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PREVIOUS YEAR's QUESTIONS

NEET 2022 **PHYSICS (SOLVED)**

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1.Match List-I with List-II

List-I (Electromagnetic waves)	**List-II (Wavelength)**
(a) AM radio waves	(i) 10^{-10} m

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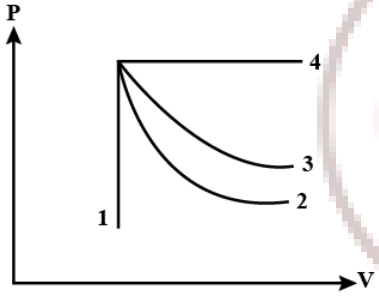
(b) Microwaves (ii) 10^2 m
(c) Infrared radiations (iii) 10^{-2} m
(d) X-rays (iv) 10^{-4} m
Choose the correct answer from the options given below
(1) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)
(2) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)
(3) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)
(4) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)

2. An ideal gas undergoes four different processes from the same initial state as shown in the figure below. Those processes are adiabatic, isothermal, isobaric and isochoric. The curve which represents the adiabatic process among 1, 2, 3 and 4 is



(1) 1
(2) 2
(3) 3
(4) 4

3.The angular speed of a fly wheel moving with uniform angular acceleration changes from 1200rpm to 3120rpm in 16 seconds. The angular acceleration in rad/s^2 is :
(1) 2π
(2) 4π
(3) 12π
(4) 104π

4.

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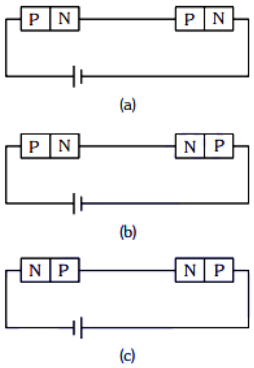
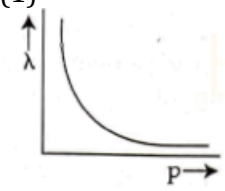


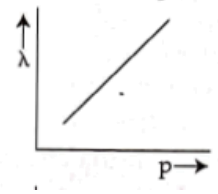
In the given circuits (a), (b) and (c), the potential drop across the two *p-n* junctions are equal in
(1) Circuit (a) only
(2) Circuit (b) only
(3) Circuit (c) only
(4) Both circuits (a) and (c)

5. A biconvex lens has radii of curvature, 20 cm each. If the refractive index of the material of the lens is 1.5, the power of the lens is
(1) +2 D
(2) +20 D
(3) +5 D
(4) Infinity

6. The graph which shows the variation of the de Broglie wavelength (λ) of a particle and its associated momentum (*p*) is
(1)



(2)



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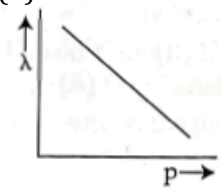
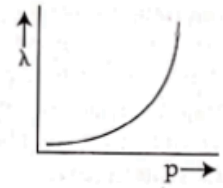
(3)

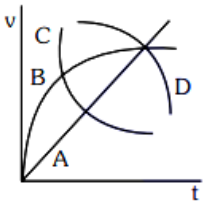


(4)



7. As the temperature increases, the electrical resistance
(1) Increases for both conductors and semiconductors
(2) Decreases for both conductors and semiconductors
(3) Increases for conductors but decreases for semiconductors
(4) Decreases for conductors but increases for semiconductors

8. A spherical ball is dropped in a long column of a highly viscous liquid. The curve in the graph shown, which represents the speed of the ball (v) as a function of time (t) is



(1) A
(2) B
(3) C
(4) D

9. The dimensions $[MLT^{-2} A^{-2}]$ belong to the
(1) Magnetic flux
(2) Self inductance
(3) Magnetic permeability
(4) Electric permittivity

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10. In half wave rectification, if the input frequency is 60 Hz, then the output frequency would be
(1) Zero
(2) 30 Hz
(3) 60 Hz
(4) 120 Hz

11. If the initial tension on a stretched string is doubled, then the ratio of the initial and final speeds of a transverse wave along the string is
(1) 1 : 1
(2) $\sqrt{2}$:1
(3) 1: $\sqrt{2}$
(4) 1 : 2

12. A shell of mass *m* is at rest initially. It explodes into three fragments having mass in the ratio 2 : 2 : 1. If the fragments having equal mass fly off along mutually perpendicular directions with speed *v*, the speed of the third (lighter) fragment is
(1) v
(2) $2v$
(3) $2\sqrt{2}v$
(4) $3\ 2v$

13. Two objects of mass 10 kg and 20 kg respectively are connected to the two ends of a rigid rod of length 10 m with negligible mass. The distance of the center of mass of the system from the 10 kg mass is
(1) 5 m
(2) 10/3 m
(3) 20/3 m
(4) 10 m

14. If a soap bubble expands, the pressure inside the bubble
(1) Decreases
(2) Increases
(3) Remains the same
(4) Is equal to the atmospheric pressure

15. An electric lift with a maximum load of 2000 kg (lift + passengers) is moving up with a constant speed of 1.5 ms^{-1}. The frictional force opposing the motion is 3000 N. The minimum power delivered by the motor to the lift in watts is : (g = 10 ms^{-2})
(1) 23000

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(2) 20000
(3) 34500
(4) 23500

16. The angle between the electric lines of force and the equipotential surface is
(1) 0°
(2) 45°
(3) 90°
(4) 180°

17. When two monochromatic lights of frequency, v and v/2 are incident on a photoelectric metal, their stopping potential becomes $V_s/2$ and V_s respectively. The threshold frequency for this metal is
(1) $2v$
(2) $3v$
(3) $2/3v$
(4) $3/2v$

18. A long solenoid of radius 1 mm has 100 turns per mm. If 1 A current flows in the solenoid, the magnetic field strength at the centre of the solenoid is
(1) 6.28×10^{-2} T
(2) 12.56×10^{-2} T
(3) 12.56×10^{-4} T
(4) 6.28×10^{-4} T

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19. In the given nuclear reaction, the element X is
$^{22}_{12}Na \rightarrow$ X +e^+ +V
(1) $^{22}_{12}Mg$
(2) $^{23}_{11}Mg$
(3) $^{23}_{10}Mg$
(4) $^{22}_{10}Mg$

20. Given below are two statements
Statement I : Biot-Savart's law gives us the expression for the magnetic field strength of an infinitesimal
current element (Idl) of a current carrying conductor only.
Statement II : Biot-Savart's law is analogous to Coulomb's inverse square law of charge q, with the former being related to the field produced by a scalar source, Idl while the latter being produced by a vector source, q.
In light of above statements choose the most appropriate answer from the options given below

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(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct and Statement II is incorrect
(4) Statement I is incorrect and Statement II is correct

21. The ratio of the radius of gyration of a thin uniform disc about an axis passing through its centre and normal to its plane to the radius of gyration of the disc about its diameter is
(1) 2 : 1
(2) $\sqrt{2}$:1
(3) 4 : 1
(4) 1: $\sqrt{2}$

22. The peak voltage of the ac source is equal to
(1) The value of voltage supplied to the circuit
(2) The rms value of the ac source
(3) $\sqrt{2}$ times the rms value of the ac source
(4) $1/\sqrt{2}$ times the rms value of the ac source

23. The energy that will be ideally radiated by a 100 kW transmitter in 1 hour is
(1) 36×10^7 J
(2) 36×10^4 J
(3) 36×10^5 J
(4) 1×10^5 J

24. In a Young's double slit experiment, a student observes 8 fringes in a certain segment of screen when a monochromatic light of 600 nm wavelength is used. If the wavelength of light is changed to 400 nm, then the number of fringes he would observe in the same region of the screen is
(1) 6
(2) 8
(3) 9
(4) 12

25. A square loop of side 1 m and resistance 1 Ω is placed in a magnetic field of 0.5 T. If the plane of loop is perpendicular to the direction of magnetic field, the magnetic flux through the loop is
(1) 2 weber
(2) 0.5 weber
(3) 1 weber
(4) Zero weber

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26. Two resistors of resistance, 100 Ω and 200 Ω are connected in parallel in an electrical circuit. The ratio of the thermal energy developed in 100 Ω to that in 200 Ω in a given time is
(1) 1 : 2
(2) 2 : 1
(3) 1 : 4
(4) 4 : 1

27. The ratio of the distances travelled by a freely falling body in the 1st, 2nd, 3rd and 4th second
(1) 1 : 2 : 3 : 4
(2) 1 : 4 : 9 : 16
(3) 1 : 3 : 5 : 7
(4) 1 : 1 : 1 : 1

28. A body of mass 60 g experiences a gravitational force of 3.0 N, when placed at a particular point. The magnitude of the gravitational field intensity at that point is
(1) 0.05 N/kg
(2) 50 N/kg
(3) 20 N/kg
(4) 180 N/kg

29. A light ray falls on a glass surface of refractive index $\sqrt{3}$, at an angle 60°. The angle between the refracted and reflected rays would be
(1) 30°
(2) 60°
(3) 90°
(4) 120°

30. When light propagates through a material medium of relative permittivity εr and relative permeability μr, the velocity of light, v is given by (c-velocity of light in vacuum)
(1) v = c
(2) v = $\sqrt{\frac{m_r}{\varepsilon_r}}$
(3) v = $\sqrt{\frac{\varepsilon_r}{m_r}}$
(4) v = $\frac{c}{\sqrt{\varepsilon_r \mu_r}}$

31. Two hollow conducting spheres of radii R_1 and R_2 ($R_1 >> R_2$) have equal charges. The potential would be
(1) More on bigger sphere

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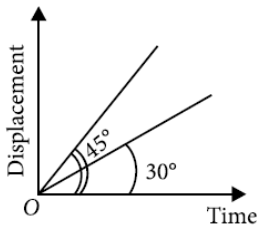
(2) More on smaller sphere
(3) Equal on both the spheres
(4) Dependent on the material property of the sphere

32. A copper wire of length 10 m and radius $\left(\frac{10^{-2}}{\sqrt{x}}\right)$ m has electrical resistance of 10 Ω. The current density in the wire for an electric field strength of 10 (V/m) is
(1) 10^4 A/m^2
(2) 10^6 A/m^2
(3) 10^{-5} A/m^2
(4) 10^5 A/m^2

33. The displacement-time graphs of two moving particles make angles of 30° and 45° with the *x*-axis as shown in the figure. The ratio of their respective velocity is



(1) $\sqrt{3}:1$
(2) 1 : 1
(3) 1 : 2
(4) $1:\sqrt{3}$

34. Plane angle and solid angle have
(1) Units but no dimensions
(2) Dimensions but no units
(3) No units and no dimensions
(4) Both units and dimensions

35. Let T_1 and T_2 be the energy of an electron in the first and second excited states of hydrogen atoms, respectively. According to the Bohr's model of an atom, the ratio $T_1 : T_2$ is
(1) 1 : 4
(2) 4 : 1
(3) 4 : 9

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(4) 9 : 4

36. Match List-I with List-II

List-I	List-II
(a) Gravitational constant (G)	(i) $[L^2T^{-2}]$
(b) Gravitational potential energy	(ii) $[M^{-1}L^3T^{-2}]$
(c) Gravitational potential	(iii) $[LT^{-2}]$
(d) Gravitational intensity	(iv) $[ML^2T^{-2}]$

Choose the correct answer from the options given below
(1) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
(2) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)
(3) (a) - (ii), (b) - (iv), (c) - (iii), (d) - (i)
(4) (a) - (iv), (b) - (ii), (c) - (i), (d) - (iii)

37. Two pendulums of length 121 cm and 100 cm start vibrating in phase. At some instant, the two are at their mean position in the same phase. The minimum number of vibrations of the shorter pendulum after which the two are again in phase at the mean position is:
(1) 11
(2) 9
(3) 10
(4) 8

38. The area of a rectangular field (in m2) of length 55.3 m and breadth 25 m after rounding off the value for correct significant digits is
(1) 138×10^1
(2) 1382
(3) 1382.5
(4) 14×10^2

39. A ball is projected with a velocity, 10 ms–1, at an angle of 60° with the vertical direction. Its speed at the highest point of its trajectory will be
(1) Zero
(2) $5\sqrt{3}$ ms^{-1}
(3) 5 ms^{-1}
(4) 10 ms^{-1}

40.

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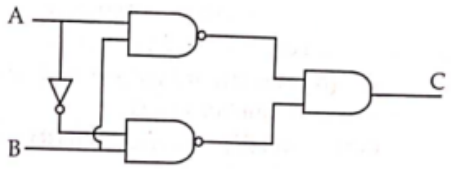

The truth table for the given logic circuit is

(1)

A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

(2)

A	B	C
0	0	1
0	1	0
1	0	0
1	1	1

(3)

A	B	C
0	0	1
0	1	0
1	0	1
1	1	0

(4)

A	B	C
0	0	0
0	1	1
1	0	0
1	1	1

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41. From Ampere's circuital law for a long straight wire of circular cross-section carrying a steady current, the variation of magnetic field in the inside and outside region of the wire is
(1) Uniform and remains constant for both the regions.

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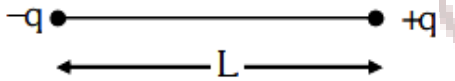
(2) A linearly increasing function of distance upto the boundary of the wire and then linearly decreasing for the outside region.
(3) A linearly increasing function of distance r upto the boundary of the wire and then decreasing one with $\frac{1}{r}$ dependence for the outside region.
(4) A linearly decreasing function of distance upto the boundary of the wire and then a linearly increasing one for the outside region.

42. A series LCR circuit with inductance 10 H, capacitance 10 μF , resistance 50 Ω is connected to an ac source of voltage, $V = 200\sin(100t)$ volt. If the resonant frequency of the LCR circuit is ν_1 and the frequency of the ac source is ν, then
(1) $\nu_0 = \nu = 50$ Hz
(2) $\nu_0 = \nu = \frac{50}{\pi}$ Hz
(3) $\nu_0 = \frac{50}{\pi}$ Hz, $\nu = 50$ Hz
(4) $\nu = 100$ Hz; $_0 = \frac{100}{\pi}$ Hz

43. Two point charges $-q$ and $+q$ are placed at a distance of L, as shown in the figure.



The magnitude of electric field intensity at a distance $R(R>>L)$ varies as:
(1) $1/R^3$
(2) $1/R^4$
(3) $1/R^6$
(4) $1/R^2$

44. Given below are two statements : One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A): The stretching of a spring is determined by the shear modulus of the material of the spring.
Reason (R): A coil spring of copper has more tensile strength than a steel spring of same dimensions.
In the light of the above statements, choose the **most appropriate** answer from the options given below
(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**
(2) Both **(A)** and **(R)** are true and **(R)** is not the correct explanation of **(A)**
(3) **(A)** is true but **(R)** is false
(4) **(A)** is false but **(R)** is true

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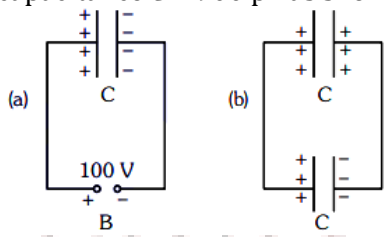
45. A big circular coil of 1000 turns and average radius 10 m is rotating about its horizontal diameter at 2 rad s^{-1}. If the vertical component of earth's magnetic field at that place is 2×10^{-5} T and electrical resistance of the coil is 12.56 Ω, then the maximum induced current in the coil will be
(1) 0.25 A
(2) 1.5 A
(3) 1 A
(4) 2 A

46. The volume occupied by the molecules contained in 4.5 kg water at STP, if the intermolecular forces vanish away is
(1) 5.6×10^{6} m^3
(2) 5.6×10^{3} $m^{(1)}$
(3) 5.6×10^{-3} m^3
(4) 5.6 m^3

47. A capacitor of capacitance C = 900 pF is charged fully by 100 V battery B as shown in figure (a). Then it is disconnected from the battery and connected to another uncharged capacitor of capacitance C = 900 pF as shown in figure (b). The electrostatic energy stored by the system (b) is



(1) 4.5×10^{-6} J
(2) 3.25×10^{-6} J
(3) 2.25×10^{-6} J
(4) 1.5×10^{-6} J

48. A wheatstone bridge is used to determine the value of unknown resistance X by adjusting the variable resistance Y as shown in the figure. For the most precise measurement of X, the resistances P and Q

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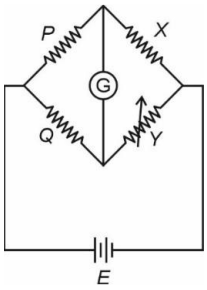

(1) should be approximately equal to 2X
(2) should be approximately equal and are small
(3) should be very large and unequal
(4) do not play any significant role

48(3) Resistance of P&Q should be approx. equal as it decreases error in experiment.

49. Two transparent media *A* and *B* are separated by a plane boundary. The speed of light in those media are 1.5×10^8 m/s and 2.0×10^8 m/s, respectively. The critical angle for a ray of light for these two media is
(1) $\sin^{-1}$ (0.500)
(2) $\sin^{-1}$ (0.750)
(3) $\tan^{-1}$ (0.500)
(4) $\tan^{-1}$ (0.750)

50. A nucleus of mass number 189 splits into two nuclei having mass number 125 and 64. The ratio of radius of two daughter nuclei respectively is
(1) 1 : 1
(2) 4 : 5
(3) 5 : 4
(4) 25 : 16

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Solutions

1(4)

=> Radio wave $\approx 10^2$m
=> Microwave $\approx 10^{-2}$m
=> Infrared radiations $\approx 10^{-4}$m
=> X-ray (i) $= 10^{-10}$ m

2(2)

When a thermodynamic system undergoes a change in such a way that no exchange of heat takes place between it and the surroundings, the process is known as adiabatic process.Graph 4 is isobaric process, 1 is isochoric. Of 2 and 3,2 has the smaller slope (magnitude) hence is isothermal. Remaining process is adiabatic.

3(2)

$\omega=\omega_0+\alpha t$

$\alpha=\frac{\omega-\omega_0}{t}$

$=\frac{(3120-1200)}{16s}$rpm

$=\frac{1920}{16}\times\frac{2\pi}{60}$ rad/s^2

$= 4\pi$rad/s^2

(4)

In (a) & (c) circuits, both the junctions are in same biasing conditions so offers equal resistances. Since both are in series, therefore equal potential will drop across the junction.

5 (3)

$R_1 = R_2 = 20$ cm $= 0.2$

$\mu = \frac{3}{2}$

$P = \frac{1}{f} = (\mu\text{-}1)\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$

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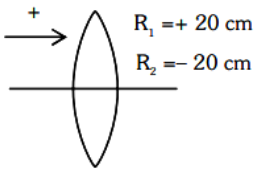

$P = \left(\frac{3}{2} - 1\right)\left(\frac{1}{0.2} + \frac{1}{0.2}\right)$

$= \frac{1}{2}\left(\frac{0.2}{0.2}\right)$

$= \frac{10}{2}$

$= +5D$

6(1)

$\lambda = \frac{h}{P}$

Graph will be hyperbolic

7(3)

For conductors α is (+)ve

For semiconductors & Insulators α is (-)ve

8(2)

Initially speed is zero, then increases & after some time it becomes constant. Acceleration (slope of v/t curve) of ball first decreases and after some time it becomes zero.

9(3)

$[MLT^{-2}A^{-2}]$= Magnetic permeability

10(3)

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In half wave rectification
$f_{in} = f_{out}$
$\Rightarrow f_{out} = 60Hz$

11 (3)
$v = \sqrt{Tension}$
$\frac{v_1}{v_2} = \sqrt{\frac{T_i}{T_f}}$
$\frac{v_1}{v_2} = \sqrt{\frac{T}{2T}}$
$\frac{v_1}{v_2} = \sqrt{\frac{1}{2}} = \frac{1}{\sqrt{2}}$

12(3)
Momentum of the system would remain conserved.

Initial momentum = 0

Final momentum should also be zero.

Let masses be 2m, 2m and m

Momentum along x-direction = $2mv\hat{\imath}$

Momentum along y-direction = $2mv\hat{\jmath}$

Net momentum = $\sqrt{(2mv)^2 + (2mv)^2} = \sqrt{2}.2\ mv$

Now, $2\sqrt{2}mv = mv'$

$v' = 2\sqrt{2}v$

13 (2)

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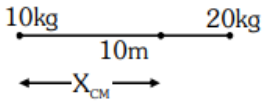


$X_{CM} = \frac{20\times10}{20+10}$ = 20/3 cm

14(1)

$P=P_0+\frac{4T}{R}$

⇒R increases and P decreases

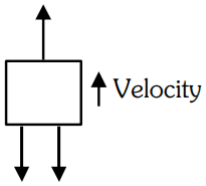
15 (3)

Constant velocity ⇒a=0

⇒T=W+f

=20000+3000

=23000N



⇒ Power =Tv

=23000×1.5

=34500 watts

16 (3)

The angle between Electric field and an equi-potential surface is always 90^0.

This is because,when the potential becomes constant,the negative potential gradient also becomes zero,hence necessitating the need for Electric field to be always normal with surface.

17 (4)

Using Einstein's photoelectric equation we can write,

For the first case,

$hv = \Phi + e\left(\frac{V_s}{2}\right)$ ....(1)

For second case,

$h\frac{v}{2} = \Phi + e(Vs)$ ...(2)

Using value of e(Vs) from equation(2) in equation(1), we can write,

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$hv = \Phi + \frac{1}{2}\left(\frac{hv}{2} - \Phi\right)$

$hv = \Phi + \frac{hv}{4} - \frac{\Phi}{2}$

$\frac{\Phi}{2} = \frac{3hv}{4}$

$\Phi = \frac{3hv}{2}$

As we know, $\Phi = hv_0$

Therefore $V_0 = \frac{3v}{2}$

18 (2)

$B=\mu_0 ni=\mu_0 \frac{N}{l} i$

$\therefore B=4\pi\times10^{-7}\times\frac{100}{10^{-3}}\times1$

$=12.56\times10^{-2}T$

19 (4)

$^{22}_{11}Na \rightarrow X + e^{+} + V$

This is β^{+} - decay

$^{22}_{11}Na \rightarrow {}^{22}_{10}Ne + e^{+} + v$

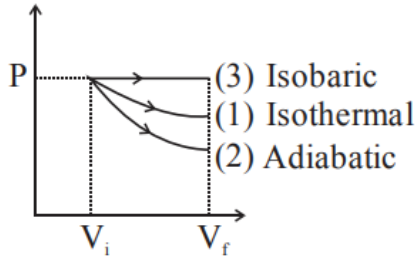
20 (3)

As per Biot Savart law,

$dB = \frac{\mu_0 (Id\vec{l}\times\vec{r})}{4\pi r^3}$

the expression for magnetic field depends on current carrying element $Id\vec{\ell}$, which is a vector quantity, therefore, statement-I is correct and statement-II is wrong.

21 (2)



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$k = \sqrt{\frac{I}{m}}$

$\frac{k_1}{k_2} = \sqrt{\frac{I_1}{I_2}}$

$\sqrt{\frac{mR^2/2}{mR^2/4}} = \sqrt{2} : 1$

22(3) $\sqrt{2}$ times the rms value of the ac source

$e_{RMS} = \frac{e_0}{\sqrt{2}}$

$e_0 = \sqrt{2} e_{RMS}$

23(1)

$E = P \times t$

$= 100 \times 10^3 \times 3600$

$= 36 \times 10^7 J$

24(4)

$y = (n\lambda)(\frac{D}{d})$

$n_1 \lambda_1 = n_2 \lambda_2$

$(8)(600nm) = n_2(400)$

$n_2 = 12$

25(2)

As plane of loop is perpendicular to the direction of magnetic field , therefore direction of area vector will be parallel to magnetic field.

Magnetic flux is given by ,

$\Phi = \vec{B} . \vec{A}$

$= 0.5 (1)^2 \cos 0^0$

$= 0.5$ Wb

26(2)

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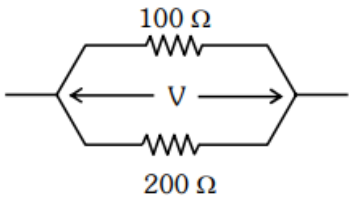

As both resistors are in parallel combination so potential drop (V) across both are same.

$P = \frac{V^2}{R}$

$\Rightarrow P \propto \frac{1}{R}$

$\frac{P_1}{P_2} = \frac{R_1}{R_2} = \frac{200}{100} = \frac{2}{1}$

$= 2 : 1$

27(3)

$S_{nth} = u + \frac{a}{2}(2n-1)$

$= 0 + \frac{a}{2}(2n-1)$

$S_{nth} \propto (2n-1)$

$\Rightarrow S_{1st}, S_{2nd}, S_{3rd}, S_{4th} = [2(1)-1]:[2(2)-1]:[2(3)-1]:[2(4)-1]$

$= 1:3:5:7$

28(2)

Gravitation force, $F_G = E_g \times m$, Where E_g = gravitation at the given point

$E_g = \frac{F_G}{m} = \frac{3}{60 \times 10^{-3}} = 50 \text{ N Kg}^{-1}$

29(3)

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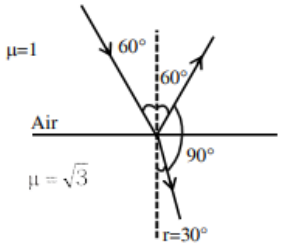

Method (i)
By Snell's law
$1\sin 60^0 = \sqrt{3}\sin r$
$\frac{\sqrt{3}}{2} = \sqrt{3}\sin r$
$\sin r = \frac{1}{2}$
$r = 30^0$

Angle between refracted and reflected ray is 90^0

Method (ii)
Because angle of incidence is Brewster's angle so that angle between reflected and refracted ray is 90^0

$\tan i_p = \mu = \sqrt{3} = 60^0 = i$

30(4)
$n = \sqrt{\epsilon_r u_r}$

$n = \frac{c}{v}$
$v = \frac{c}{n}$
$v = \left(\frac{c}{\sqrt{\epsilon_r u_r}}\right)$

31(2)
Potential at the surface of the spheres will be given by, $V = \frac{kQ}{R}$. As charge on both the spheres is equal, therefore, smaller sphere will have higher potential.

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32(4)

Radius of wire = $\frac{10^{-2}}{\sqrt{\pi}}$

Cross sectional area A= $\pi r^2 = 10^{-4}$ m^2

$j = \frac{i}{A} = \left(\frac{V}{R}\right).\frac{1}{A} = \frac{El}{RA}R = \frac{pl}{A}$

$j = \frac{10\times10}{10\times10^{-4}} = 10^5$ A/m^2

or

$J = \sigma E$

$\frac{E}{P} = \frac{El}{RA} = \frac{10\times10\times\pi}{10\times10^{-4}\times\pi} = 10^5$A/m^2

33(4)

Slope of displacement-time graph is velocity

$\frac{v_1}{v_2} = \frac{\tan(\theta_1)}{\tan(\theta_2)} = \frac{tan(30^0)}{tan(45^0)} = 1:\sqrt{3}$

34(4)

Plane angle and solid angle are dimensionless but have units.

35(4)

First excited state $\Rightarrow$ n = 2

$T_1 = -13.6\frac{z^2}{n^2} = -\frac{13.6}{4}$eV

First excited state

$T_2 = -13.6\frac{z^2}{n^2} = -\frac{13.6}{9}$eV

$T_1 : T_2 = \frac{1}{4} : \frac{1}{9} = 9 : 4$

36(2)

Gravitational constant =[$M^{-1}L^3T^{-2}$]

Gravitational potential energy =[ML^2T^{-2}]

Gravitational potential =[L^2T^{-2}]

Gravitational intensity =[LT^{-2}]

37(3)

Let the two pendulum are in same phase, after n vibrations of

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the longer pendulum. In this time the shorter pendulum will complete (n + 1) vibrations.

$n\times 2\pi\sqrt{\frac{l_2}{g}} = (n+1)2\pi\sqrt{\frac{l_2}{g}}$

$n\times 2\pi\sqrt{\frac{121}{g}} = (n+1)2\pi\sqrt{\frac{100}{9}}$

$11n=10(n+1)$

$n=10$

38(4)

Area = Length × Breadth

$=55.3\times 25$

$=1382.5$

$=14\times 10^2$

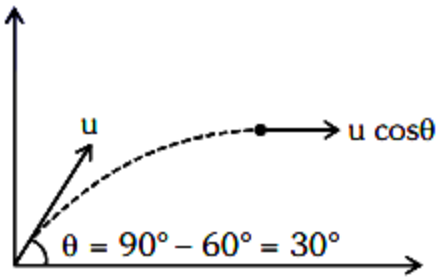
Resultant should have 2 significant figures

39(2)

At highest point only horizontal component of velocity remains

$\Rightarrow ux = u\cos q$

$ux = u\cos q$



$U_x = u\cos\theta = 10\cos 30^0$

$= 5\sqrt{3}\ ms^{-1}$

40(3)

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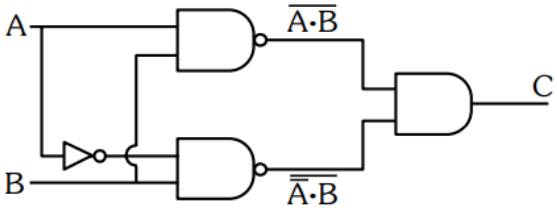
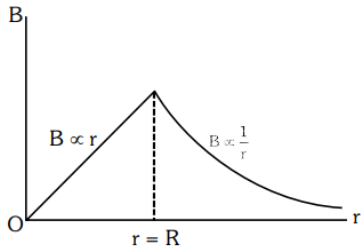


C = $\overline{A \cdot B} \cdot \bar{A} \cdot B$
using De-Morgan Theorem
C= $\overline{A \cdot B + \bar{A} \cdot \bar{B}}$
C= $\overline{B(A + \bar{A})} = \bar{B}$
Therefore

A	B	C
0	0	1
0	1	0
1	0	1
1	1	0

41(4)
Correct answer is (d) a linearly increasing function of distance r upto the boundary of the wire and then decreasing one with 1/r dependence for the outside region.



42(2)
ω=100
v= $\frac{\omega}{2\pi} = \frac{100}{2\pi} = \frac{50}{\pi}$Hz
Resonance frequency
$v_0 = \frac{1}{2\pi\sqrt{C}} = \frac{1}{2\pi}\sqrt{\frac{1}{10\times10\times10^{-6}}}$

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$= \frac{50}{\pi}$ Hz

43(1)
It is electric dipole at large distance electric field intensity
E= $\frac{KP}{R^3}\sqrt{1+3cos^2\theta}$

$\therefore E \propto \frac{1}{R^3}$

44(3)
In stretching of a spring shape charges therefore shear modulus is used. $Y_{copper} < Y_{steel}$

45(3)
$i_{max} = \frac{E_{max}}{R} = \frac{NBAw}{R}$

$i_{max} = \frac{1000\times2\times10^{-5}\times\pi(10^2)\times2}{12.56}$

i_{max} = 1A

46(4)
V= (no. of moles) (22.4 litre)

$= \frac{mass}{molar\ mass}$ (22.4×10^{-3} m^3)

$= \frac{4.5\times10^3}{18}\times22.4\times10^{-3}$ m^3

= 5.6 m^3

47(3)

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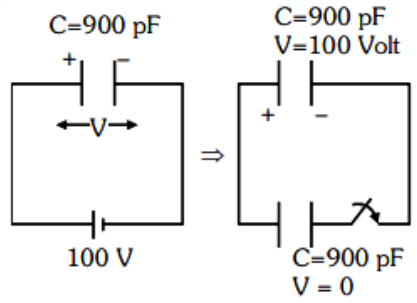

Common potential

$V_c = \frac{C_1V_1+C_2V_2}{C_1+C_1}$

$= \frac{C\times100+C\times0}{C+C}$

= 50 volt

Electrostatic energy stored

$= 2 \times\frac{1}{2}CV^2 = CV^2$

$= 900 \times10^{-12}\times50\times50$

$= 225\times10^{-8}$ J

$= 2.25\times10^{-6}$ J

49(3)

$\mu = C/u$

$u = 1/\mu$

Critical angle

Sini $c = \mu_R / \mu_D = \frac{u_D}{u_R} = 1.5/2 = ¾$

$i_c = \sin^{-1}\left(\frac{3}{4}\right)$

$\sin i_c = \mu_R / \mu_D = \frac{u_D}{u_R}$

$i_c = \sin^{-1}\left(\frac{3}{4}\right)$

50(3)

Nuclear Radius :

$R=R_0(A)^{1/3}$

$\frac{R(165)}{R(64)} = \frac{R_0(165)^{1/3}}{R_0(64)^{1/3}} = 5/4$

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