\left(1000\pi t + \pi\right)$ • In a circuit with only resistors, V_{emf} lags i.	D	$i = 12\sin\left(1000\pi t\right)$ • In a circuit with only resistors, i lags V_{emf}.

End of MCQ part

1	Solve problems related to Self Inductance of a Solenoid	As mentioned in the textbook	241

Question 62

what happens to the coefficient of self-inductance in the following cases:

a. Doubling the current flowing in the solenoid or the coil

b. Doubling the number of windings

c. Doubling the cross section of the coil or solenoid

d. Decreasing the length of the solenoid to half of the original length

Question 63

a solenoid with a cross section area of 0.04 m^2, a self-inductance coefficient (L = mH), 200 turns, and a current flowing in it of 4A.

a. Find the length of the solenoid.

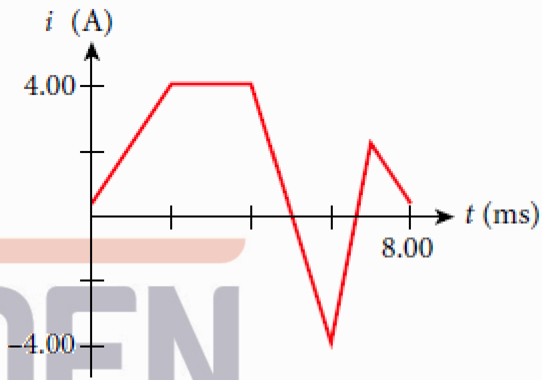
b. The induced potential difference in the solenoid if the current became zero in 0.1s

Question 64

a solenoid with a length of 40 cm, 400 windings, a cross section area of 30 cm^2, and a flowing current of 3.0A. Calculate the magnetic flux through the cross section of the solenoid.

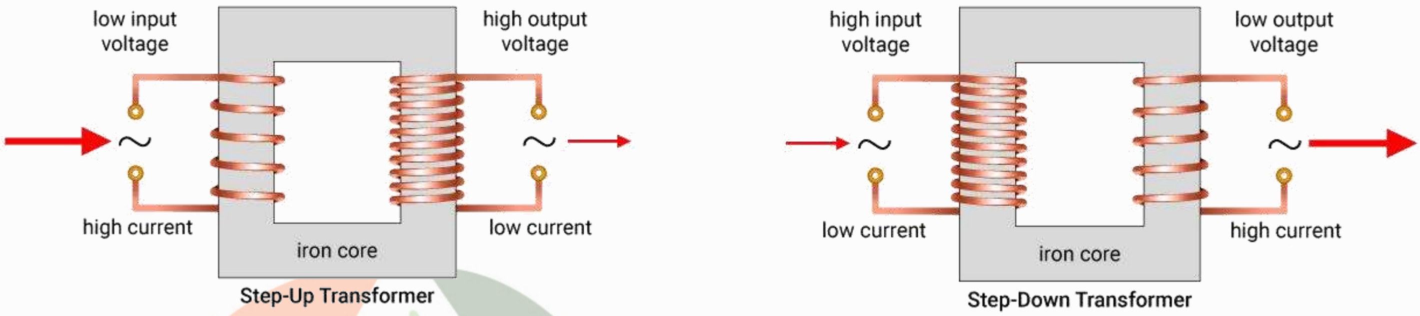
Question 65

The figure shows the current through a 10.0-mH inductor over a time interval of 8.00 ms. Draw a graph showing the self-induced potential difference, $\Delta V_{ind,L}$, for the inductor over the same interval.



Question 66
Consider a long solenoid with a circular cross section of radius (r = 8.00 cm) and (n = 2.0× 10^4 turns/m). The solenoid is carrying a current of magnitude (i = 2.0 mA). If the stored energy in the magnetic field of the solenoid is 1.6 x 10^{-5} J, what is the length of the solenoid? The magnetic permeability for this application is ($\mu = 2 \times 10^{-6}\ H/m$)

2	Apply the ideal transformer equation ($\frac{I_S}{I_P}=\frac{V_P}{V_S}=\frac{N_P}{N_S}$) to solve numerical problems.	As mentioned in the textbook	279-281



Step-Up Transformer	Step-Down Transformer
$V_p < V_s$	$V_p > V_s$
$I_p > I_s$	$I_p < I_s$
$N_p < N_s$	$N_p > N_s$

$$\frac{V_P}{V_S} = \frac{N_P}{N_S}$$

$$\frac{V_P}{V_S} = \frac{I_S}{I_P}$$

$$\frac{R_P}{R_S} = \left(\frac{N_P}{N_S}\right)^2$$

In **real transformers**, the input power doesn't equal the output power because there is a lost power in the transformer. The efficiency of a real transformer can be found using the following formula:

$$\textbf{Efficiency(\%)} = \frac{V_S I_S}{V_P I_P} \times 100$$

The power lost in the grid can be found using the following relationship in non-ideal transformers:

$$P_{lost\ in\ grid} = I^2_{in\ grid} R$$

Question 67

A transformer has 800 turns in the primary coil and 40 turns in the secondary coil.

a) What happens if an AC voltage of 100. V is across the primary coil?

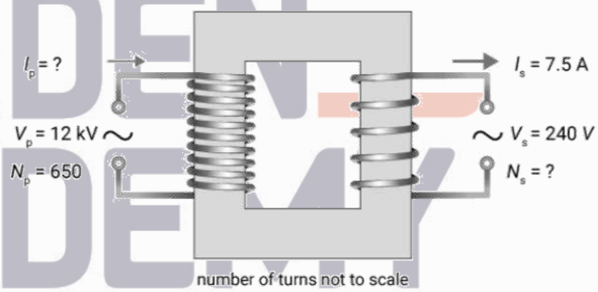
b) If the initial AC current is 5.00 A, what is the output current?

c) What happens if a DC current at 100. V flows into the primary coil?

d) If the initial DC current is 5.00 A, what is the output current?

Question 68

Based on sketch on the right, find the input current in the primary coil and the number of turns in the secondary coil assuming that no power dissipation occured in the transformer. What is the type of this transformer?



Question 69

Question: A step-up transformer has a potential difference across its primary coil of 220 V and a current of 9.0 A. The induced EMF in its secondary coil is 440 V and the induced current is 4.4 A. What is the efficiency of this transformer?

Question 70

A transformer contains a primary coil with 200 turns and a secondary coil with 120 turns. The secondary coil drives a current I through a 1.00 kΩ resistor. If an input voltage of V_{rms} = 75.0 V is applied across the primary coil, what is the power dissipated in the resistor?

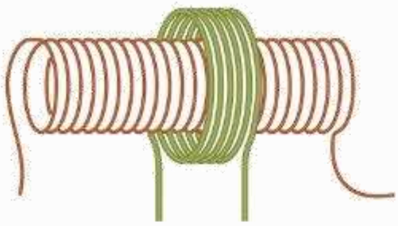
Question 71

The transmission of electric power occurs at the highest possible voltage to reduce losses. By how much could the power loss be reduced by raising the voltage by a factor of 10.0?

3	Solve problems related to Mutual Induction of a Solenoid and a Coil	SOLVED PROBLEM 9.2	242-244

Question 72

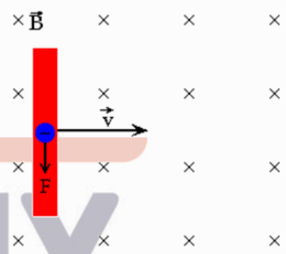
A short coil with radius R = 10.0 cm contains N = 30.0 turns and surrounds a long solenoid with radius r = 8.00 cm containing n = 60 turns per centimeter. When the current in the short coil is increased at a constant rate from zero to i A in a time of t = 8.0 s, the induced potential difference in the long solenoid was found to be 1.2 mV. Calculate the current i.



4	Solve problems related to Lenz's Law	Example 9.3 and Example 9.4	236-237

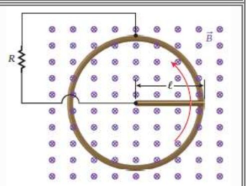
Question 73

Metal bar its length ($\ell = 0.25$ m) is moving with constant velocity (v) perpendicular to a uniform magnetic field (B = 0.65 T) pointing into the page as shown in the figure .If the induced potential difference generated in the wire equal ($V_{ind} = 1.25$ V) . Calculate the velocity of metal bar (v) . Identify the direction of the current flowing in the bar.



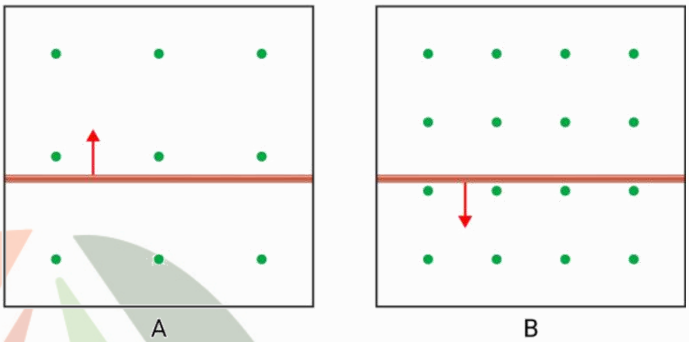
Question 74

Rod A conducting rod with length l = 8.17 cm rotates around one of its ends in a uniform magnetic field that has a magnitude B = 1.53 T and is directed parallel to the rotation axis of the rod. The other end of the rod slides on a frictionless conducting ring. The rod makes 6.00 revolutions per second. A resistor, R = 1.63 mΩ, is connected between the rotating rod and the conducting ring. What is the power dissipated in the resistor due to magnetic induction?

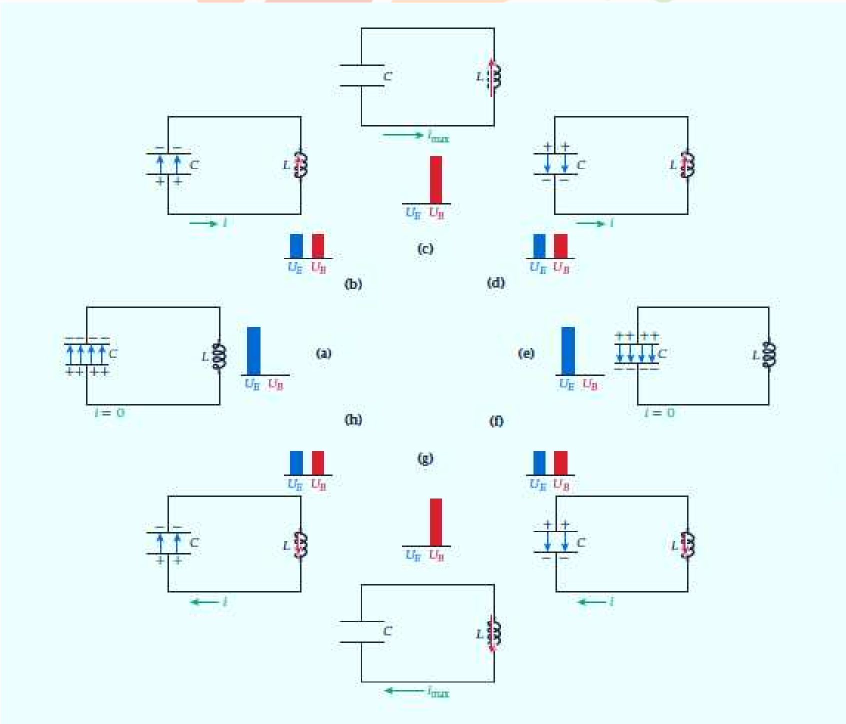


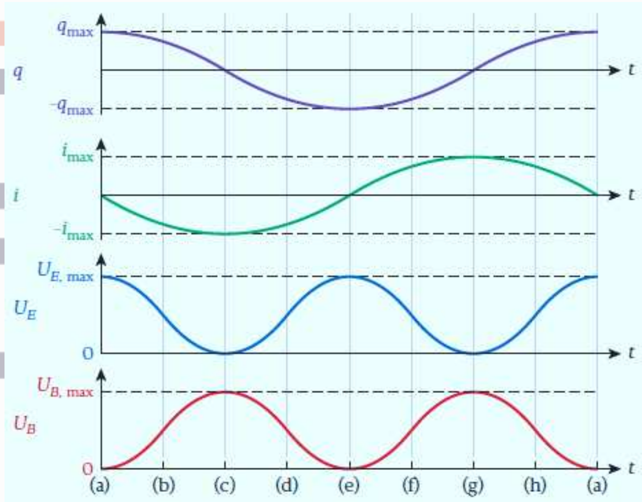
Question 75

identify the direction of the current in the wire as it crosses the magnetic field.



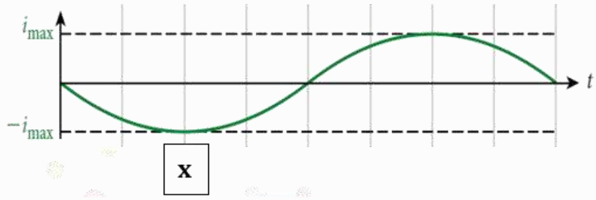
5	Solve problems related to LC oscillator showing the variations of charge, current, energy stored in electr	As mentioned in the textbook	258-260





Question 76

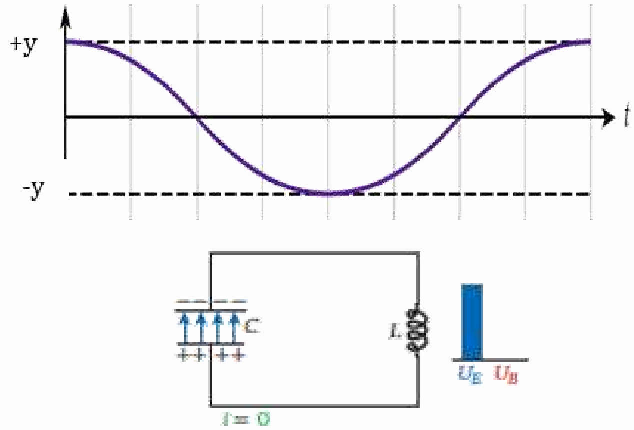
The figure shows the variation of current as a function of time for a simple, single-loop LC circuit. If the maximum value of magnetic energy is (0.02 J), what is the magnetic energy at time (x) ?



A	-1.0 J	B	-2.0 J
C	1.0 J	D	2.0 J

Question 77

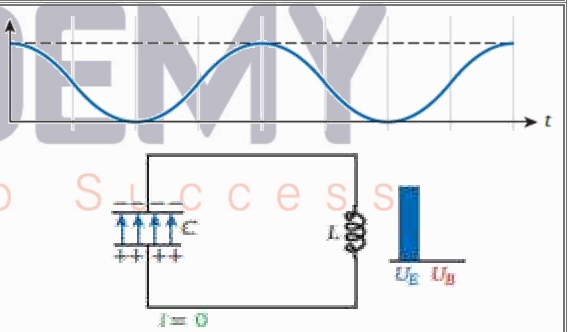
When the switch of the circuit in the figure is closed. the current and the voltage in the circuit oscillates over time. what is the physical quantity represented by the y-axis in the graph?



A	The charge	B	The current
C	The energy stored in the electric field	D	The energy stored in the magnetic field

Question 78

When the switch of the circuit in the figure is closed. the current and the voltage in the circuit oscillates over time. what is the physical quantity represented by the y-axis in the graph?



A	The charge	B	The current
C	The energy stored in the electric field	D	The energy stored in the magnetic field

Question 79
An oscillating LC circuit is formed of a 3.6 μF capacitor and a 75 mH inductor of negligible internal resistance. The maximum current in the circuit is 5.6 mA. What is the maximum charge on the capacitor?

Question 80
: In an oscillating LC circuit formed of a 100 mH inductor and a 5.0 μF capacitor, the expression of the current in terms of t is: $i = 2.0 \sin(200t + \frac{\pi}{2})$ where i is in A and t is in s. What is the maximum magnetic potential energy in the inductor?

End of FRQ part

مع تمنايتي لكم بالتوفيق والنجاح