1. While walking to her school, a student first travelled 60 m East, then 30 m North and finally 30 m West. The magnitude and direction of the student's displacement are

A. 120 m North of East.
C. $60\sqrt{2}$ m East.
B. $30\text{m}\sqrt{2}$ North of East.
D. 30 m East

2. An object that is moving in a straight line increases its speed uniformly from 10 m/s to 20 m/s in 2 s. The distance travelled by the object during this time interval is

A. 20 m.
C. 40 m.
B. 60 m.
D. 30 m.

3. A student pushes a fixed wall by applying a horizontal force. According to Newton's third law, the force

A. the student exerts on the wall is less than the force the wall exerts on the student.
B. the student exerts on the wall is in the same direction as the wall exerts on the student.
C. the student exerts on the wall is equal in magnitude and opposite in direction to the force the wall exerts on the student.
D. on the wall by the student is perpendicular to the force on the student by the wall.

4. A 10 kg block slides down on an inclined plane, making an angle of 30^0 with the horizontal. If the coefficient of kinetic friction between the block and the inclined plane is $\mu_k = 0.1$, the acceleration of the block is

A. 5 m/s^2.
C. 4.23 m/s^2.
B. 4.13 m/s^2.
D. 5.87 m/s^2.

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5. An object of mass 4 kg moving with a velocity 4 m/s to the right collides head on with another object of mass 2 kg moving with a velocity 2 m/s to the left. After the collision, the objects stick together and move as a single object. What is their kinetic energy just after collision?

A. 12J
B. 16 J
C. 20J
D. 33J

6. Kilowatt-hour is a unit of

A. power.
B. force.
C. Electrical current.
D. Work

7. The efficiency of a machine can be expressed in terms of the mechanical advantage (MA) and velocity ration (VR) of the machine as

A. $\eta = MA/VR$
B. $\eta = VR/MA$
C. $\eta = VR \times MA$
D. $\eta = VR + MA$

8. In a hydraulic lift, a force $F_1 = 120$ N is applied to a smaller piston of radius r_1 to lift a 12000 N car placed on a larger piston of radius r_2. What is the ratio of r_2 to r_1?

A. 1/100
B. 1/10
C. 100
D. 10

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9. Compared to other substances (such as ice, salt, ethanol, copper, oil,...), water has a relatively high specific heat capacity. Which one of the following statements explains the result of high specific heat capacity of water?

A. A larger amount of heat is required to increase the temperature of 1 kg of water by 1^0C than the amount required to raise the temperature of 1 kg of salt by 1^0C.

B. If we put equal masses of water and oil on two identical heat sources simultaneously and boil them, water boils faster than oil.

C. If equal amount of heat is applied to equal masses of water and oil for equal time interval, the temperature of water is greater than that of oil.

D. The amount of heat required to increase the temperature of 1 kg of water by 1 K is less than the amount required to raise the temperature of 1 kg of ethanol by 1 K.

0. A square plane sheet of copper is 8.00 cm along each side. What is the change in the area of this sheet when its temperature is increased by 50.0 K? (Coefficient of area expansion of copper is $3.4 \times 10^{-5}/K$)

A. 0.1088 cm^2

B. 0.1944 cm^2

C. 0.6410 cm^2

D. 0.400 cm^2

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11. Which one of the following statements is correct about longitudinal and transverse waves?

A. In longitudinal waves, particles of the medium through which the wave is travelling perpendicular to the direction of wave propagation.
B. In transverse waves, energy is transferred between two points by actual motion of particles in the medium.
C. Transverse waves cannot propagate in vacuum, whereas longitudinal waves can propagate in vacuum.
D. In transverse waves, the direction of vibration of the particles in the medium or field through which the wave is travelling is perpendicular to the direction of wave propagation.

12. The unit of linear momentum is

A. N/sec.
B. Kg m/sec.
C. Kg m/sec^2.
D. N/m.

13. A wedge of 8 cm and thickness 2 cm is pushed into a block of wood. If the effort applied in 40 N, what is the load on the wooden block? (Assume the wedge is 100% efficient)

A. 10 N
B. 160 N
C. 80 N
D. 320 N

14. Which one of the following statement correct about sound waves?

A. They are transversal mechanical waves.
B. They are produced by vibration of electric and magnetic fields.
C. Their wave particles propagate in the same direction as wave carrier displacement.
D. Their wave particles propagate in the direction perpendicular to the wave carrier displacement.

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15. A stone is thrown from the top of a building horizontally with an initial speed u. The height from which the stone is thrown is h above the ground. The stone reaches the ground after travelling a distance x along the horizontal. The time taken t for the stone to reach the ground (air resistance is negligible) is found from the equation

A. $t = \sqrt{\frac{2x}{g}}$ C. $t = \frac{x}{u}$

B $t = \frac{h}{u}$ D. $t = \sqrt{\frac{h}{2g}}$

16. According to Kepler's law of planetary motion

A. each planet moves in a circular path with the Sun at the center.
B. each planet moves in an elliptical path with the Sun at one focus.
C. the line that joins the Sun to the orbiting planet sweeps out different areas in equal time.
D. the square of the time taken for the planet to go around the Sun is proportional to the square of its average distance from the Sun.

17. The distribution of charges on the surface of an irregularly shaped conductor in electrostatic equilibrium is

A. the greatest at locations where the radius of curvature of the surface is smallest.
B. the same at all locations irrespective of the radius of curvature of the surface.
C. the smallest at locations where the radius of curvature of the surface is smallest.
D. the greatest at locations where the radius of curvature of the surface is largest.

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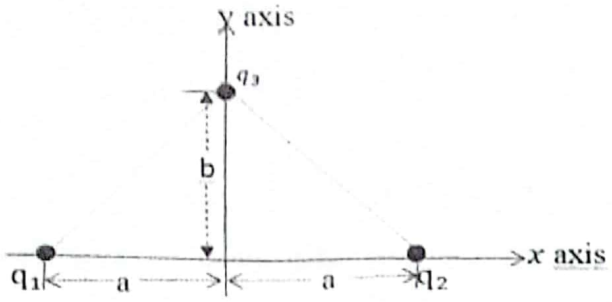
18. Consider three point charges $q_1 = q_2 = +5.00\ \mu C$ and $q_3 = -20.00\ \mu C$ located at the corners of a triangle as shown in figure below.



If a = 30 cm, and b = 40 cm, the net force exerted by q_1 and q_2 on q_3 is

A. 5.76 N, in the negative y direction.
B. 4.30 N, in the negative y direction.
C. 5.76 N, in the positive y direction.
D. 4.30 N, in the positive y direction.

19. Consider that there are four electric cells, where each cell has an electro motive force (e.m.f.) of 1.5 V. If these cells are connected

A. in series, the total e.m.f. of the cells is 1.5 V.
B. in parallel, the total e.m.f. of the cells is 6.0 V.
C. in series, the total e.m.f. of the cells is 6.0 V.
D. in parallel, the total emf of the cells is 0.375 V.

20. Suppose a charged particle of charge q is moving with velocity $\vec{v}$ in a magnetic field $\vec{B}$. The force acting on the charged particle is

A. inversely proportional to the magnitude of the magnetic field $\vec{B}$.
B. directly proportional to the magnitude of the magnetic field $\vec{B}$.
C. inversely proportional to the magnitude of the velocity $\vec{v}$.
D. independent of the angle between $\vec{v}$ and $\vec{B}$.

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21. A semiconductor is called

A. n-type, if the majority carriers due to doping are holes.
B. p-type, if it is doped with donor impurities.
C. p-type, if the majority carriers due to doping are holes.
D. n-types, if it is doped with acceptor impurities.

22. The image formed by a mirror is

A. virtual, if it is possible to focus the light from an image on a screen.
B. real, if it is possible to focus the light from an image on a screen.
C. real, if it is possible to see an image behind the mirror.
D. virtual, if it is possible to capture the image on a screen.

23. A converging lens has a focal length of 10 cm. If an object is placed at 6 cm from the lens, the image formed is

A. virtual and located at a distance of 3.75 cm from the lens.
B. real and located at a distance of 3.75 cm from the lens.
C. real and located at a distance of 15 cm from the lens.
D. virtual and located at a distance of 15 cm from the lens

24. Which of the following defines angular acceleration?

A. Angular acceleration is the time rate of change of tangential velocity
B. Angular acceleration is the time rate of change of angular velocity.
C. Angular acceleration is the time rate change of angular displacement
D. Angular acceleration is the product of centripetal acceleration and radius.

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25. Which one of the following statements correctly describes the difference between absolute potential and potential difference?

A. Absolute potential is the work done per unit charge in bringing a small object from infinity to a point in an electric field whereas the potential difference is the difference between two absolute potentials in a given electric field.

B. The two potentials differ in that absolute potential is a vector physical quantity whereas the potential difference is a scalar physical quantity.

C. Potential difference is the work done per unit charge in bringing a small object from infinity to a point in an electric field whereas the absolute potential is the difference between two potentials in a given electric field.

D. It is difficult to separate absolute potential and potential difference since both are defined as work done per unit charge in bringing a small object from infinity to a point in a given electric field.

26. A circuit provides a maximum current of 10.0 A at an operating voltage of 60.0 V. The numbers of bulb each with 75.0W that can operate with this voltage source and the energy consumption if the bulbs operate for 4.0 hours are, respectively

A. 8.0, 2.4 kWh
B. 2.4, 8.0 kWh
C. 4.0, 1.20 kWh
D. 1.20, 600 kWh

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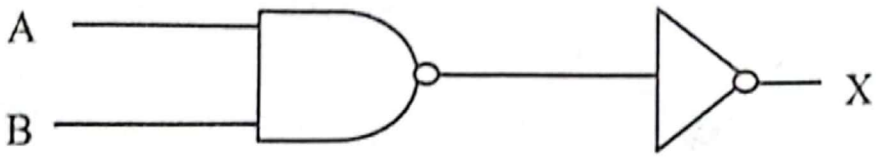
27. Which of the following is **NOT** part of the safety features incorporated in mains electrical installation?

A. Earthling appliances to discharge safely large and dangerous currents
B. Need of circuit breakers
C. A fuse containing a wire that melts when the current exceeds a certain value
D. A fuse containing a wire that allows when the current exceeds a certain value

28. A logic gate circuit shown in the figure below consist two inputs A and B and an output *X*.



For what values of A and B the output of the circuit X = 1

A. A=1 and B=1
B. A=0 and B=0
C. A=0 and B=1
D. A=1 and B=0

29. Which of the following is distinguishes between concave and convex mirrors?

A. A concave mirror has a reflecting surface that bulges outwards, whereas the reflecting surface of a convex mirror bulges inwards
B. A convex mirror forms real or virtual image, whereas a concave mirror does not form real image.
C. Parallel rays incident on a concave mirror diverge from a point, whereas parallel rays incident on a convex mirror converges to a point
D. Parallel rays incident on a concave mirror converges to a point, whereas parallel incident on a convex mirrors appear to diverge from a point.

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30. Which one of the following measurement is appropriate in collecting data?

A. Measuring the distance between two towns in meter
B. Measuring the mass of the bob of a pendulum in milligram.
C. Measuring the diameter of a test tube in centimeter.
D. Measuring the thickness of a book in meter.

31. According to Newton's law of universal gravitation, the gravitational force between two objects is directly proportional to

A. The product of the two masses of the objects.
B. The square of distance between the two objects.
C. The ratio of mass of the object to mass of the Earth
D. The volume of the object

32. Among the following, which pair of vectors is collinear?

A. $3\,\hat{i}+4\,\hat{j}$ and $4\,\hat{i}+3\,\hat{j}$
B. $(8/3)\,\hat{i}+2\,\hat{j}$ and $4\,\hat{i}+(16/3)\,\hat{j}$
C. $-3\,\hat{i}+4\,\hat{j}$ and $-6\,\hat{i}+8\,\hat{j}$
D. $2\,\hat{i}-4\,\hat{j}$ and $4\,\hat{i}+8\,\hat{j}$

33. A ball is kicked by a goal keeper with an initial velocity v_0 at angle of θ with respect to the horizontal? What is the relationship between the range (R), and the maximum height (h_{max})?

A. $h_{max} = (1/4)\,R\,\tan\theta$
B. $h_{max} = (1/4)\,R\,\cos\theta$
C. $h_{max} = (1/4)\,R\,\sin\theta$
D. $h_{max} = (1/4)\,R\,\sec\theta$

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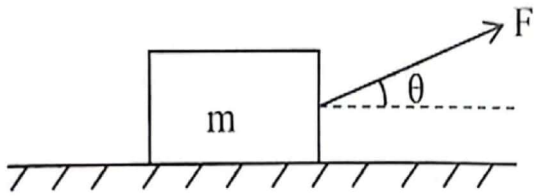
34. The position s of a car as a function of t is described by the equation s (t) = (10 m/s) t+ (2 m/s^2) t^2. What is the average velocity in the time interval between 2s and 5s?

A. 14 m/s
B. 20 m/s
C. 28 m/s
D. 24 m/s

35. In the figure below a block of mass m = 4 kg, moving horizontally on a horizontal surface, is acted by a pulling force F = 50 N that makes an angle of $\theta=30^0$ with the horizontal. If the coefficient of kinetic friction between the block and the surface is 0.25, what is the net force acting on the block?



A. 43.50 N
B. 15 N
C. 39.75 N
D. 3.75 N

36. A mass of 0.5 kg, attached to a string, is whirled in a vertical circle of radius r = 1 m. If the object's speed when it reaches the bottom of the circle is v = 4 m/s, then what tension is developed in the string?

A. 8 N
B. 13 N
C. 5 N
D. 2 N

Physics Try Out

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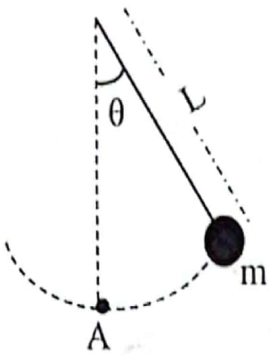
37. A projectile ball is fired from the ground with an initial velocity $\vec{v}_0 = \left(6\frac{m}{s}, 8\frac{m}{s}\right)$. After certain time of flight, it intercepts the edge of a tower which is at a horizontal distance of 1.2 m from the point of projection. How high is the ball above the ground when it intercepts the tower?

A. 1.8 m.
B. 3.2 m.
C. 1.4 m.
D. 9.6 m.

38. A mass m hanging from a rope of length L makes a simple pendulum, as shown in the figure below.



If the mass is pulled to the right until the rope makes an angle θ with the vertical and released, what is its speed in terms of L, g, and angle θ when it reaches the bottom (Point A)?

A. $(2\,g\,L\,(1+\cos\theta))^{\frac{1}{2}}$
B. $(2\,g\,L\,(1+\sin\theta))^{\frac{1}{2}}$
C. $(2\,g\,L\,(1-\cos\theta))^{\frac{1}{2}}$
D. $(2\,g\,L\,(1-\sin\theta))^{\frac{1}{2}}$

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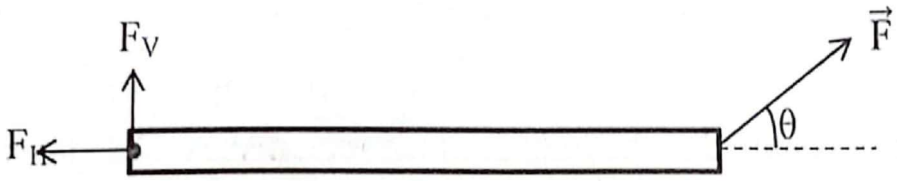
39. The angular momentum of a rotating flywheel of moment of inertia 50 kgm^2 is changed by the action of a constant torque from 1200 kgm^2/s to 2400 kg m^2/s within 1minute. What is the magnitude of this torque?

A. 1200 Nm
B. 20 Nm
C. 72000 Nm
D. 2400 Nm

40. The pressure at the bottom of a 0.8 m height glass which is fully filled with water is P. The water is poured out, and the glass is then fully filled with a liquid($\rho_l = 800$ Kg/m^3). The new pressure at the bottom of the glass is recorded to be P_f. The value of the pressure difference, $\Delta P = P - P_f$, is

A. 1.6 kPa.
B. 0.8 kPa.
C. 14.4 kPa.
D. 6.4 kPa.

41. A uniform bar of mass m is free to rotate about a hinge at one of its end and is pulled by a force $\vec{F}$ at the opposite end, as shown in the figure below.



F_H and F_V are the horizontal and vertical components of the force on the rod due to the hinge. If the system is held in equilibrium while θ is increased, then which of the following will happen to F_H, F_V and $\vec{F}$?

A. F_H is decreased and F_V remains the same, and $\vec{F}$ is decreased.
B. F_H is increased and F_V remains the same, and $\vec{F}$ is increased.
C. F_V is increased and F_H remains the same, and $\vec{F}$ is decreased.
D. F_H is decreased and F_V remains the same, and $\vec{F}$ is increased.

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42. Gasoline of density $\rho = 860$ kg/m^3 flows steadily through a horizontal pipe that tapers in cross-sectional area from A_1 to $A_2 = (1/2)\ A_1$. If the pressure difference $P_1 - P_2$ is 5,160 Pa, what is the velocity of the gasoline at area A_1?

A. 1 m/s
B. 2 m/s
C. 3 m/s
D. 4 m/s

43. Stokes law states that,

A. any increment in pressure at one part of a fluid is distributed equally to all parts of the fluid.
B. a body submerged in a fluid wholly or partially is pushed by a force that is equal to the weight of the displaced fluid.
C. Gauge pressure is the difference between absolute pressure at a point and the atmospheric pressure.
D. the viscous drag force that acts on a sphere of radius r travelling at velocity v through a fluid of viscosity η is given by $F = 6\pi\eta rv$.

44. A specific temperature and a specific pressure at which the liquid and gas phases of a substance coexist together is known as

A. steam point.
B. triple point.
C. boiling point.
D. critical point.

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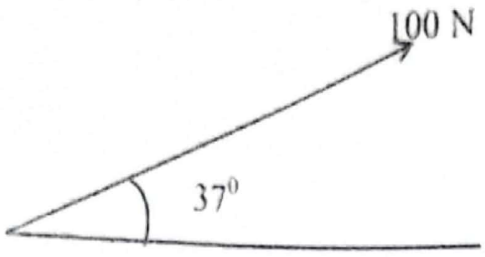
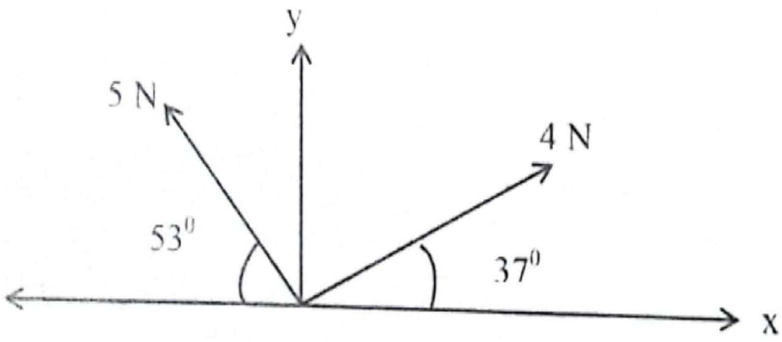
The arrow represents a force of 100 N at about 37^0 to the horizontal, as shown the figure below



This means that the force partly acting towards

A. North by its 80N amount.
B East by its 60N amount.
C. North by its 60N amount.
D. West by its 80 N amount.

Two forces make the indicated angles to the x-axis each, as shown in figure bellow



If both of them act at the origin, what will be the magnitude and direction of the components of the resultant vector?

A. 6.2 N towards the +x-axis and 6.4 N towards the +y axis
B. 6.2 N towards the +x-axis and 1.6 N towards the +y-axis
C 0.2 N towards the +x-axis and 6.4 N towards the +y axis
D 0.2 N towards the +x axis and 1.6 N towards the +y axis

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47. A block of mass 200-gm is attached to one end of a spring (κ =400N/cm) which is fixed to a wall from the other end and lie down on the top surface of a frictionless table. If the spring is pulled from its equilibrium position by 10-cm and released, what will be the kinetic energy of the block when it reaches 5 cm stretch from the equilibrium position

A. 250 J
B. 2.5 J
C. 1.5 J
D. 150 J

48. If moment of inertia of a body of mass M about its center of mass is known to be I_0, the moment of inertia I about another axis parallel to and at distance *R* from the central axis is equal to

A. $I = I_0 + MR$.
B. $I = I_0 - MR^2$.
C. $I = I_0 + MR^2$.
D. $I = I_0 - MR$.

49. Which of the following is different from others in relation to the knowledge of physics used in wired and wireless communications?

A. Electricity and magnetism
B. Energy
C. Momentum
D. Wave phenomena

50. If an object is projected horizontally from a certain height,

A. The magnitude of its velocity increases as time increases.
B. Its velocity remains constant throughout the motion as the time increases.
C. Its acceleration increases with time.
D. The magnitude of its velocity decreases with increase in time.

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51. In rotational motion of a rigid body about a fixed axis

A. a point on the object moves in a circle with tangential speed equal to the product of angular speed and radial distance from the axis.
B. the tangential velocity of a point on the rotating rigid object is the product of radial distance from the axis and angular acceleration.
C. the angular acceleration of rotating rigid object is the product of the tangential acceleration and radial distance from the axis.
D. the shape of the rigid object may change with change of time.

52. The central point to describe that Newton's law of universal gravitation is a basis for understanding Kepler's laws is that it gives a

A. constant tangential velocity of rotating planets.
B. constant angular acceleration for a revolving planet.
C. centripetal force for planets revolving around the sun.
D. tangential force while planets revolve about the sun.

53. Which one of the following description is correct for a physical property substance?

A. Density measures mass of a given volume of a substance.
B. Specific gravity measures mass of a given volume of matter.
C. Density measures the substance's mass as compared to water.
D. Specific gravity measures the actual density of the substance.

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54. The table below shows the volume (V), of a fluid that passes through a cross sectional area (A) of a pipe as a function of time with speed v.

Time (in second)	0	1	2	3	4	5	6	7	8	9	10
Volume (in m^3)	2	4	6	8	10	12	14	16	18	20	22

Which of the following is correct about the flow rate?

A. $Av = 3\ m^3/s$
B. $Av = 4\ m^3/s$
C. $Av = 2\ m^3/s$
D. $Av = 2.2\ m^3/s$

55. Which one of the following is **NOT** a source of magnetic field?

A. The Earth
B. Bar magnet
C. Electric Current
D. A stationary charge

56. A flexible square coil of wire has side length of 2.0 cm and is in a magnetic field of magnitude 0.15 T perpendicular to the plane of the loop. The loop is grasped at its edges and stretched until its area is nearly zero. If it takes 0.2 s to stretch the loop, what is the magnitude of the average induced emf in it during this time interval?

A. 15 mV
B. 0.3 mV
C. 6 mV
D. 0.94 mV

57. One of the following statements is correct about the function of logic gates?

A. They are designed to use or produce only digital signals.
B. They are designed to use or produce only analog signals.
C. They are designed to use or produce both digital and analog signals.
D. They are designed to produce signal which varies continuously with time.

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58. A parallel-plate capacitor of capacitance 55 μF is charged with a battery of 12 V to a charge Q. The battery is then removed, and a slab of material that has a dielectric constant k = 4 is inserted between the plates. The energy stored in the system after the dielectric is inserted is

A. 9.9×10^{-4} J.
C. 3.96×10^{-3} J.
B. 1.58×10^{-2} J.
D. 7.92×10^{-3} J.

59. Consider an electric circuit that is formed by connecting a resistor of resistance R across the terminals of a battery of e.m.f. ε and internal resistance, r. If the current in the circuit is I, then the potential difference between the terminals of the battery is known as its

A. terminal voltage and equal to $\varepsilon - IR$.
B. terminal voltage and equal to $\varepsilon - Ir$.
C. emf and equal to ε.
D. terminal voltage and equal to Ir.

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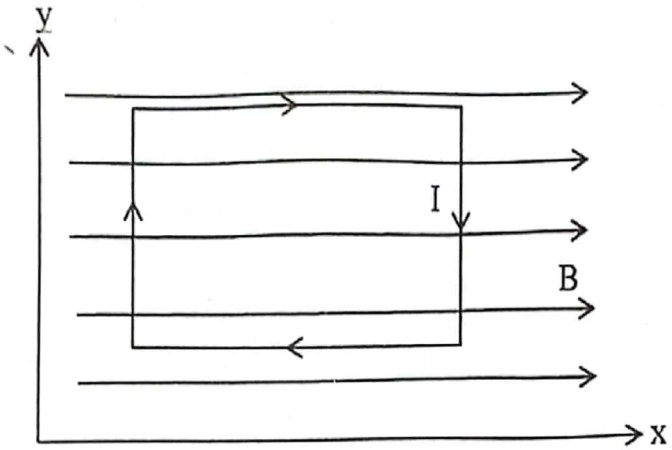
60. Consider a rectangular loop of wire that lies in xy-plane has area of 50 cm^2 and a current of I = 2 A in the clockwise direction as shown in the figure.



If a magnetic field B = 0.4 T is applied in the positive x direction, what is the magnitude and direction of the torque acting on the loop?

A. 0.4×10^{-2} Nm, in the negative y direction.
B. 0.4 Nm, in the positive y direction.
C. 0.4 Nm, in the negative y direction.
D. 0.4×10^{-2} Nm, in the positive y direction.

The End

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