Learne2i most important questions for NEET 2025

Welcome to this curated collection of questions designed to reflect key concepts and high-priority topics from past NEET examinations. While these samples aim to highlight recurring themes, they are not exact replicas—the NEET ensures originality in every paper.

Subject Insights

- **Biology**: Highest predictive accuracy due to the structured nature of biological concepts and their frequent recurrence.
- **Physics**: Moderate consistency in thematic approaches (e.g., mechanics, electromagnetism).
- **Chemistry**: Least predictable trends, given its diverse topics and experimental formats.

Study Smart

- Master core principles, not just questions.
- Practice varied formats to adapt to new problem structures.
- Use this as a guide, not a substitute for comprehensive preparation.

Disclaimer for Predicted Questions in NEET

The following set of questions has been curated as part of an analytical study aimed at identifying patterns and trends in past NEET examinations. These questions are intended to serve as sample questions or representations of important topics that have historically appeared in the exam. It is crucial to understand that while these questions provide valuable insight into the types of problems that may be encountered, they are not exact replicas nor guaranteed predictions of future examination content. Instead, they are designed to highlight key concepts and areas of focus that students should prioritize during their preparation.

Nature of Predictions and Their Limitations The methodology behind this analysis involves identifying similarities among questions from previous years, focusing on recurring themes, concepts, and problem-solving approaches. However, it is essential to note that:

1. **Questions will not be repeated verbatim**: NEET strictly adheres to a policy of non-repetition in its question papers. The questions provided here are not exact duplicates but are conceptually similar to those seen in past exams. Students should use them as a tool for understanding the underlying principles and problem-solving techniques rather than expecting identical questions in the future.
2. **Focus on conceptual understanding**: The similarity analysis primarily emphasizes thematic connections between questions rather than their specific wording or structure. This means that while certain topics may appear repeatedly in different forms, the way they are presented can vary significantly. To succeed, students must develop a deep understanding of the concepts behind these sample questions.
3. **Subject-specific variability in prediction accuracy**: The effectiveness of these predictions varies across subjects:
    - **Biology**: The predictive accuracy for biology is notably higher due to the structured nature of biological concepts and their frequent recurrence. Students can expect a closer alignment between sample questions and exam trends in this subject.
    - **Physics**: Predictions for physics exhibit moderate accuracy. While many physics problems share common themes (e.g., mechanics, electromagnetism), variations in question framing and numerical details can introduce unpredictability.

- **Chemistry**: Chemistry demonstrates the lowest predictive accuracy due to its diverse range of topics, including organic reactions, inorganic properties, and physical chemistry calculations. The subject's variability makes it challenging to identify consistent patterns across years.

Example of Similar Questions For instance, a past NEET question might ask: "What is the function of the Golgi apparatus in a cell?" A similar question in the guess paper could be: "Describe the role of the Golgi apparatus in protein modification and transport."

Recommendations for Students To maximize the utility of these sample questions, students are advised to adopt the following approach:

- **Study the concepts thoroughly**: Treat each question as a gateway to understanding broader concepts rather than an isolated problem. For example, if a question pertains to integration techniques in mathematics or electrostatics principles in physics, focus on mastering those areas comprehensively.
- **Practice applying concepts in varied scenarios**: Since examiners often reframe similar ideas in different ways, students should practice solving problems across multiple formats and difficulty levels within each topic.
- **Do not rely solely on predictions**: While these sample questions provide valuable guidance, they should not replace a complete study plan or comprehensive syllabus coverage. NEET is designed to test a student's grasp of fundamental principles across all topics in the syllabus.
- **Pay attention to weak areas**: Given the variability in prediction accuracy across subjects, students may need to allocate additional time and effort toward subjects like chemistry where trends are less predictable.

Final Note The sample questions provided here are meant to assist students in identifying high-priority topics and honing their problem-solving skills. However, success in NEET requires more than familiarity with past trends; it demands a robust understanding of core concepts, consistent practice, and adaptability to new challenges. Students are encouraged to use these resources responsibly as part of a balanced preparation strategy that includes textbooks, reference materials, coaching guidance, and mock tests.

By focusing on conceptual clarity and disciplined preparation, students can build the confidence and skills necessary to tackle any variation of questions presented in the examination effectively.

Question 1:
Ionized hydrogen atoms and α-particles with the same momenta enter perpendicular to a constant magnetic field (B). The ratio of the radii of their paths $r_H : r$ will be:
:
(1) 2:1
(2) 1:2
(3) 4:1
(4) 1:4
Answer: (1)
Solution:

$$r_H = \mathrm{p/eB}$$
$$r_\alpha = \mathrm{p/2eB}$$
$$r_H/r_\alpha = (p/eB)/(p/2eB)$$
$$r_H/r_\alpha = 2/1$$

Question 2:
In a double slit experiment, when light of wavelength 400 nm was used, the angular width of the first minima formed on a screen placed 1 m away was found to be 0.2°. What will be the angular width of the first minima, if the entire apparatus is immersed in water?
(1) 0.266°
(2) 0.15°
(3) 0.05°
(4) 0.10°
Solution:
In air: θ_0 = 0.2°
In water: θ_w = θ_0 / μ = 0.2° / (4/3) = 0.15°
Answer: (2)
In air angular fringe width θ_0 = β/D
Angular fringe width in water
θw = β / (μD) = θ_0 / μ
θw = 0.2° / (4/3) = 0.15°

Question 3:
In which of the following devices is the eddy current effect not used?
:
(1) Induction furnace
(2) Magnetic braking in train
(3) Electromagnet
(4) Electric heater
Answer: (4)
Explanation: Electric heaters do not involve eddy currents. It works on Joule's heating effect.

Question 5:
A solid cylinder of mass 2 kg and radius 4 cm rotating about its axis at the rate of 3 rpm. Find the torque required to stop it after 2 revolutions.
(1) $2 \times 10^{(-6)}\mathrm{Nm}$
(2) $2 \times 10^{(-3)}\mathrm{Nm}$
(3) $12 \times 10^{(-4)}\mathrm{Nm}$

(4) $2 \times 10^6 \mathrm{Nm}$
Answer: (1)
Work energy theorem.
W = 1/2 I (ωf^2 - ωi^2)
θ = 2π revolution
θ = 2π × 2π = 4π^2 rad
Wi = 3 × (2π / 60) rad/s
⇒ -τθ = (1/2) × (1/2) m r^2 (0^2 - ωi^2)
⇒ -τ = ((1/2 × 1/2 × 2 × (4 × 10^(-2)) × (-3 × 2π / 60)^2) / (4π^2))
⇒ τ = 2 × 10^(-6) Nm

Question 6:
A force $\mathrm{F} = 20 + 10\mathrm{y}$ acts on a particle in y direction where F is in newton and y in meter. Work done by this force to move the particle from $\mathrm{y} = 0$ to $\mathrm{y} = 1\ \mathrm{m}$ is\\
(1) 30 J
(2) 5 J
(3) 25 J
(4) 20 J
Answer (3)}
Solution: Work done by variable force is

$$\mathrm{W} = \int (y_i)^{(y_f)}\ \mathrm{Fdy}$$

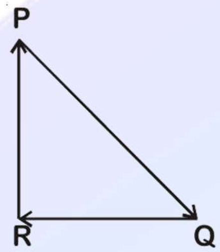
Here, $y_i = 0, y_f = 1\mathrm{m}$

$$\therefore W = \int_0^1 (20 + 10y) dy = [20y + (10y^2)/2]_0^1 = 25\mathrm{J}$$

Question 7:
The speed of a swimmer in still water is $20\ \mathrm{m}/s$. The speed of river water is $10\ \mathrm{m}/s$ and is flowing due east. If he is standing on the south bank and wishes to cross the river along the shortest path the angle at which he should make his strokes w.r.t. north is given by :
(1) 30° west
(2) 0°
(3) 60° west
(4) 45° west
Answer (1)
Solution:

$$V_S\mathrm{R} = 20\mathrm{m/s}$$
$$V_R\mathrm{G} = 10\mathrm{m/s}$$
$$\vec{V}_G\mathrm{S} = \vec{V}_R\mathrm{S} + \vec{V}_R\mathrm{G}$$
$$\sin\theta = |\mathrm{V}\ \vec{}\_\mathrm{GR}|/|\mathrm{V}\ \vec{}\_\mathrm{RS}|$$
$$\sin\theta = 10/20$$
$$\sin\theta = 1/2$$
$$\theta = 30° West$$

Question 8:
A particle moving with velocity $\vec{V}$ is acted by three forces shown by the vector triangle PQR. The velocity of the particle will :



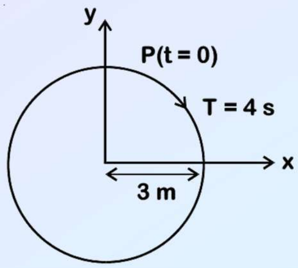
(1) Increase
(2) Decrease
(3) Remain constant
(4) Change according to the smallest force (QR)
Answer (3)
Solution:
As forces are forming closed loop in same order
So, F_net = 0
⇒ m (dv/dt) = 0
⇒ v = constant

Question 9:
Two particles A and B are moving in uniform circular motion in concentric circles of radii r_A and r_B with speed v_A and v_B respectively. Their time period of rotation is the same. The ratio of angular speed of A to that of B will be :
(1) $r_A : r_B$
(2) $v_A : v_B$
(3) $r_B : r_A$
(4) $1 : 1$
Answer (4)
Solution:
TA = TB = T
ωA = 2π / TA
ωB = 2π / TB
ωA / ωB = TB / TA = T / T = 1

Question 10:
A small hole of area of cross-section 2 〖mm〗^2 is present near the bottom of a fully filled open tank of height 2 m . Taking $g = 10 m/s^2$, the rate of flow of water through the open hole would be nearly
(1) 12.6×10^(−6) 〖m〗^3/s
(2) 8.9×10^(−6) 〖m〗^3/s
(3) 2.23×10^(−6) 〖m〗^3/s
(4) 6.4×10^(−6) 〖m〗^3/s
Answer (1)\\
Solution:
Rate of flow liquid

= a u = a √(2gh)
= 2 × 10^(-6) m^2 × √(2 × 10 × 2) m/s
= 2 × 2 × 3.14 × 10^(-6) m^3/s
= 12.56 × 10^(-6) m^3/s
= 12.6 × 10^(-6) m^3/s

Question 11:
The radius of a circle, the period of revolution, initial position, and sense of revolution are given. The projection of the radius vector of the rotating particle is:



(1) $y(t) = -3cos2\pi t$, where y in m
(2) $y(t) = 4sin\left(\frac{\pi t}{2}\right)$, where y in m
(3) $y(t) = 3cos\left(\frac{3\pi t}{2}\right)$, where y in m
(4) $y(t) = 3cos\left(\frac{\pi t}{2}\right)$, where y in m
Answer: (4)

Explanation: At t = 0, displacement is maximum, so the equation is a cosine function.

$$T = 4\ s$$
$$\omega = \frac{2\pi}{T} = \frac{2\pi}{4} = \frac{\pi}{2} rad/s$$
$$y = acos\omega t$$
$$y = 3cos\frac{\pi}{2}t$$

Question 12:
In an experiment, the percentage of error occurred in the measurement of physical quantities A, B, C and D are $1\%, 2\%, 3\%$ and 4% respectively. Then the maximum percentage of error in the measurement X, where $X = \frac{A^2 B^{1/2}}{C^{1/3} D^3}$, will be
(1) $\left(\frac{3}{13}\right)\%$
(2) 16%
(3) -10%
(4) 10%
Answer (2)
Solution:
Given
x = (A^2 B^(1/2)) / (C^(1/3) D^3)

% error, $(\Delta x / x) \times 100 = 2(\Delta A / A) \times 100 + (1/2)(\Delta B / B) \times 100 + (1/3)(\Delta C / C) \times 100 + 3(\Delta D / D) \times 100$
$= 2 \times 1\% + (1/2) \times 2\% + (1/3) \times 3\% + 3 \times 4\%$
$= 2\% + 1\% + 1\% + 12\%$
$= 16\%$

Question 13:
A spherical conductor of radius 10 cm has a charge of $3.2 \times 10^{-7} C$ distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere? $\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 Nm^2/C^2\right)$
(1) $1.28 \times 10^5\ N/C$
(2) $1.28 \times 10^6\ N/C$
(3) $1.28 \times 10^7\ N/C$
(4) $1.28 \times 10^4\ N/C$
Answer (1)
Solution
Electric field outside a conducting sphere
$E = (1 / (4\pi\varepsilon_0)) (Q / r^2)$
$= (9 \times 10^9 \times 3.2 \times 10^{-7}) / (225 \times 10^{-4})$
$= 0.128 \times 10^6$
$= 1.28 \times 10^5$ N/C

Question 14:
A capillary tube of radius r is immersed in water and water rises in it to a height h. The mass of the water in the capillary is 5 g . Another capillary tube of radius $2r$ is immersed in water. The mass of water that will rise in this tube is :
(1) 5.0 g
(2) 10.0 g
(3) 20.0 g
(4) 2.5 g
Answer (2)
Solution: Sol. Force of surface tension balances the weight of water in capillary tube.

$$F_S = 2\pi r T cos\theta = mg$$

Here, T and θ are constant
So, $m \propto r$
Hence, $\frac{m_2}{5.0} = \frac{2r}{r}$

$$\Rightarrow m_2 = 10.0\ g$$

Question 15:
The quantities of heat required to raise the temperature of two solid copper spheres of radii r_1 and $r_2 (r_1 = 1.5 r_2)$ through 1 K are in the ratio :
(1) $\frac{9}{4}$
(2) $\frac{3}{2}$
(3) $\frac{5}{3}$
(4) $\frac{27}{8}$

Answer (4)

Solution: Sol. $\Delta Q = ms\Delta T$

$\Delta Q = (4/3)\pi r^3 \rho s \Delta T$

$\Delta Q_1 / \Delta Q_2 = (r_1 / r_2)^3$

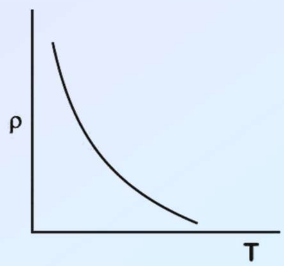
$= (1.5)^3$

$= 27 / 8$

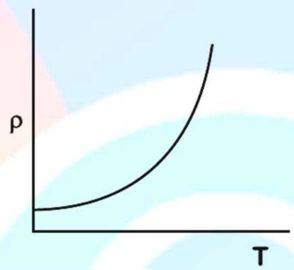
Question 16:

Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper?

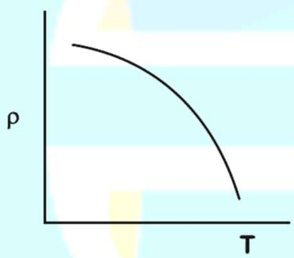
(1)



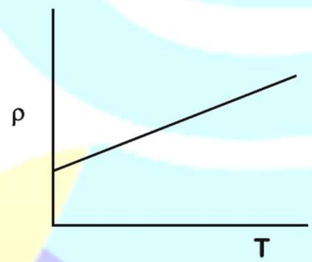
(2)



(3)



(4)



Answer (2)

Solution: Sol. At temperature much lower than $0^\circ C$, graph deviates considerably from a straight line.

Question 17:
The average thermal energy for a mono-atomic gas is: (k_B is Boltzmann constant and T, absolute temperature)
(1) $\frac{3}{2} k_B T$
(2) $\frac{5}{2} k_B T$
(3) $\frac{7}{2} \;_B\; T$
(4) $\frac{1}{2} k_B T$
Answer (1)}
Solution: Sol. For monoatomic gases, degree of freedom is 3 . Hence average thermal energy per molecule is $KE_{avg} = \frac{3}{2} k_B T$

Question 18:
Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled?
(1) four times
(2) one-fourth
(3) zero
(4) doubled
Answer (3)
Solution: Sol. $v = \frac{3}{2} v_0$
v' = v / 2 = (3/4)v_0
∵ v' < v_0
∴ No photoelectric emission will take place.

Question 19:
Taking into account of the significant figures, what is the value of $9.99\ m - 0.0099\ m$
(1) 9.98 m
(2) 9.980 m
(3) 9.9 m
(4) 9.9801 m
Answer (1)
Solution: Sol. $\frac{-0.0099}{9.9801\ m}$
In subtraction, answer should be reported to least number of decimal places, so answer should be 9.98 m .

Question 20:
A particle is released from height S from the surface of the Earth. At a certain height its kinetic energy is three times its potential energy. The height from the surface of earth and the speed of the particle at that instant are respectively
(1) $\frac{S}{4}, \frac{3gS}{2}$
(2) $\frac{S}{4}, \frac{\sqrt{3gS}}{2}$

(3) $\frac{S}{2}, \frac{\sqrt{3gS}}{2}$
(4) $\frac{S}{4}, \sqrt{\frac{3gS}{2}}$
Answer (4)
Solution: Sol. Let required height of body is y.
When body from rest falls through height $(S-y)$
Then under constant acceleration

$$v^2 = 0^2 + 2g(S-y)$$

v = √(2g(S - y)) (1)
When body is at height y above ground. Potential energy of body of mass m
U = mgy
As per given condition kinetic energy, K = 3U
(1/2)m(v)^2 = 3(mgy)
(1/2) × m × 2g(S - y) = 3(mgy) (using (1))
S - y = 3y
∴ y = S / 4 (2)
∴ v = √(2g(S - S/4)) = √(3gS/2) (3)

Question 21:
A particle moving in a circle of radius R with a uniform speed takes a time T to complete one revolution. If this particle were projected with the same speed at an angle ' θ ' to the horizontal, the maximum height attained by it equals $4R$. The angle of projection, θ, is then given by :
(1) $\theta = cos^{-1}\left(\frac{gT^2}{\pi^2 R}\right)^{1/2}$
(2) $\theta = cos^{-1}\left(\frac{\pi^2 R}{gT^2}\right)^{1/2}$
(3) $\theta = sin^{-1}\left(\frac{\pi^2 R}{gT^2}\right)^{1/2}$
(4) $\theta = sin^{-1}\left(\frac{2gT^2}{\pi^2 R}\right)^{1/2}$
Answer (4)}
Solution: Sol. To complete a circular path of radius R, time period is T.
so speed of particle $(U) = \frac{2\pi R}{T}$
Now the particle is projected with same speed at angle θ to horizontal.
So Maximum Height $(H) = \frac{U^2 sin^2\theta}{2g}$
Given that: $H = 4R$

$$\Rightarrow \frac{U^2 sin^2\theta}{2g} = 4R$$

⇒ sin^{2}θ = (8gR) / U^2 (2)
$\Rightarrow sin^2\theta = \frac{8gRT^2}{4\pi^2 R^2} = \frac{2gT^2}{\pi^2 R}$ (using equation 1)

$$\Rightarrow \theta = sin^{-1}\left(\frac{2gT^2}{\pi^2 R}\right)^{1/2}$$

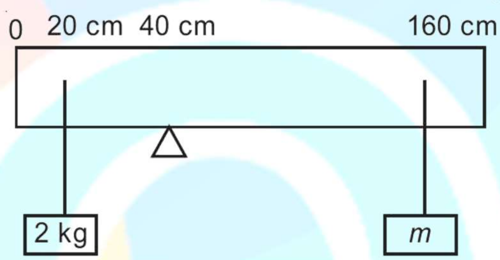
Question 22:
A uniform conducting wire of length $12a$ and resistance ' R ' is wound up as a current carrying coil in the shape of,

(i) an equilateral triangle of side 'a'.
(ii) a square of side ' a '.
The magnetic dipole moments of the coil in each case respectively are
(1) $\sqrt{3}/a^2$ and $3\ la^2$
(2) $3la^2$ and la^2
(3) $3la^2$ and $4la^2$
(4) $4la^2$ and $3la^2$
Answer (1)
Solution: Sol. Current in the loop will be $\frac{V}{R} = I$ which is same for both loops.
Now magnetic moment of Triangle loop = NIA
$M_1 = (12a / 3a) \cdot \mu \cdot (\sqrt{3} / 4)\ a^2 = \sqrt{3} / a^2$
and magnetic moment of square loop $= N'IA'$

$$= \left(\frac{12a}{4a}\right) \cdot 1 \cdot a^2$$
$$M_2 = 3/a^2$$

Question 23:
A uniform rod of length 200 cm and mass 500 g is balanced on a wedge placed at 40 cm mark. A mass of 2 kg is suspended from the rod at 20 cm and another unknown mass ' m ' is suspended from the rod at 160 cm mark as shown in the figure. Find the value of ' m ' such that the rod is in equilibrium.

$$(g = 10\ m/s^2)$$



(1) $\frac{1}{2}\ kg$
(2) $\frac{1}{3}\ kg$
(3) $\frac{1}{6}\ kg$
(4) $\frac{1}{12}\ kg$
Answer (4)}
Solution: Sol. Given that
Mass of rod $= 500\ g$; Length of $rod = 200\ cm$
Rod will be in equilibrium, when net torque about point O will be zero.
Torque at point O due to 2 kg mass

$$\vec{\tau} = \vec{r} \times \vec{F} = rF\sin\theta(\hat{n})$$
$$\tau_1 = 20 \times 20 \times 10^{-2} \times \sin 90^\circ(\hat{k}) = 4\ N\ m(\hat{k})$$

Torque due to mass of rod :

$$\tau_2 = 5 \times 60 \times 10^{-2} \times \sin 90^\circ(-\hat{k}) = 3Nm(-\hat{k})$$

Torque due to mass m

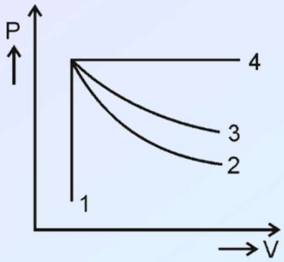
$$\tau_3 = mg \times 120 \times 10^{-2} \times \sin 90^\circ(-\hat{k}) = 12\ m\ N\ m(-\hat{k})$$

Net torque about point O will be zero

So $\vec{\tau_1} + \vec{\tau_2} + \vec{\tau_3} = 0$

$$\Rightarrow 4 - 3 - 12m = 0$$
$$\Rightarrow 12m = 1$$
$$m = \frac{1}{12}\ kg$$

Question 24:
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
Answer (2)
Solution: Sol. $\left(\frac{dP}{dV}\right)_{adiabatic} = -\gamma P$
(dP/dV) isothermal = -P
(dP/dV) adiabatic > (dP/dV) isothermal

Question 26:
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
Answer (3)
Solution: Sol. In half wave rectifier, the output frequency is same as that of input frequency.

Question 27:
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) $1:2$
Answer (3)
Solution: Sol. We know, velocity of transverse wave
v = √(T / μ)
∴ vi = √(T / μ) and vf = √(2T / μ)
∴ vi / vf = 1 / √2

Question 28:
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) $6.28 \times 10^{-2}\ T$
(2) $12.56 \times 10^{-2}\ T$
(3) $12.56 \times 10^{-4}\ T$
(4) $6.28 \times 10^{-4}\ T$
Answer (2)}

Question 29:
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 given below
(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
Answer (3)
Solution: Sol. According to Biot-Savart's law $d\vec{B} = \frac{\mu_0}{4\pi}\frac{I d\vec{l} \times \vec{r}}{r^3}$ which is applicable for infinitesimal element. It is analogous to Coulomb's law, where $I d\vec{l}$ is vector source and electric field is produced by scalar source q.
Here statement I is correct and statement II is incorrect.

Question 30:
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
Answer (4)

Question 31
A square loop of side 1 m and resistance is placed in a magnetic field of 0.5 T. If the plane of the loop is perpendicular to the direction of the magnetic field, the magnetic flux through the loop is:
(1) 2 weber
(2) 0.5 weber
(3) 1 weber
(4) Zero weber
Explanation:
$\phi_B = B \times A = 0.5 \times 1^2 = 0.5$ Wb
Correct Answer: (2)

Question 32
Two resistors of resistance R_1 and R_2 are connected in parallel in an electrical circuit. The ratio of the thermal energy developed in R_1 to that in R_2 in a given time is:
(1) 1:1
(2) 2:1
(3) 1:2
(4) 4:1
Explanation:
$P = V^2 / R$
$P_1 / P_2 = R_2 / R_1 = 200 / 100 = 2:1$
Correct Answer: (2)

Question 32:
Two resistors of resistance, 100Ω and 200Ω are connected in parallel in an electrical circuit. The ratio of the thermal energy developed in 100Ω to that in 200Ω in a given time is
(1) $1:2$
(2) $2:1$
(3) $1:4$
(4) $4:1$
Answer (2)}

Question 33: The ratio of the distances travelled by a freely falling body in the $1^{st}, 2^{nd}, 3^{rd}$ and 4^{th} second
(1) $1:2:3:4$
(2) $1:4:9:16$
(3) $1:3:5:7$
(4) $1:1:1:1$
Answer (3)

Question 34
A light ray falls on a glass surface of refractive index μ at an angle i. The angle between the refracted and reflected rays would be:
:
(1) 30°
(2) 60°
(3) 90°
(4) 45°
Correct Answer: (3)

Question 35
When light propagates through a material medium of relative permittivity ε_r and relative permeability μ_r, the velocity of light, v is given by (c-velocity of light in vacuum)
(1) $v = c$
(2) $v = \sqrt{\frac{\mu_r}{\varepsilon_r}}$
(3) $v = \sqrt{\frac{\varepsilon_r}{\mu_r}}$

(4) $v=\frac{c}{\sqrt{\varepsilon_r\mu_r}}$
Answer (4)}

Question 36:

A copper wire of length 10 m and radius $\left(\frac{10^{-2}}{\sqrt{\pi}}\right)m$ has electrical resistance of 10Ω. 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) $10^5\ A/m^2$
Answer (4)
Solution: Sol. Resistance, $R=\rho\frac{L}{A}=\frac{L}{\sigma A}$
$\Rightarrow \sigma = L / (RA)$
Also current density $j = \sigma E = LE / (RA)$
$j = (10 \times 10) / (10 \times \pi(10^{-2} / \sqrt{\pi})^2) = 100 / (10 \times \pi(10^{-4} / \pi)) = 10^5\ A/m^2$

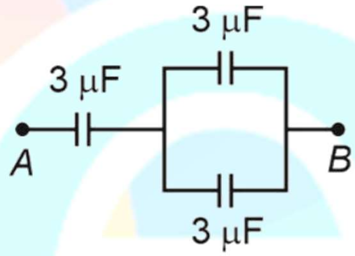
Question 38:
From Ampere's circuital law for a long straight wire of circular cross-section carrying a steady current, the variation of magnetic field in the inside and outside region of the wire is
(1) Uniform and remains constant for both the regions.
(2) A linearly increasing function of distance 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.
Answer (3)
Corect Answer:- 2
Solution: Sol. For solid wire
Inside point
$B = (\mu_0 / r^2) / (R^2 \times 2\pi r)$
$= \mu_0 / (rR^2 \times 2\pi)$
$B \propto r$
Outside point
$B = \mu_0 I / (2\pi r)$
$B \propto 1/r$

Question 39:
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
Answer (3)}
Solution: Sol. It is true that stretching of spring is determined by shear modulus of the spring as when coil spring is stretched neither its length nor its volume changes, there is only change in its shape.
Tensile strength of steel is more than that of copper.
Hence Assertion is true and reason is false.

Question 40:
The volume occupied by the molecules contained in 4.5 kg water at STP, if the intermolecular forces vanish away is (1) $5.6 \times 10^6\ m^3$ (2) $5.6 \times 10^3\ m^3$ (3) $5.6 \times 10^{-3}\ m^3$ (4) $5.6\ m^3$
Answer (4)
(1) $4.5 \times 10^{-6}\ J$
(2) $3.25 \times 10^{-6}\ J$
(3) $2.25 \times 10^{-6}\ J$
(4) $1.5 \times 10^{-6}\ J$
Answer (3)

Question 41:
The equivalent capacitance of the system shown in the following circuit is



(1) $2\mu\ F$
(2) $3\mu\ F$
(3) $6\mu\ F$
(4) $9\mu\ F$
Answer (1)

Question 42:
A full wave rectifier circuit consists of two p-n junction diodes, a centre-tapped transformer, capacitor and a load resistance. Which of these components remove the ac ripple from the rectified output?
(1) A centre-tapped transformer
(2) p-n junction diodes
(3) Capacitor
(4) Load resistance
Answer (3)

Question 43:

An ac source is connected to a capacitor C. Due to decrease in its operating frequency
(1) Capacitive reactance decreases
(2) Displacement current increases
(3) Displacement current decreases
(4) Capacitive reactance remains constant
Answer (3)

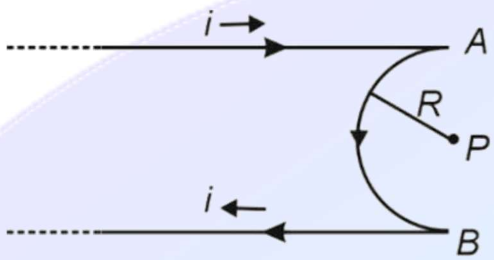
Question 44:
A bullet is fired from a gun at the speed of $280\ m\ s^{-1}$ in the direction 30° above the horizontal. The maximum height attained by the bullet is $(g = 9.8\ m\ s^{-2}, sin30^{\circ} = 0.5)$
(1) 2800 m
(2) 2000 m
(3) 1000 m
(4) 3000 m
Answer (3)

Question 45:
A horizontal bridge is built across a river. A student standing on the bridge throws a small ball vertically upwards with a velocity $4\ m\ s^{-1}$. The ball strikes the water surface after 4 s . The height of bridge above water surface is (Take $g = 10\ m\ s^{-2}$)
(1) 56 m
(2) 60 m
(3) 64 m
(4) 68 m
Answer (3)}

Question 46:
A wire carrying a current I along the positive x-axis has length L. It is kept in a magnetic field $\vec{B} = (2\hat{\imath} + 3\hat{\jmath} - 4\hat{k})T$. The magnitude of the magnetic force acting on the wire is
(1) $3/L$
(2) $\sqrt{5}/L$
(3) $5/L$
(4) $\sqrt{3}/L$
Answer (3)

Question 47:
A satellite is orbiting just above the surface of the earth with period T. If d is the density of the earth and G is the universal constant of gravitation, the quantity $\frac{3\pi}{Gd}$ represents
(1) T
(2) T^2
(3) T^3
(4) $\sqrt{T}$
Answer (2)}

Question 48:
A very long conducting wire is bent in a semi-circular shape from A to B as shown in figure. The magnetic field at point P for steady current configuration is given by



(1) $\frac{\mu_0 i}{4R}$ pointed into the page
(2) $\frac{\mu_0 i}{4R}$ pointed away from the page
(3) $\frac{\mu_0 i}{4R}\left[1-\frac{2}{\pi}\right]$ pointed away from page
(4) $\frac{\mu_0 i}{4R}\left[1-\frac{2}{\pi}\right]$ pointed into the page
Answer (3)

Question 49:

If $x = 5sin\left(\pi t + \frac{\pi}{3}\right) m$ represents the motion of a particle executing simple harmonic motion, the amplitude and time period of motion, respectively, are
(1) 5 $cm, 2\ s$
(2) 5 $m, 2\ s$
(3) 5 $cm, 1\ s$
(4) 5 $m, 1\ s$
Answer (2)

Solution: Sol. $x = 5sin\left(\pi t + \frac{\pi}{3}\right) m$

Amplitude $= 5\ m$

$$\omega = \pi = \frac{2\pi}{T}$$

$$T = \frac{2\pi}{\pi} = 2\ s$$

Question 50:

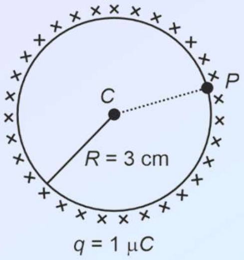
If c is the velocity of light in free space, the correct statements about photon among the following are:
A. The energy of a photon is $E = h\nu$.
B. The velocity of a photon is c.
C. The momentum of a photon, $p = \frac{h\nu}{c}$.
D. In a photon-electron collision, both total energy and total momentum are conserved.
E. Photon possesses positive charge.
Choose the correct answer from the options given below:
(1) A and B only
(2) A, B, C and D only
(3) A, C and D only
(4) A, B, D and E only
Answer (2)

Solution:

(1) If c is the velocity of light so, $E = h\nu$ (Energy of photon)

(2) Velocity of photon is equal to velocity of light i.e. c.
(3) λ = h / p; p = h / λ; p = hv / c
(4) In photon-electron collision both total energy and total momentum are conserved.

Question 51:
A thin spherical shell is charged by some source. The potential difference between the two points C and P (in V) shown in the figure is:
(Take $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 SI$ units)



(1) 3×10^5
(2) 1×10^5
(3) 0.5×10^5
(4) Zero
Answer (4)
Solution: For uniformly charged spherical shell,

$$V = \frac{kq}{R}(For r \leq R) \therefore V_C = V_P V_C - V_P = Zero$$

Question 52:
13 Copper of fixed volume ' V ' is drawn into wire of length ' l '. When this wire is subjected to a constant force ' F ', the extension produced in the wire is ' Δl '. Which of the following graphs is a straight line?
(1) Δl versus $1/l$
(2) Δl versus l^2
(3) Δl versus $1/l^2$
(4) Δl versus l
Ans. [2]
Solution: $Y = \frac{stress}{strain} = \frac{F/A}{\frac{\Delta\ell}{\ell}} = \frac{F\ell}{\Delta\ell A}$

$$\Delta\ell = \left(\frac{F}{YA}\right)\ell$$

Here F = constant ; Y = constant
$V = A\ell$ = constant

$$A \propto \frac{1}{\ell}$$
$$\Delta\ell \propto \frac{A}{\ell} \propto \ell^2$$
$$\Delta\ell \propto \ell^2$$

Graph between $\Delta\ell$ and ℓ^2 is straight line.

Question 53:

26 Two cities are 150 km apart. Electric power is sent from one city to another city through copper wires. The fall of potential per km is 8 volt and the average resistance per km is 0.5Ω. The power loss in the wire is :

(1) 19.2 W

(2) 19.2 kW

(3) 19.2 J

(4) 12.2 kW

Ans. [2]

Solution:

V = 6x - 8xy - 8y + 6yz

$E = -\partial V/\partial x\ \hat{i} - \partial V/\partial y\ \hat{j} - \partial V/\partial z\ \hat{k}$

$\partial V/\partial x = \partial(6x - 8xy - 8y + 6yz)/\partial x$

$= (6 - 8y - 0 + 0)_{(1,1,1)} = -2$

$\partial V/\partial y = \partial(6x - 8xy - 8y + 6yz)/\partial y$

$= (0 - 8x - 8 + 6z)_{(1,1,1)} = -10$

$\partial V/\partial z = \partial(6x - 8xy - 8y + 6yz)/\partial z$

Total voltage drop across wire = 150 × 8 = 1200 volt

Total resistance of wire = 150 × 0.5 = 75 Ω

Therefore current through wire

I = V/R = 1200/75 = 16 Ampere

Therefore Power loss = I^2R

$= (16)^2 \times 75 = 19200$ W = 19.2 kW

Question 54:

28 A potentiometer circuit has been set up for finding the internal resistance of a given cell. The main battery, used across the potentiometer wire, has an emf of 2.0 V and a negligible internal resistance. The potentiometer wire itself is 4 m long. When the resistance, R , connected across the given cell, has values of.

(i) infinity

(ii) 9.5Ω

the 'balancing lengths', on the potentiometer wire are found to be 3 m and 2.85 m , respectively. The value of internal resistance of the cell is

(1) 0.25Ω

(2) 0.95Ω

(3) 0.5Ω

(4) 0.75Ω

Ans. [3]

Internal resistance of cell

$$r = \left(\frac{\ell_1 - \ell_2}{\ell_2}\right)(R)$$

= ((3 - 2.85) / 2.85)(9.5)

= 0.5 Ω

Question 55:

30 In an ammeter 0.2% of main current passes through the galvanometer. If resistance of galvanometer is G, the resistance of ammeter will be :

(1) $\frac{1}{499}G$
(2) $\frac{499}{500}G$
(3) $\frac{1}{500}$ G
(4) $\frac{500}{499}G$
Ans. [3]
Solution:
In parallel

$$I \propto \frac{1}{R}$$

G/S = 99.8 / 0.2 ⇒ S = G / 499
Therefore R(A) = S || Rg
= G / 500

Question 56:
43 A radio isotope ' X ' with a half life 1.4×10^9 years decays to ' Y ' which is stable. A sample of the rock from a cave was found to contain ' X ' and ' Y ' in the ratio 1:7. The age of the rock is
(1) 1.96×10^9 years
(2) 3.92×10^9 years
(3) 4.20×10^9 years
(4) 8.40×10^9 years
Ans. [3]
Solution: $X : Y = 1:7$

$$\uparrow\uparrow$$

Active stable
Active part of sample A.P. $= \frac{X}{X+Y} = \frac{1}{8}$
$A.P = \frac{1}{8} = \frac{1}{2^n}$
$n = 3$
$t = nT_{1/2} = 3 \times 1.4 \times 10^9$
$= 4.2 \times 10^9$ year

Question 57:
2 A ship A is moving Westwards with a speed of $10\ km\ h^{-1}$ and a ship B 100 km South of A, is moving Northwards with a speed of $10\ km\ h^{-1}$. The time after which the distance between them becomes shortest, is:
(1) 0 h
(2) 5 h
(3) $5\sqrt{2}h$
(4) $10\sqrt{2}\ h$

Question 58:
3 A particle of unit mass undergoes one-dimensional motion such that its velocity varies according to $v(x) = ßx^{-2n}$ where ß and n are constants and x is the position of the particle. The acceleration of the particle as a function of x , is given by:
(1) $-2nß^2x^{-2n-1}$
(2) $-2nß^2x^{-4n-1}$

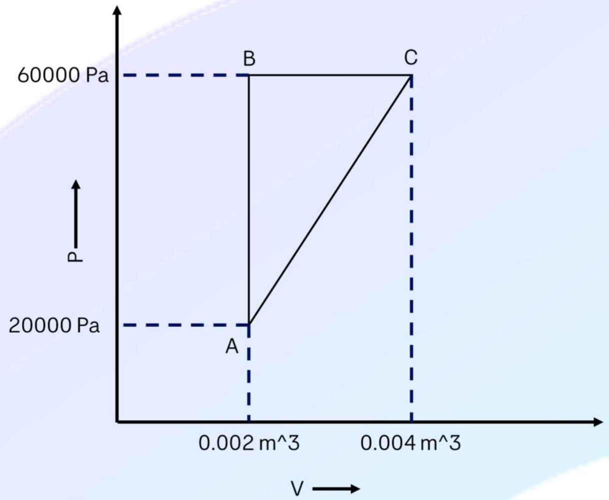
(3) $-2\beta^2 x^{-2n+1}$
(4) $-2n ß^2 e^{-4n+1}$

Question 59:
5 A block A of mass m_1 rests on a horizontal table. A light string connected to it passes over a frictionless pulley at the edge of table and from its other end another block B of mass m_2 is suspended. The coefficient of kinetic friction between the block and the table μk. When the block A is sliding on the table, the tension in the string is:
(1) $\frac{(m_2+\mu_k m_1)g}{(m_1+m_2)}$
(2) $\frac{(m_2-\mu_k m_1)g}{(m_1+m_2)}$
(3) $\frac{m_1 m_2(1+\mu_k)g}{(m_1+m_2)}$
(4) $\frac{m_1 m_2(1-\mu_k)g}{(m_1+m_2)}$

Question 60:
13 Kelper's third law states that square of period of revolution (T) of a planet around the sun, is proportional to third power of average distance r between sun and planet
i.e. $T^2 = Kr^3$
here K is constant.
If the masses of sun and planet are M and m respectively then as per Newton's law of gravitation force of attraction between them is
$F = \frac{GMm}{r^2}$, here G is gravitational constant
The relation between G and K is described as:
(1) $GK = 4\pi^2$
(2) $GMK = 4\pi^2$
(3) $K = G$
(4) $K = \frac{1}{G}$

Question 61:
The two ends of a metal rod are maintained at temperature $100^\circ C$. The rate of heat flow in the rod is found to be $4.0\ J/s$. If the ends are maintained at temperature $200^\circ C$ and $210^\circ C$, the reate of heat flow will be:
(1) $44.0\ J/s$
(2) $16.8\ J/s$
(3) $8.0\ J/s$
(4) $4.0\ J/s$

Question 62:
Figure below show two paths that may be taken a gas to go from a state A to a state C .
In process AB, $400\ J$ of heat is added to the system and in process BC, $100\ J$ of heat is added to the system. The heat absorbed by the system in the process AC will be:



(1) 380 J
(2) 500 J
(3) 460 J
(4) 300 J

Question 63:
A carnot engine, having an efficiency of $\eta = \frac{1}{10}$ as heat engine, is used as a refrigerator. If the work done on the system is 10 J , the amount of energy absorbed from the reservoir at lower temperature is:
(1) 100 J
(2) 99J
(3) 90 J
(4) 1 J

Question 64:
A particle is executing SHM along a straight line. Its velocities at distances x_1 and x_2 from the mean position V_1 and V_2, respectively. Its time period is:
(1) $2\pi\sqrt{\frac{x_1^2+x_2^2}{V_1^2+V_2^2}}$
(2) $2\pi\sqrt{\frac{x_2^2-x_1^2}{V_1^2-V_2^2}}$
(3) $2\pi\sqrt{\frac{V_1^2+V_2^2}{x_1^2+x_2^2}}$
(4) $2\pi\sqrt{\frac{V_1^2-V_2^2}{x_1^2-x_2^2}}$

Question 65:
The fundamental frequency of a closed organ pipe of length 20 cm equal to the second overtone of an organ pipe open at both the ends. The length of organ pipe open at both the ends is:
(1) 80 cm
(2) 100 cm
(3) 120 cm
(4) 140 cm

Question 66:
A parallel plate air capacitor of capacitance C is connected to a cell of emf V and then disconnected from it. A dielectric slab of dielectric constant K, which can just fill the air gap of the capacitor, is now inserted in it. Which of the following is incorrect?
(1) The potential difference between the plates decreases K times.
(2) The energy stored in the capacitor decreases K times.
(3) The change in energy stored is $\frac{1}{2}CV^2\left(\frac{1}{K}-1\right)$.
(4) The charge on the capacitor is not conserved.

Question 67:
A resistance ' R ' draws power ' P ' when connected to an AC source. If an inductance is now planced in series with the resistance, such that the impedance of the circuit becomes ' Z ', the power drawn will be:
(1) $P\left(\frac{R}{Z}\right)^2$
(2) $P\sqrt{\frac{R}{z}}$
(3) $P\left(\frac{R}{z}\right)$
(4) P

Question 68:
A black body is at a temperature of 5760 K . The energy of radiation emitted by the body at wavelength 250 nm is U_1, at wavelength 500 nm is U_2 and that at 1000 nm is $U3$. Wien's constant, $b = 2.88 \times 10 \quad ^6 nmK$. Which of the following is correct?
(1) $U_1 = 0$
(2) $U_3 = 0$
(3) $U_1 > U_2$
(4) $U_2 > U_1$
Ans. 4
Solution: Maximum amount of emitted radiation corresponding to $\lambda_m = \frac{b}{T}$
λ_m = (2.88 × 10^6 nmK) / 5760 K = 500 nm
From the graph $U_1 < U_2 > U_3$

Question 69:
A npn transistor is connected in common emitter configuration in a given amplifier. A load resistance of 800Ω is connected in the collector circuit and the voltage drop across it is 0.8 V . If the current amplification factor is 0.96 and the input resistance of the circuit is 192Ω, the voltage gain and the power gain of the amplifier will respectively be :
(1) 4, 3.84
(2) 3.69,3.84
(3) 4,4
(4) 4,3.69
Ans. 1
Solution: Given $\alpha = 0.96$
so, $\beta = \frac{\alpha}{1-\alpha} = \frac{0.96}{0.04} \Rightarrow \beta = 24$

Voltage gain for common emitter configuration

$$A_v = \beta \cdot \frac{R_L}{R_i} = 24 \times \frac{800}{192} = 100$$

Power gain for common emitter configuration

$$P_v = \beta A_v = 24 \times 100 = 2400$$

Voltage gain for common base configuration

$$A_v = \alpha \cdot \frac{R_L}{R_P} = 0.96 \times \frac{800}{192} = 4$$

Power gain for common base configuration

$$P_v = A_v \alpha = 4 \times 0.96 = 3.84$$

Question 70:

A uniform circular disc of radius 50 cm at rest is free to turn about an axis which is perpendicular to its plane and passes through its centre. It is subjected to a torque which produces a constant angular acceleration of $2.0 rads^{-2}$. Its net acceleration in ms^{-2} at the end of 2.0 s is approximately :

(1) 8.0

(2) 7.0

(3) 6.0

(4) 3.0

Ans. 1

Solution: Particle at periphery will have both radial and tangential acceleration

$$a_t = R\alpha = 0.5 \times 2 = 1\, m/s2$$

$$\omega = \omega_0 + \alpha t$$

$$\omega = 0 + 2 \times 2 = 4 rad/sec$$

$$a_c = \omega^2 R = (4)^2 \times 0.5 = 16 \times 0.5 = 8\, m/s$$

$$a_{total} = \sqrt{a_p^2 + a_c^2} = \sqrt{1^2 + 8^2} \approx 8\, m/s^2$$

Question 71:

The molecules of a given mass of a gas have r.m.s. velocity of 200 ms^{-1} at 27°C and 1.0×10^5 Nm^{-2} pressure. When the temperature and pressure of the gas are respectively, 127°C and 0.05×10^5 Nm^{-2}, the r.m.s. velocity of its molecules in ms^{-1} is:

(1) $100\sqrt{2}$

(2) $400/\sqrt{3}$

(3) $(100\sqrt{2})/3$

(4) $100/3$

Ans. 2

Solution:

$v \propto \sqrt{T} \Rightarrow v/200 = \sqrt{(400/300)} \Rightarrow v = (200\times2)/\sqrt{3} = 400/\sqrt{3}$ m/s

Question 72:

A long straight wire of radius a carries a steady current I. The current is uniformly distributed over its cross-section. The ratio of the magnetic fields B and B' at radial distances a/2 and 2a respectively, from the axis of the wire is:

(1) 1/4
(2) 1/2
(3) 1
(4) 4
Ans. 3

Solution:
For points inside the wire:
$B = (\mu_0 Ir) / (2\pi R^2)$ for $r \leq R$
For points outside the wire:
$B = (\mu_0 I) / (2\pi r)$ for $r \geq R$
So,
$B / B' = [(\mu_0 I(a/2)) / (2\pi a^2)] / [(\mu_0 I) / (2\pi(2a))] = 1:1$

Question 73:
The ratio of escape velocity at earth (v_e) to the escape velocity at a planet (v_p) whose radius and mean density are twice as that of earth is:

(1) 1:2
(2) 1:2√2
(3) 1:4
(4) 1:√2
Ans. 2

Solution:
$v_e = \sqrt{(2GM/R)} = \sqrt{(2G * (4/3)\pi R^3 \rho / R)} \propto R\sqrt{\rho}$
Ratio = 1:2√2

Question 74:
An inductor 20 mH, a capacitor 50 μF and a resistor 40 Ω are connected in series across a source of emf V = 10 sin(340t). The power loss in the A.C. circuit is:

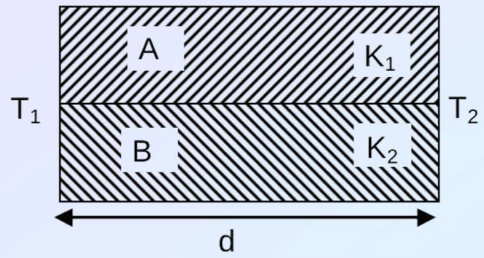
(1) 0.51 W
(2) 0.67 W
(3) 0.76 W
(4) 0.89 W
Ans. 1

Question 75:
The acceleration due to gravity at a height 1 km above the earth is the same as at a depth d below the surface of earth. Then:

(1) d = 0.5 km
(2) d = 1 km
(3) d = 1.5 km
(4) d = 2 km

Ans. (4)

Question 76:
Two rods A and B of different materials are welded together. Their thermal conductivities are K_1 and K_2. The thermal conductivity of the composite rod will be:



(1) $(K_1 + K_2)/2$
(2) $3(K_1 + K_2)/2$
(3) $K_1 + K_2$
(4) $2(K_1 + K_2)$
Ans. (1)

Question 77:
The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is:

(1) 2
(2) 1
(3) 4
(4) 0.5
Ans. (3)

Question 78:
A thin prism having refracting angle 10° is made of glass of refractive index 1.42. This prism is combined with another thin prism of glass of refractive index 1.7. This combination produces dispersion without deviation. The refracting angle of second prism should be:

(1) 4°
(2) 6°
(3) 8°
(4) 10°
Ans. (2)

Question 79:
A beam of light from a source L is incident normally on a plane mirror fixed at a certain distance x from the source. The beam is reflected back as a spot on a scale placed just above the source. When the mirror is rotated through a small angle θ, the spot of light is found to move through a distance y on the scale. The angle θ is given by:

(1) y / 2x

(2) y / x
(3) x / 2y
(4) x / y
Ans. (1)

Question 80:
The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is:

(1) 2
(2) 1
(3) 4
(4) 0.5
Ans. (3)