

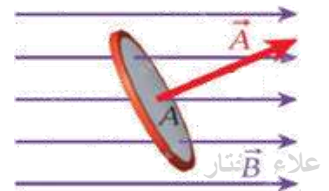
1) Depending on the figure if the magnet is **moved away** from the coil. What is the direction of the induced current in the upper part of the loop?

- a) It can be in any direction.
- b) Perpendicular to the plane of the ring.
- c) **From point B to point A.**
- d) from point A to point B.



2) A ring of radius (5.0 cm) in a magnetic field of strength (15.0 T) The magnetic field makes an angle of ($\theta = 60^\circ$) with the plane of the ring. What is the magnitude of the magnetic flux?

- a) **0.10 Wb**
- b) 0.06 Wb
- c) 0.12 Wb
- d) 0.05 Wb

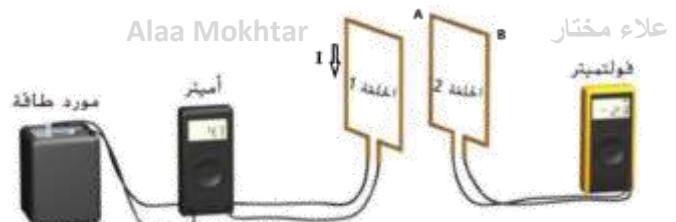


3) Which of the following equations **cannot be used** to find an induced potential difference when the angle changes between the magnetic field and the area vector perpendicular to the plane of the loop.

- a) $AB \sin \theta \frac{d\theta}{dt}$
- b) **$AB \sin \theta$**
- c) $AB \omega \sin \theta$
- d) $\omega AB \sin \omega t$

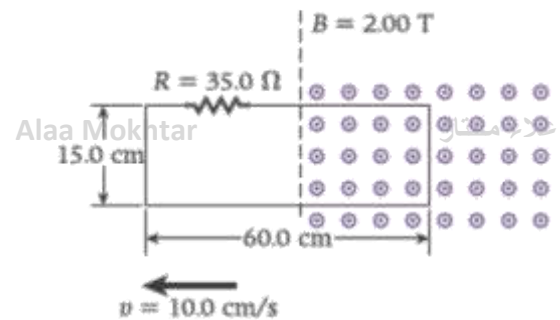
4) What is the direction of the induced current in loop (2) when the current in loop (1) is **increases**.

- a) It can be in any direction.
- b) Perpendicular to the plane of the ring.
- c) From point B to point A.
- d) **from point A to point B.**

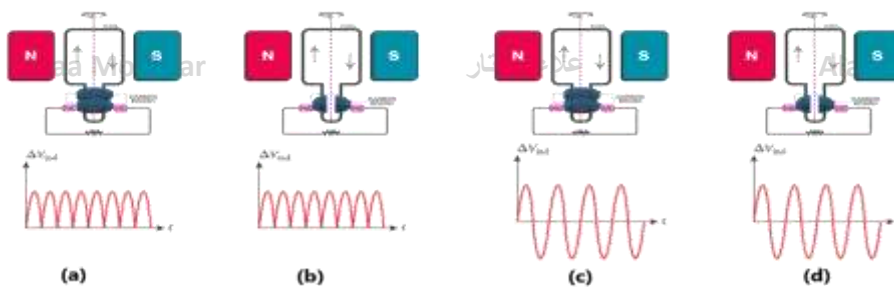


5) depending on the data shown in the figure, determine the magnitude and direction of the induced current in the loop.

	Magnitude	Direction
a)	$8.60 \times 10^{-4} \text{ A}$	Counter-clockwise
b)	$3.40 \times 10^{-3} \text{ A}$	Counter-clockwise
c)	$8.60 \times 10^{-4} \text{ A}$	Clockwise
d)	$3.40 \times 10^{-3} \text{ A}$	Clockwise



6) Which of the figures shown below represent a DC generator, and what is the name of the connecting part between the generator and the electrical circuit?



	The part name
a)	Two slip rings
b)	Commutator
c)	Commutator
d)	Two slip rings

7) An electric motor is a device that

- a) Produces an electric current from a mechanical movement.
- b) It produces electromagnetic energy from electrical energy.
- c) converts chemical energy into electrical energy.
- d) Produces mechanical motion from an electric current.

8) Which of the following equations can be used to find the electric field induced by a changing magnetic field flux?

a) $\oint \vec{E} \cdot d\vec{s} = -\frac{d\Phi_B}{dt}$

b) $\oint \vec{B} \cdot d\vec{s} = -\frac{d\Phi_E}{dt}$

c) $\oint \vec{E} \cdot d\vec{s} = -\frac{d\Phi_E}{dt}$

d) $\oint \vec{E} \cdot d\vec{s} = \frac{d\Phi_B}{dt}$

9) A solenoid with a length of (30.0 cm) and a diameter of (5.0 cm) and the number of turns (600). The current passing through it increases at a rate of 22.5 mA/s. What is the magnitude of the self-inductance of the coil and the electric field induced inside it at (1.5 cm) from its axis.

	(E) magnitude	(L) magnitude
a)	4.24x10 ⁻⁷ V/m	2.96x10 ⁻³ H
b)	5.63x10 ⁻⁴ V/m	1.18x10 ⁻² H
c)	2.81x10 ⁻⁴ V/m	2.96x10 ⁻³ H
d)	2.81x10 ⁻⁴ V/m	1.18x10 ⁻² H

10) An inductor of (500) turns and a cross-sectional area of (5.0cm²) and an inductance of (0.8H) in which an electric current of (1.5A) passes. What is the flux linkage through the coil?

a) 1.2 Wb

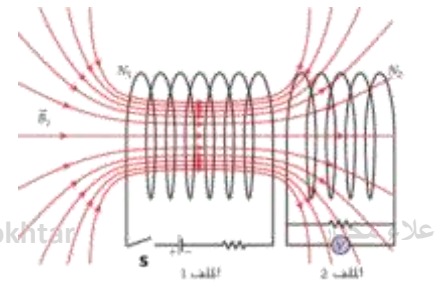
b) 6.0x10²Wb

c) 2.4x10⁻³Wb

d) 0.3Wb

11- In the figure, when the switch (S) is closed in coil No. (1), an induced potential difference is in.....

- a) Coil No. (2) due to mutual induction
- b) File No. (1) due to mutual induction
- c) File No. (1) and (2) due to mutual induction only



d) Coil No. (1) and (2) due to self-induction and mutual induction

12) A long solenoid of diameter **4.0 cm** and **$n=300$ turn/cm** inside a short coil of diameter **6.0 cm** and **$N=40$ turn**. The current in the solenoid increases at a rate from zero to **2.50A** over a time of **50.0ms**.

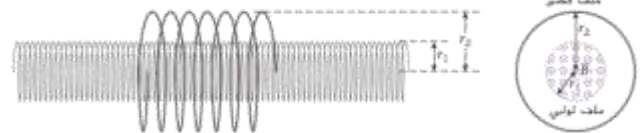
What is the magnitude of the potential difference induced in the short coil when the current changes?

a) 0.095 V

b) 0.379 V

c) 0.213V

d) 50.0 V



13) A series circuit contains a **48.0V** battery, an inductor of **1.80H**, a **16.0k Ω** resistor, and a switch.

Find the time constant?

a) 1.13×10^{-4} s

b) 0.1125 s

c) 8.89×10^3 s

d) 8.89 s

14) A series circuit contains a **$V_{emf}=48.0V$** battery, an inductor of inductance **$L=1.80H$** , a resistor **$R=16.0k\Omega$** , and a switch. How much work is done by the battery from **$t=0$ s to $t=1.40 \times 10^{-4}$ s**?

a) 1.13×10^{-4} J

b) 6.80×10^{-6} J

c) 8.60×10^{-6} J

d) 8.60×10^{-3} J

15) The total energy stored in the LC circuit in series is (20.0J) What is the energy stored in the magnetic field of the coil when the strength of the current passing through it is equal to half of the maximum value of the current ($\frac{I_m}{2}$)

a) 10.0 J

b) 5.00 J

c) 15.0 J

d) 2.00 J

16) What is the current that flows in an inductor whose self-inductance is (1.2H) and that stores a magnetic energy of 375J

a) 5.0 A

b) 18.0A

c) 25.0A

d) 1.8A

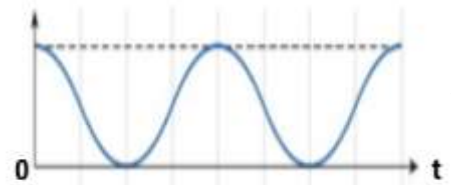
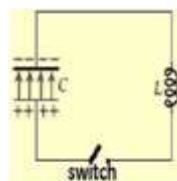
17) When the switch of the circuit in the figure is closed, the current and the voltage in the circuit oscillate over time. What is the physics quantity represented by the y-axis in the graph? (Electrical resistance is neglected in the circuit)

a) The energy stored in the magnetic field

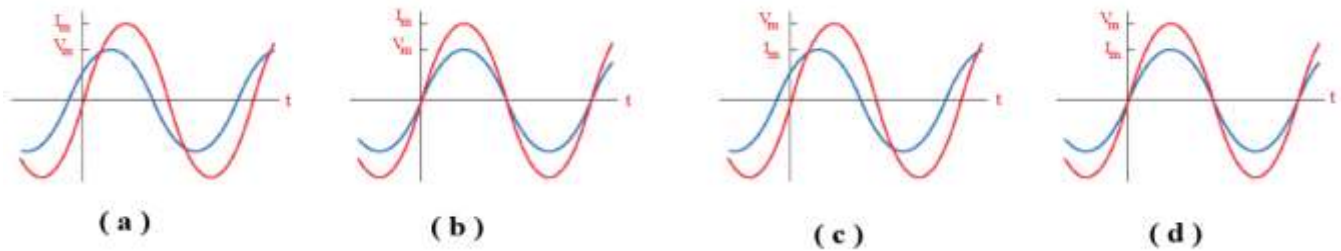
b) The charge

c) The current

d) The energy stored in the electric field

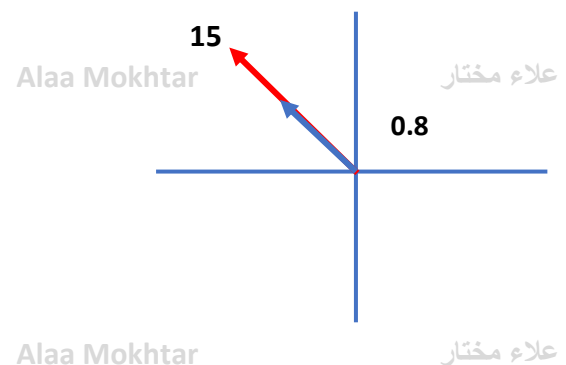


18) Which figure represents the voltage and current as functions of time for an ohmic resistor circuit connected to an AC source?



19) - The graph represents the phase vectors at an instant time of the voltage and current difference in an AC circuit, what type of circuit is this and what is the magnitude of the electric potential difference between the two ends of the resistor in the circuit at this time.

	Type of the circuit	V_R magnitude
a)	R-circuit	8.82 V
b)	RL-circuit	8.82 V
c)	R-circuit	0.66 V
d)	RL-circuit	0.66 V



20) An electric power station producing **500MW** of power is transmitted at a potential difference of **400kV** through a power transmission line whose total resistance is **19.2Ω**. How much power is lost during transmission?

a) 24kW

b) 30MW

c) 12TW

d) 0.06W

21 -An ideal transformer has the number of turns of its primary coil (500) and the number of turns of its secondary coil (100) if the effective potential difference between the two ends of the primary coil is (120V) and the power of the device connected to the secondary coil is (100W), what is the maximum current that passes in the secondary coil .

a) 0.24A

b) 4.2A

c) 2.4 A

d) 5.9 A

22) What type of transformer is used at the beginning of the power transmission line and what type of transformer is used at the end of the power transmission line (consumption places)

	At power station	At consumption places
a)	Step-up transformer	Step-down transformer
b)	Step-down transformer	Step-up transformer
c)	Step-up transformer	Step-up transformer
d)	Step-down transformer	Step-down transformer

23) Which of the following equations is Maxwell-Ampere's law and which represents the displacement current?

	Displacement current $I_d =$	Maxwell-Ampere's law $\oint \vec{B} \cdot d\vec{s} =$
a)	$\epsilon_0 \frac{d\Phi_E}{dt}$	$\mu_0(I_d + I)$
b)	$\epsilon_0 \frac{d\Phi_B}{dt}$	$\mu_0(I_d + I)$
c)	$\mu_0 \frac{d\Phi_E}{dt}$	$\epsilon_0(I_d + I)$
d)	$\epsilon_0 \frac{dE}{dt}$	$\mu_0 \epsilon_0 \frac{d\Phi_E}{dt}$

24) Capacitor with circular plates of a radius (0.1m) and the distance between plates is (1.2mm) What is the magnitude of the displacement current between the plates when the rate of change of the electric field between the plates is (12.0V/ms)

a) $3.3 \times 10^{-16}\text{A}$

b) $3.3 \times 10^{-12}\text{A}$

c) 12A

d) $1.2 \times 10^{-3}\text{A}$

25) What is the wavelength of electromagnetic waves with a frequency of 450MHz ?

a) 0.76m

b) 0.67m

c) 0.67cm

d) 7.6cm

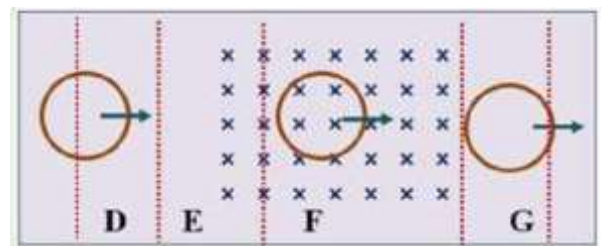
26) A conducting ring is moving from left to right through a region that contains a constant magnetic field as shown in the figure. In which area there is an induced current in the ring?

a) region D

b) region E

c) region F

d) region G



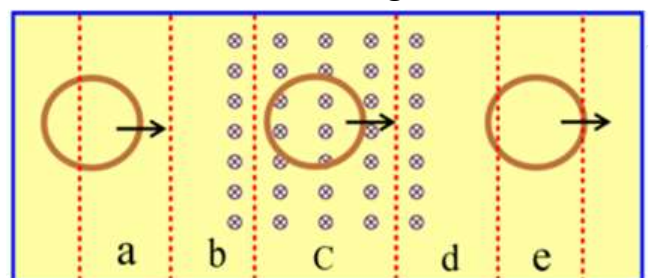
27) A conducting ring is moving from left to right through a region that contains a constant magnetic field as shown in the figure. In which areas there is an induced current in the ring?

a) regions a and c

b) regions e and c

c) regions e and a

d) regions b and d



28) A 5-turn square loop whose side length is (0.20m) is placed in a magnetic field that makes an angle of 30° with the normal to the plane of the loop. The magnitude of this field varies with time as: $B(t) = -2t^3$. Where t is measured in s and B in T. What is the magnitude of the induced potential difference in the loop at (t=2.0 s)?

a) 0.74 V

b) 2.8 V

c) 4.2 V

d) 2.4 V

29) A rectangular metal loop with a length of 4.0 cm and a width of 2.0 cm in a magnetic field of unit T perpendicular to its surface and changes with time according to the equation $B(t) = 7.0 t^2$. What is the magnitude of the potential difference induced in the loop at t=5.0 s?

a) 0.60 V

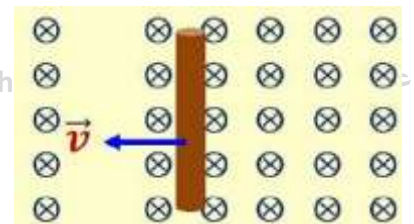
b) 0.06 V

c) 0.14 V

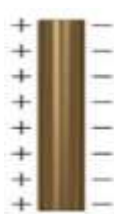
d) 1.4 V

30) A metal bar is moving at constant velocity v through a uniform magnetic field point into the page,

as shown in the figure. Which of the following most accurately represents the charge distribution on the charge of the bar?



a)



b)

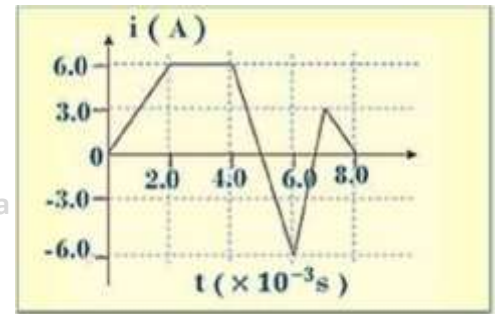


c)



d)

31) The graph shows the current through a **12mH** inductor. What is maximum potential difference $\Delta V_{L,ind}$ induced in the inductor over the period shown?



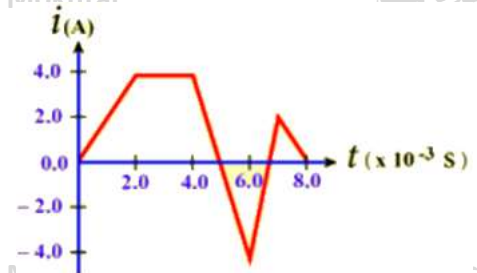
a) 72 V

b) **108 V**

c) 144 V

d) 36 V

32) The graph shows the current through a **10mH** inductor. What is maximum potential difference $\Delta V_{L,ind}$ induced in the inductor over the period shown?



a) 20 V

b) 30 V

c) 40 V

d) **60 V**

33) A **7.0mH** inductor is connected to a circuit with current (I) passing through the inductor. What is the magnitude of the induced potential difference in the inductor at $t=3.0s$, if the current varies with time as: $I(t) = 5 + 6t - 2t^2$ (Where I is measured in A).

a) 35 mV

b) 22 mV

c) 90 mV

d) **42 mV**

34) An inductor in which a changing current is passing through it $I(t) = 5 + 7t - 2t^2$ at $t = 3.0s$ the induced potential difference in the inductor is **0.036 V**. Calculate the inductance of the inductor.

a) 3.5 mH

b) 2.2 mH

c) 9.0 mH

d) **7.2 mH**

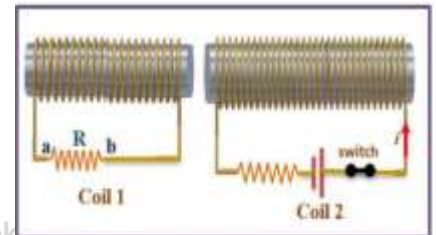
35) Which of the following is equivalent to the henry (H) unit? Where (T- tesla, A- ampere, m-meter)

- a) $T m^2 A^2$
- b) $T m^2 A^{-2}$
- c) $T m^2 A^{-1}$
- d) $T m^2 A$

36) Which of the following is equivalent to the tesla (T) unit? Where (H- henry, A- ampere, m-meter)

- a) $H m^{-2} A^{-2}$
- b) $H m^{-2} A$
- c) $H m^{-2} A^{-1}$
- d) $H m^2 A$

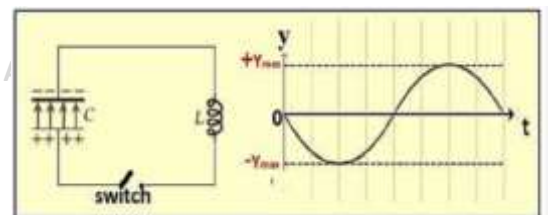
37) Two coils are shown in the figure. Coil 2 has a current I flowing in the direction shown. When the switch in the circuit containing coil 2 is opened, what happens in coil 1?



- a) A current is induced in it that flows in R from a to b
- b) A current is induced in it that flows in R from b to a
- c) No current is induced in coil 1
- d) A current is induced in it that flows in two direction b to a and a to b

38) When the switch of the circuit in the figure is closed, the current and the voltage in the circuit oscillate over time. What is the physical quantity represented by the y-axis in the graph?

- a) The energy stored in the magnetic field.
- b) The charge
- c) The current
- d) The energy stored in the electric field.



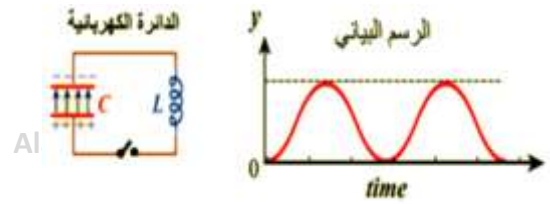
39) When the switch of the circuit is closed, the current and the voltage in the circuit oscillate over time. what is the physical quantity represented by the y-axis in the graph?

a) The energy stored in the magnetic field.

b) The charge

c) The current

d) The energy stored in the electric field.



40) What is the electric field amplitude ($E_{\max}$) of an electromagnetic wave whose magnetic field amplitude is ($5.0 \times 10^{-3} \text{T}$)

a) $1.5 \times 10^3 \text{V/m}$

b) $6.7 \times 10^5 \text{V/m}$

c) $6.7 \times 10^6 \text{V/m}$

d) $1.5 \times 10^6 \text{V/m}$

41) What is the electric field amplitude ($E_{\max}$) of an electromagnetic wave whose magnetic field amplitude is ($2.22 \times 10^{-3} \text{T}$)

a) $1.5 \times 10^3 \text{V/m}$

b) $6.7 \times 10^5 \text{V/m}$

c) $6.7 \times 10^6 \text{V/m}$

d) $1.5 \times 10^6 \text{V/m}$

42) An AC power supply puts out a voltage as: $V_{emf} = 170 \sin(2\pi 60t)$. The power supply is connected to a resistor of 15Ω resistance. What is the average power dissipated in the resistor?

a) 963 W

b) 480 W

c) 1000 W

d) 1920 W

43) An AC power supply puts out a voltage as: $V_{emf} = 200\sin(2\pi 60t)$. The power supply is connected to a resistor of 20Ω resistance. What is the average power dissipated in the resistor?

- a) 1000 W
- b) 4000 W
- c) 2000 W
- d) 8000 W

44) An AC power supply puts out a voltage as: $V_{emf} = 120\sin(2\pi 60t)$. The power supply is connected to a resistor of 15Ω resistance. What is the average power dissipated in the resistor?

- a) 960W
- b) 480W
- c) 1000W
- d) 1920W

45) What is the unit of the physical quantity expressed by the formula $\left[\frac{1}{\sqrt{\epsilon_0 \mu_0}} \right]$

($\mu_0 = 4\pi \times 10^{-7} \text{ N/A}^2$, $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N/m}^2$)

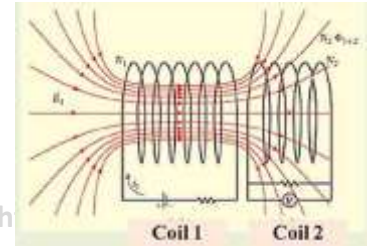
- a) m.s
- b) A.m
- c) A.m^{-1}
- d) m.s^{-1}

46) Which of the following is correct formula for the electromagnetic waves speed c in space

- a) $c = \frac{1}{\sqrt{\epsilon_0 \mu_0}}$
- b) $c = \sqrt{\epsilon_0 \mu_0}$
- c) $c = \frac{\mu_0}{\sqrt{\epsilon_0}}$
- d) $c = \frac{\epsilon_0}{\sqrt{\mu_0}}$

47) Depending on the figure. What does symbol Z represent in this equation $\left| \Delta V_{ind,2} = -Z \frac{dI_1}{dt} \right|$

- a) The number of turns for coil 1 (N_1).
- b) **The mutual inductance between the two coils M**
- c) The self-inductance for coil 2 L_2 .
- d) The self-inductance for coil 1 L_1 .



48) What is the incorrect statement about an electromagnetic wave travelling in vacuum?

- a) **The electric and the magnetic fields change in time, but do not change with position in space.**
- b) The electric and the magnetic fields change in time and position in space.
- c) Both electric and magnetic fields exist in a plane perpendicular to the direction of propagation.
- d) The electric field vector and the magnetic field vector are always perpendicular to each other.
- a) The energy is transported with speed c in the direction of propagation.

49) The total amount of energy stored in an LC series circuit is **8.0 J**. When the current through the inductor is equal quarter to its maximum value ($\frac{I_m}{4}$) how much energy is stored in the magnetic field

- a) 2.0 J
- b) 8.0 J
- c) **0.50 J**
- d) 1.0 J

50) What is the direct current that flows in an inductor whose self-inductance is (**1.2H**) and stores a magnetic energy of **375J**?

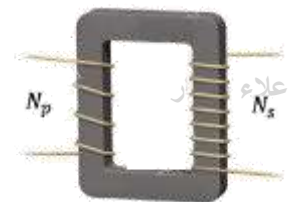
- a) 5.0A
- b) 18A
- c) **2.5A**
- d) 1.8A

51) The total energy stored in an LC series circuit is **8.0J**. When the current through the inductor is equal to half its maximum value ($\frac{I_m}{2}$), how much energy is stored in the magnetic field?

- a) **2.0 J**
- b) 8.0 J
- c) 4.0 J
- d) 6.0 J

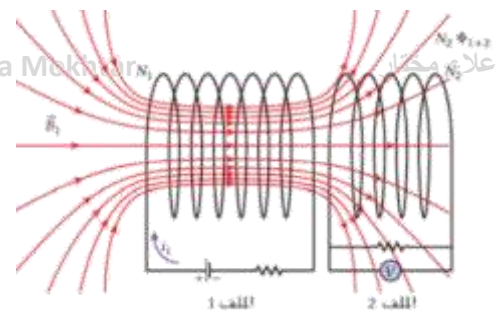
52) The figure shows an electric transformer, where ($N_s = 8$) and ($N_p = 4$), and the primary coil is connected to a source of electromotive force, where ($V_p = 110V$). What is the magnitude of the potential difference in the secondary coil? And what type of transformer?

- a) 55V, a step-up transformer
- b) 220V, a step-down transformer
- c) **220V, a step-up transformer**
- d) 55V, a step-down transformer



53) In the figure, the current I_1 in coil 1 increased from **zero** to **2.0A** in (**50ms**). The self-inductance for coil 1 is (**0.1H**) and the self-inductance for coil 2 is (**0.2H**), and the mutual induction between the two coils is (**0.04H**). What is the magnitude of the potential difference induced in the coil 2.

- a) **1.6 V**
- b) -1.6 V
- c) 0.6 V
- d) -0.6 V



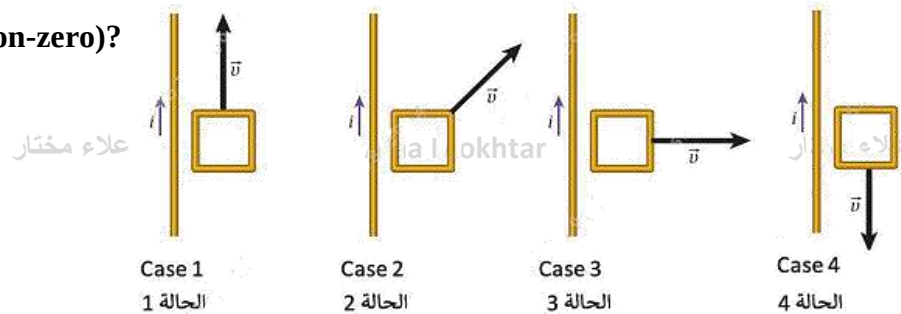
54) In the figures, the straight wire carries an electric current, I , and the wire loop moves at a constant speed $\vec{v}$ in the same plane as the straight wire as shown in the figure. In which of the following cases is the smallest induced current (non-zero)?

a) case 1

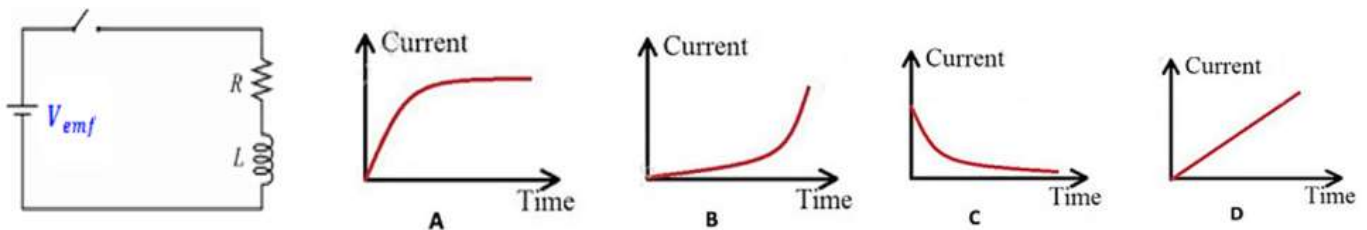
b) **case 2**

c) case 3

d) case 4



55) In the figure is an electric circuit. Which of the following curves represents the flow of current as a function of time when a switch is suddenly opened after it has been closed for a long time?



56) What is the rule for determining the direction of the induced current?

a) Ampere's Law

b) Ohm's law

c) Newton's third law

d) **Lenz's law**

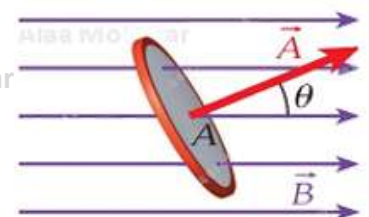
57) For the figure shown. Which of the following equations expresses magnetic flux?

a) **$\Phi_B = \oint \vec{B} \cdot d\vec{A}$**

b) $\Phi_B = \oint \vec{B} \times d\vec{A}$

c) $\Phi_B = \oint \vec{B} \cdot d\vec{A}$

d) $\Phi_B = \oint \vec{B} \times d\vec{A}$



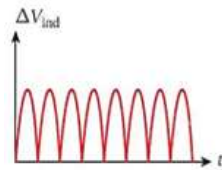
58) A generator is started by rotating a coil containing N number of turns in a constant magnetic field B where the coil rotates at a frequency f . Which of the following curves shows the induced potential difference as a function of time for an AC generator?

a) Case 1 only

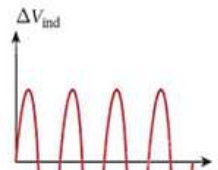
b) Case 2 only

c) Case 3 only

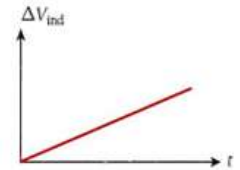
d) Cases 1 and 2



Case 1 الحالة 1



Case 2 الحالة 2



Case 3 الحالة 3

59) Select the correct statement about the electromagnetic spectrum from the following statements?

a) X-rays used in medical imaging are not part of the electromagnetic spectrum.

b) Visible light waves have higher frequencies than gamma waves.

c) Microwaves can be seen with eyes

d) Infrared waves have longer wavelengths than visible light.

60) A current of ($I=100\text{mA}$) passes through a solenoid with length (50.0cm), its cross-sectional area is ($A=2.0 \times 10^{-4}\text{m}^2$), and its number of turns is $N=4000$. What is the self-inductance of the solenoid?

a) 10.0mH

b) 3.5mH

c) 25.0mH

d) 8.0mH

61) The magnetic flux through a coil change with time (t) according to the equation $\Phi_B = -2t$. What is the magnitude of the potential difference (V_{ind}) induced in the coil at $t=3.0\text{s}$

a) 2.0V

b) -6.0V

c) 6.0V

d) -2.0V

62) Faraday's law of induction states that it induces a potential difference in the presence of a changing magnetic flux, what is the formula for that?

a) $\Delta V_{ind} = - \frac{d\Phi_B}{dt}$

b) $\Delta V_{ind} = - \frac{dI}{dt}$

c) $\Delta V_{ind} = - \frac{dt}{dI}$

d) $\Delta V_{ind} = - \frac{d\Phi_E}{dt}$

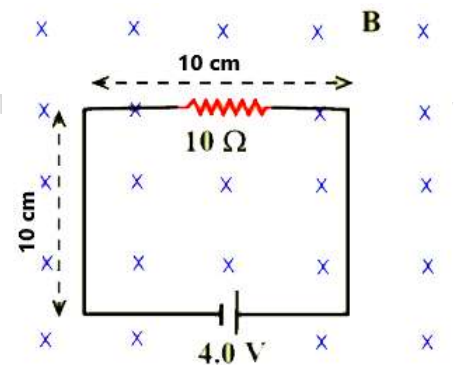
63) In the figure, the magnetic field increases at a rate of **200 T/s**. Calculate the strength of the current passing through the resistance during the decrease in the magnetic field.

a) 0.4 A

b) 0.2 A

c) 0.6 A

d) 0.3 A



64) In the figure, the magnetic field decreases at a rate of **200 T/s**. Calculate the strength of the current passing through the resistance during the decrease in the magnetic field.

a) 0.4 A

b) 0.2 A

c) 0.6 A

d) 0.3 A

