PhysicsByAaryan

CSIR NET · GATE · JEST · BARC – Physics

GATE Physics 2026 — Full Question Paper

Previous Year Questions with Official Answer Key

Inside this PDF

- Every GATE Physics (PH) 2026 question, in order
- Marking scheme + question type (MCQ/MSQ/NAT) on every question
- Subject & topic classification per question
- Official answer key at the end

65 Questions with answer key

Questions taken from official GATE Physics (PH) papers conducted by IITs / IISc.
Compiled by PhysicsByAaryan for free use by aspirants. Answer key at the end of this PDF.

Q1. [Marks: 1 | MCQ] General Aptitude · English

Gate 2026	MCQ	1M

He often ___ the numbers. False claims are not going to help. Honesty ___ trust", said the manager.

Choose the option with the correct order of words to fill the blanks.

(A) exaggerates; engenders

(B) excels; encourages

(C) aggravates; alleviates

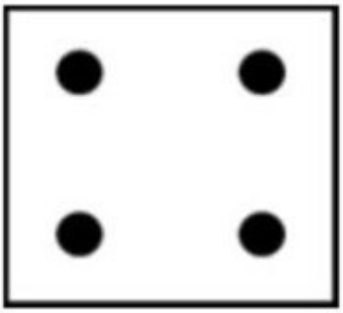
(D) diminishes; eliminates

Q2. [Marks: 1 | MCQ] General Aptitude · Reasoning

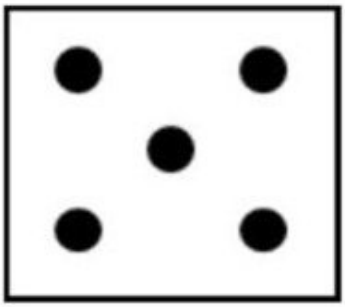
Gate 2026	MCQ	1M

In the sequence of tiles shown below, the missing tile indicated by the question mark should be

(A)



(B)



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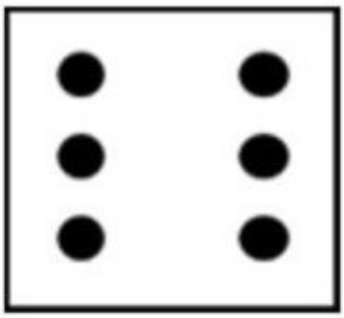

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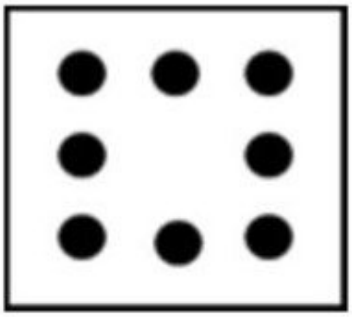


Q3. [Marks: 1 | MCQ] General Aptitude · Reasoning

Gate 2026	MCQ	1M

A school has 100 students distributed among 1^{st} to 10^{th} standards.

Based on this, which one of the following statements is always correct?

(A) There are at least 10 students who belong to the same standard.

(B) There is at least one student in each standard.

(C) There are at most 10 students in 10^{th} standard.

(D) The total number of students from 1^{st} to 5^{th} standards is at least 50.

Q4. [Marks: 1 | MCQ] General Aptitude · Mathematical Analysis

Gate 2026	MCQ	1M

How many 3-digit numbers can be formed using three distinct single digit prime numbers?

(A) 64

(B) 24

(C) 12

(D) 4

Q5. [Marks: 1 | MCQ] General Aptitude · Mathematical Analysis

Gate 2026	MCQ	1M

In a group of students, 10 students like Mathematics, 12 students like English, 4 students like both Mathematics and English, and 6 students like neither Mathematics nor English. The number of students in the group is ___

(A) 18

(B) 20

(C) 24

(D) 32

Q6. [Marks: 2 | MCQ] General Aptitude · English

Gate 2026	MCQ	2M

Charity : P :: Retaliation : Q

Choose the appropriate pair of words P and Q that fit the analogy.

(A) P = Parsimonious; Q = Vengeful

(B) P = Altruistic; Q = Amicable

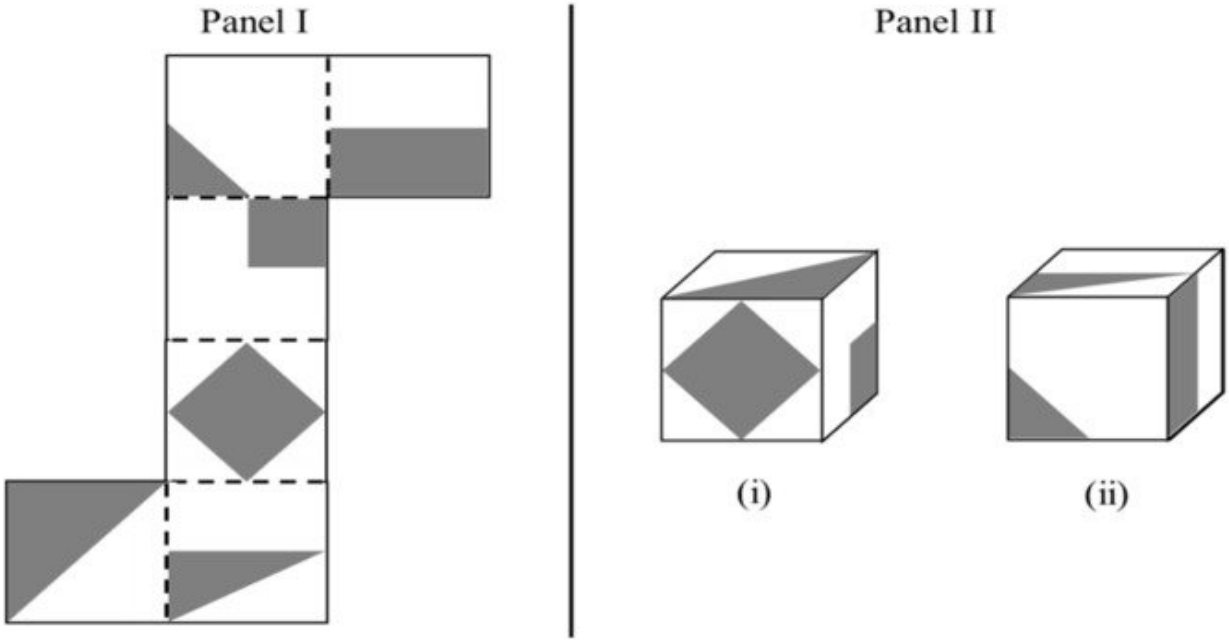
(C) P = Resentful; Q = Spiteful

(D) P = Magnanimous; Q = Vindictive

Q7. [Marks: 2 | MCQ] General Aptitude · Reasoning

Gate 2026	MCQ	2M

A paper shown in Panel I is folded along the dashed lines (- - -) to construct a cube. The shaded regions shown in Panel I appear on the outer surface of the cube. Referring to cubes shown in Panel II, which one of the options is correct?



(A) Only (i) can correspond to the unfolded cube in Panel I.

(B) Only (ii) can correspond to the unfolded cube in Panel I.

(C) Both (i) and (ii) can correspond to the unfolded cube in Panel I.

(D) Neither (i) nor (ii) can correspond to the unfolded cube in Panel I.

Q8. [Marks: 2 | MCQ] General Aptitude · Mathematical Analysis

Gate 2026	MCQ	2M

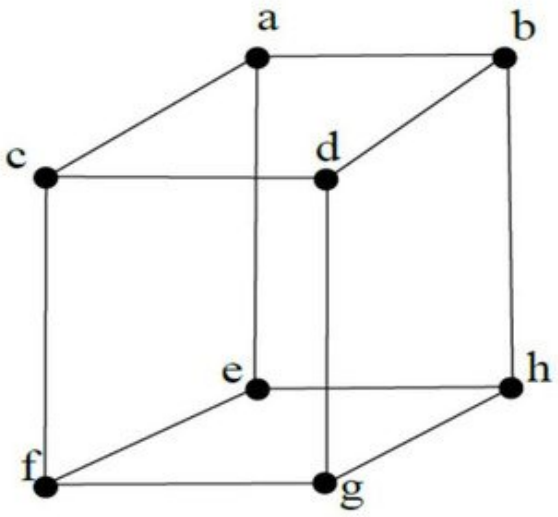
Consider the cube shown below with its 8 corners labelled a, b, c, d, e, f, g, and h . The figure is representative. All corners are to be colored such that any two corners that are connected by an edge must be of different colors. The minimum number of colors required to achieve this is ___

(A) 8

(B) 4

(C) 3

(D) 2



Q9. [Marks: 2 | MCQ] General Aptitude · Reasoning

Gate 2026	MCQ	2M

Four hills H1, H2, H3, and H4 are present in an area. The following observations are made about them:

i. Neither H 2 nor H 3 is the easternmost hill.

ii. Neither H 2 nor H 3 is the westernmost hill.

iii. Neither the easternmost hill nor the westernmost hill is the southernmost hill.

iv. Two hills are located to the west of H 2 .

v. The southernmost hill has at least two hills to its east.

The southernmost hill is . ___

(A) H1

(B) H2

(C) H3

(D) H4

Q10. [Marks: 2 | MCQ] General Aptitude · Geometry

Gate 2026	MCQ	2M

As shown in the figure, circle C_1 with center O_1 and radius r_1 touches the square $VWXY$ at points P and Q while circle C_2 with center O_2 and radius r_2 touches the square $VWXY$ at points R and S. The two circles touch each other at T.

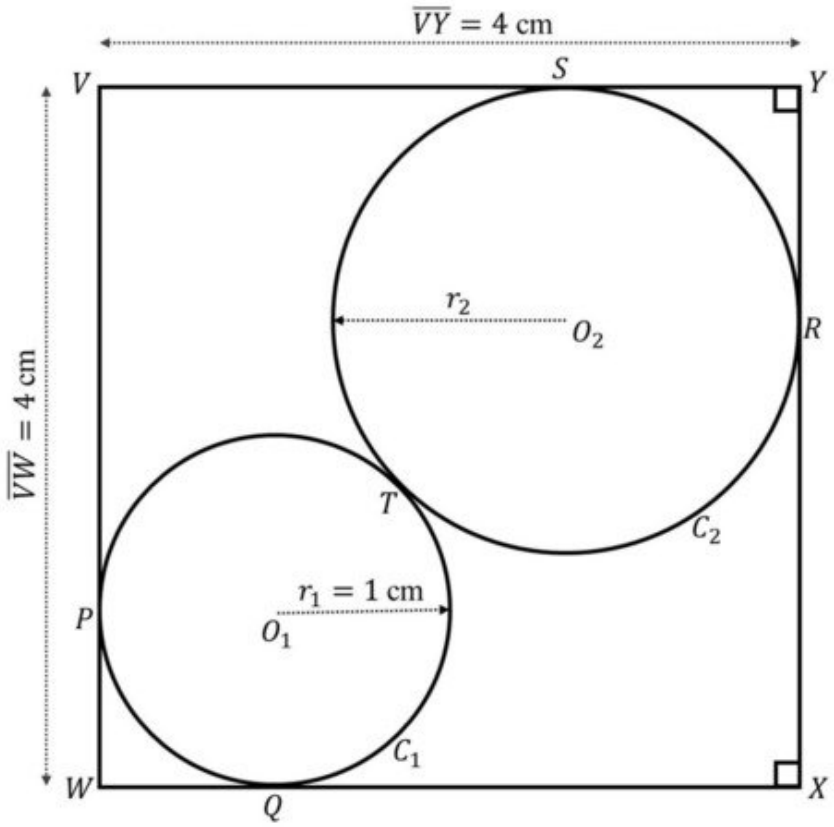
Given $r_1 = 1$ cm and $\overline{VY} = \overline{VW} = 4$ cm, $r_2 =$ ___ cm.

(A) $4 - 3\sqrt{2}$

(B) $1 + 2\sqrt{2}$

(C) $7 - 4\sqrt{2}$

(D) $5 + 3\sqrt{2}$



Q11. [Marks: 1 | MCQ] Electromagnetism · EM Waves

Gate 2026	MCQ	1M

In free space, an electromagnetic wave is travelling whose wavevector is $\vec{k} = 10(\hat{x} + \sqrt{3}\hat{y})\text{m}^{-1}$. The electric field component of this electromagnetic wave is given by $\vec{E}(\vec{r}, t) = \hat{z}\, 600 \cos(\vec{k} \cdot \vec{r} - \omega t) V.m^{-1}$. The speed of light in free space is $c = 3.0 \times 10^8\ \text{m.s}^{-1}$. The corresponding magnetic field $\vec{B}(\vec{r}, t)$ is

(A) $\vec{B}(\vec{r}, t) = 2 \times 10^{-6}(\sqrt{3}\hat{x} - \hat{y}) \cos(\vec{k} \cdot \vec{r} - \omega t)\ \text{V} \cdot \text{m}^{-2} \cdot \text{s}$

(B) $\vec{B}(\vec{r}, t) = 10^{-6}(\sqrt{3}\hat{x} - \hat{y}) \cos(\vec{k} \cdot \vec{r} - \omega t)\ \text{V} \cdot \text{m}^{-2} \cdot \text{s}$

(C) $\vec{B}(\vec{r}, t) = 2 \times 10^{-5}(-\sqrt{3}\hat{x} + \hat{y}) \cos(\vec{k} \cdot \vec{r} - \omega t)\ \text{V.m}^{-2} \cdot \text{s}$

(D) $\vec{B}(\vec{r}, t) = 10^{-5}(\sqrt{3}\hat{x} - \hat{y}) \cos(\vec{k} \cdot \vec{r} - \omega t)\ \text{V} \cdot \text{m}^{-2} \cdot \text{s}$

Q12. [Marks: 1 | MCQ] Electromagnetism · Electrostatics

Gate 2026	MCQ	1M

An infinitely large non-conducting thin sheet in the xy plane ($z = 0$) carries a uniform surface charge density $\sigma = 17.70 \times 10^{-12} \mathrm{C.m^{-2}}$. The electric field in the region $z < 0$ is $\vec{E}_2 = \hat{x} + 2\hat{y} + 3\hat{z}$. Then, the electric field $\vec{E}_1$ in the region $z > 0$ will be ($\epsilon_0 = 8.85 \times 10^{-12} \mathrm{C^2.N^{-1}.m^{-2}}$)

(A) $\vec{E}_1 = \hat{x} + 2\hat{y} + 5\hat{z}$

(B) $\vec{E}_1 = \hat{x} + 2\hat{y} + 4\hat{z}$

(C) $\vec{E}_1 = \hat{x} + 2\hat{y} + 3\hat{z}$

(D) $\vec{E}_1 = \hat{x} + 4\hat{y} + \hat{z}$

Q13. [Marks: 1 | MCQ] Quantum Mechanics · Basics Quantum Mechanics

Gate 2026	MCQ	1M

Consider an operator $\hat{A}$ which is not Hermitian. Find the possible values of c and d such that the operator ($c\hat{A} - d\hat{A}^{\dagger}$) is Hermitian.

(A) $c = i$ and $d = i$

(B) $c = 1$ and $d = 1$

(C) $c = -1$ and $d = i$

(D) $c = i$ and $d = -i$

Q14. [Marks: 1 | MCQ] Mathematical Physics · Vector Analysis

Gate 2026	MCQ	1M

For a scalar field $\psi(\vec{r})$ and a vector field $\vec{A}(\vec{r})$, $\vec{\nabla} \times (\vec{A}\psi)$ is equivalent to the expression

(A) $\psi(\vec{\nabla} \times \vec{A}) - \vec{A} \times (\vec{\nabla}\psi)$

(B) $\psi(\vec{\nabla} \times \vec{A}) + \vec{A} \times (\vec{\nabla}\psi)$

(C) Null vector

(D) $\vec{A} \times (\vec{\nabla}\psi) - \psi(\vec{\nabla} \times \vec{A})$

Q15. [Marks: 1 | MCQ] Electromagnetism · Relativistic EMT

Gate 2026	MCQ	1M

Which of the following options is correct for transformation of electric field $\vec{E}$ and magnetic field $\vec{B}$ under time reversal, i.e., $t \to -t$?

(A) $\vec{E} \to \vec{E}$ and $\vec{B} \to \vec{B}$

(B) $\vec{E} \to -\vec{E}$ and $\vec{B} \to \vec{B}$

(C) $\vec{E} \to \vec{E}$ and $\vec{B} \to -\vec{B}$

(D) $\vec{E} \to -\vec{E}$ and $\vec{B} \to -\vec{B}$

Q16. [Marks: 1 | MCQ] Classical Mechanics · Basic Mechanics

Gate 2026	MCQ	1M

On a horizontal plane, a projectile of mass m is launched from the ground with speed v_0 at an angle θ_0 with the horizontal. In addition to the gravitational force (mg), it also experiences a drag force $\vec{F}_{drag} = -\gamma\vec{v}$, where $\vec{v}$ is its velocity and γ is a constant. It hits the ground at a distance R from the point of launch with its velocity making an angle θ with the horizontal, as shown schematically in the figure. Then which of the following options is correct?

(A) $R = \frac{v_0^2 \sin 2\theta}{g}$ $\theta < \theta_0$

(B) $R < \frac{v_0^2 \sin 2\theta_0}{g}$ $\theta < \theta_0$

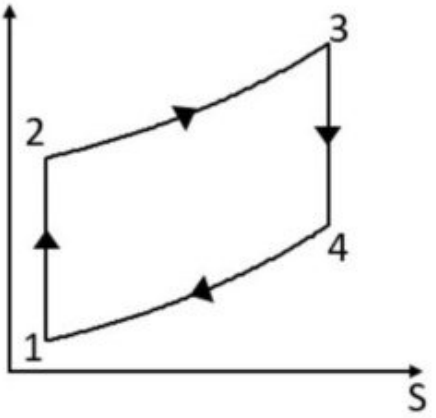
(C) $R < \frac{v_0^2 \sin 2\theta_0}{g}$ $\theta > \theta_0$

(D) $R = \frac{v_0^2 \sin 2\theta}{g}$ $\theta > \theta_0$

Q17. [Marks: 1 | MCQ] Thermodynamics · Carnot Cycle

Gate 2026	MCQ	1M

Consider the Otto cycle for an ideal gas engine consisting of two quasistatic adiabatic and two quasistatic isochoric processes. The correct temperature-entropy (T-S) phase diagram for the cycle is

(A)


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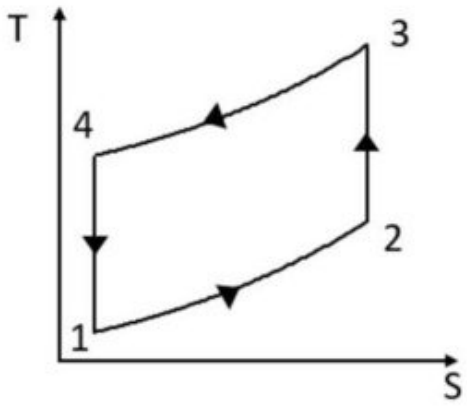

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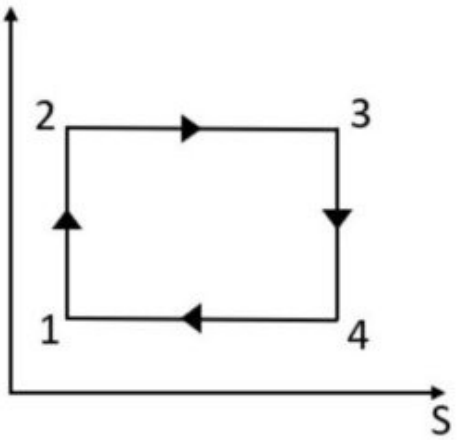

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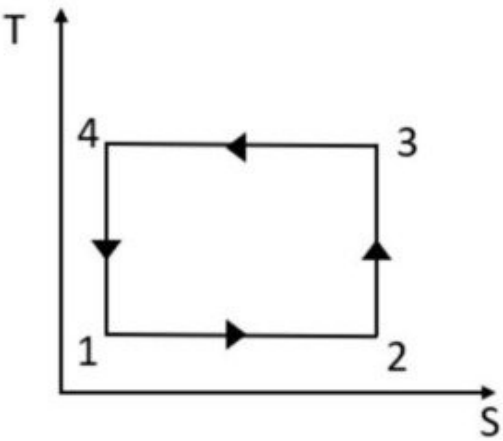


Q18. [Marks: 1 | MCQ] Statistical Mechanics · Quantum Statistical Mechanics

Gate 2026	MCQ	1M

The formula for energy E of a photon gas at temperature T in a two-dimensional box at equilibrium with $g_{2d}(v)$ denoting the density of states of photons is given below where symbols v, h and k_B have their standard meaning. The specific heat (C_V) of this photon gas obeys

$$E = \int_0^\infty dv g_{2d}(v) \frac{hv}{\exp\left(\frac{hv}{k_B T}\right) - 1}$$

(A) $C_V \propto T$

(B) $C_V \propto T^2$

(C) $C_V \propto T^3$

(D) $C_V \propto T^4$

Q19. [Marks: 1 | MCQ] Optics · Polarization

Gate 2026	MCQ	1M

For the electric field of an electromagnetic wave given below, which of the following statements is correct? $\vec{E} = \hat{x}E_0\cos(\omega t) + \hat{y}2E_0\cos\left(\omega t + \frac{\pi}{2}\right)$

(A) The electric field is linearly polarised with slope 2.

(B) The electric field is circularly polarised with radius E_0.

(C) The electric field is elliptically polarised with a ratio of major to minor axis being 2.

(D) The electric field is unpolarised with the two components being phase shifted by $\pi/2$.

Q20. [Marks: 1 | MCQ] Statistical Mechanics · Quantum Statistical Mechanics

Gate 2026	MCQ	1M

A gas of non-interacting $^4\mathrm{He}$ atoms (of mass m) is in a three-dimensional trap whose energy levels can be approximated by those of a harmonic oscillator potential $V(x,y,z) = \frac{1}{2}m\omega^2\left(x^2+y^2+z^2\right)$. The chemical potential of the gas at $T = 0$ K is

(A) 0

(B) $\frac{1}{2}\hbar\omega$

(C) $\frac{3}{2}\hbar\omega$

(D) $3\hbar\omega$

Q21. [Marks: 1 | MCQ] Mathematical Physics · Tensors

Gate 2026	MCQ	1M

Given $|v_1\rangle = \frac{1}{\sqrt{2}}\begin{pmatrix}1\\ i\end{pmatrix}$ and $|v_2\rangle = \frac{1}{\sqrt{2}}\begin{pmatrix}1\\ -i\end{pmatrix}$, the tensor product $|v_1\rangle \otimes |v_2\rangle$ is

(A) $\frac{1}{2}\begin{pmatrix}1\\ -i\\ i\\ 1\end{pmatrix}$

(B) $\frac{1}{2}\begin{pmatrix}1\\ i\\ -i\\ 1\end{pmatrix}$

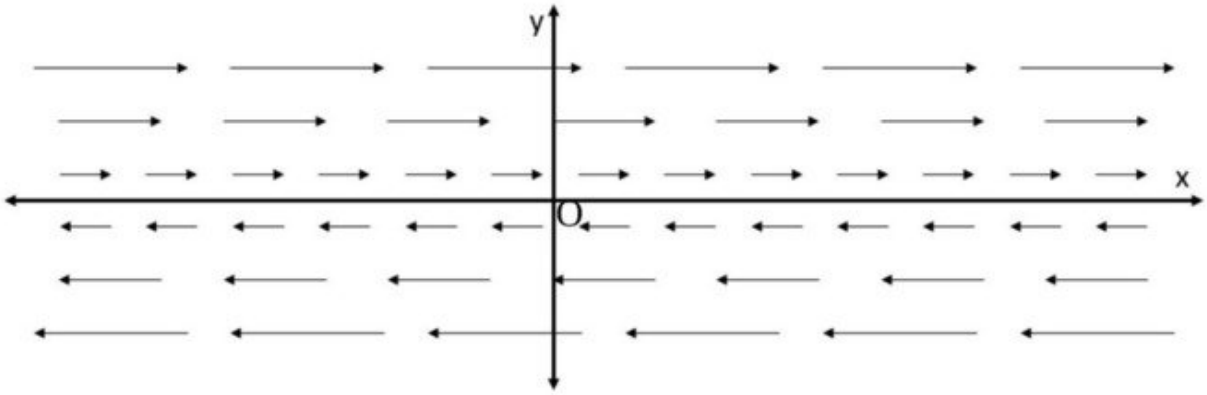
(C) $\frac{1}{2}\begin{pmatrix}1 & i\\ i & -1\end{pmatrix}$

(D) $\frac{1}{2}\begin{pmatrix}1 & i\\ -i & 1\end{pmatrix}$

Q22. [Marks: 1 | MCQ] Mathematical Physics · Vector Analysis

Gate 2026	MCQ	1M

Sketch of a two-dimensional vector field $\vec{V}$ is shown below. Here, length and arrow head of the arrows denote magnitude and direction of the vector field, respectively. Which of the following statements is correct for $\vec{\nabla} \times \vec{V}$?



(A) It is zero everywhere in the two-dimensional space.

(B) Its magnitude is non-zero and its direction is out of the two-dimensional plane.

(C) Its magnitude is non-zero and its direction is into the two-dimensional plane.

(D) It points in opposite directions above and below the x-axis.

Q23. [Marks: 1 | MCQ] Nuclear and Particle Physics · Particle Physics

Gate 2026	MCQ	1M

Which one of the following is an allowed process?

(A) $\pi^- + p \rightarrow \pi^0 + n$

(B) $\pi^0 \rightarrow \gamma + \gamma + \gamma$

(C) $p + \bar{p} \rightarrow \Lambda^0 + \Lambda^0$

(D) $p + \bar{p} \rightarrow \gamma$

Q24. [Marks: 1 | MSQ] Nuclear and Particle Physics · Particle Physics

Gate 2026	MSQ	1M

Given Q is the electromagnetic charge and S is the strangeness quantum number, identify the particle(s) for which $(Q - S) = 0$ is satisfied.

(A) Σ^{*-}

(B) K^+

(C) Ω^-

(D) Δ^{++}

Q25. [Marks: 1 | MSQ] Atomic and Molecular Physics · Molecular Physics

Gate 2026	MSQ	1M

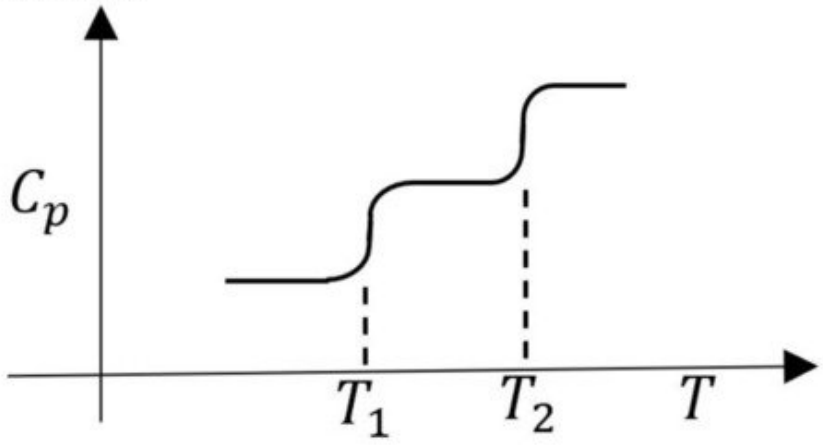
Schematic variation of the specific heat C_p of an ideal gas of diatomic molecules with temperature T is shown in the figure below. For rotational energy E_R and vibrational energy E_v of the molecule, which of the following options is/are correct? Here k_B is the Boltzmann constant.

(A) $E_R \cong k_B T_1$

(B) $E_R \cong k_B T_2$

(C) $E_v \cong k_B T_1$

(D) $E_v \cong k_B T_2$



Q26. [Marks: 1 | MSQ] Quantum Mechanics · Perturbation Theory

Gate 2026	MSQ	1M

If the perturbation $V = \lambda x^3$ is added to the Hamiltonian of a one-dimensional harmonic oscillator, the matrix element $\langle m|V|0\rangle$ is/are non-zero for which of the following states? Here, the eigenstates of the harmonic oscillator are denoted by $|n\rangle$.

(A) $|m = 3\rangle$

(B) $|m = 1\rangle$

(C) $|m = 2\rangle$

(D) $|m = 5\rangle$

Q27. [Marks: 1 | MSQ] Mathematical Physics · Vector Analysis

Gate 2026	MSQ	1M

For which of the following functions does the Laplacian vanish?

(A) $xe^y - ye^x$

(B) $x\cos(y) - y\cos(x)$

(C) e^{x+iy}

(D) $yx^2 - \frac{y^3}{3} - xy$

Q28. [Marks: 1 | NAT] Classical Mechanics · Lagrangian and Hamiltonian

Gate 2026	NAT	1M

A projectile of mass m is launched from the ground with the initial speed v_0 at an angle $30°$ from the horizontal. Take the ground to be horizontal. Ignoring the drag, the magnitude of Hamilton's action $\int Ldt$ for the particle from the beginning till it hits the ground is $f \times \left(\frac{mv_0^3}{g}\right)$. The value of f (rounded off to two decimal places) is ___

Q29. [Marks: 1 | NAT] Quantum Mechanics · Orbital angular momentum and hydrogen atom

Gate 2026	NAT	1M

Consider an electron in the energy eigenstate $\psi_{211}(\vec{r})$ of the hydrogen atom. Given that the radial probability distribution of the electron in such a state takes its maximum value at $r = n_0 a$, where a is the Bohr radius, and n_0 is an integer. The value of n_0 (in integer) is ___

The radial part of the wavefunction $\psi_{211}(\vec{r})$ is given by $R_{21}(r) = \frac{1}{\sqrt{24a^5}} re^{-r/2a}$.

Q30. [Marks: 1 | NAT] Electromagnetism · Electric field in matter

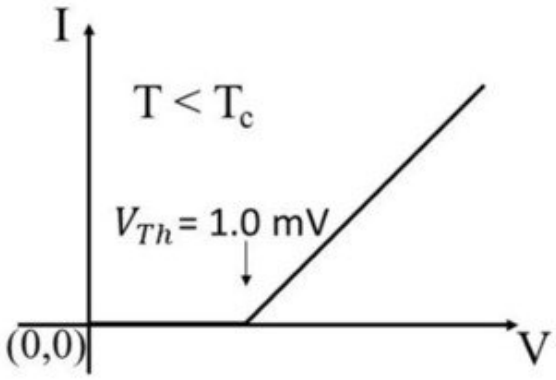
Gate 2026	NAT	1M

A dielectric sphere carries a uniform polarization $P = 26\mu\text{C.cm}^{-2}$. The magnitude of the electric field at the center of the sphere is $E \times 10^9\ \text{N.C}^{-1}$. The value of E (rounded off to one decimal place) is ___
$\left(\epsilon_0 = 8.85 \times 10^{-12}\text{C}^2 \cdot \text{N}^{-1} \cdot \text{m}^{-2}\right)$

Q31. [Marks: 1 | NAT] Solid State Physics · Superconductivity

Gate 2026	NAT	1M

Consider a metal-superconductor junction connected to a dc voltage V. At $T < T_c$, where T_c is the superconductor's transition temperature, the current I versus V behavior of this junction is shown schematically in the figure below. If the superconducting energy gap is DmeV. The value of D (rounded off to one decimal place) is ___



Q32. [Marks: 1 | NAT] Solid State Physics · Tight binding model

Gate 2026	NAT	1M

For the energy dispersion of an electron in a one-dimensional solid $E(k) = E_0 - 2\gamma \cos(ka)$, the ratio of the effective mass of the electron in the solid to the free electron mass (m_e) at $k = 0$ is R_0. Taking $\gamma = 0.5\text{eV}$ and $a = 0.5\,\text{nm}$, the value of R_0 (rounded off to two decimal place) is ___ $\left(\hbar = 1.054 \times 10^{-34}\,\text{J.s}, m_e = 9.1 \times 10^{-31}\,\text{kg},\right.$ electron charge $\left. = 1.6 \times 10^{-19}\text{C}\right)$

Q33. [Marks: 1 | NAT] Thermodynamics · Laws of thermodynamics

Gate 2026	NAT	1M

The specific heat $C_p(T)$ of one mole of a material as a function of temperature T is given as $C_p(T) = AT + BT^3$, where $A = 0.695\,\text{mJ.mol}^{-1}.\text{K}^{-2}$ and $B = 0.045\,\text{mJ.mol}^{-1}.\text{K}^{-4}$. When T is changed from 1 K to 10 K at constant pressure, then the change in entropy ΔS in $\text{mJ.mol}^{-1}.\text{K}^{-1}$ (rounded off to one decimal place) is ___

Q34. [Marks: 1 | NAT] Atomic and Molecular Physics · Molecular Physics

Gate 2026	NAT	1M

Raman spectrum of a molecule was recorded using a source of wavelength 5000Å. The first Stokes line is observed at 5100Å. The first anti-Stokes line will appear at a wavelength L (in Å). The value of L (rounded off to nearest integer) is ___

Q35. [Marks: 1 | NAT] Classical Mechanics · Special theory of relativity

Gate 2026	NAT	1M

A rocket of length 18.0 m is moving at speed 0.9c (where c is the speed of light) parallel to its own length, relative to the earth. The length of the rocket measured in meters by an observer on earth (rounded off to two decimal places) is ___

Q36. [Marks: 2 | MCQ] Mathematical Physics · Complex Analysis

Gate 2026	MCQ	2M

The function $f(z)$ of complex variable z given below,

$$f(z) = \frac{z^2 - 5z + 4}{z^3 + 4z - z^2 - 4}$$

has singular points at $z =$

(A) 1 and $(2 - i)$

(B) $2i$ and $-2i$

(C) 1 and $(2 + i)$

(D) $(2 + i)$ only

Q37. [Marks: 2 | MCQ] Mathematical Physics · Matrices

Gate 2026	MCQ	2M

Consider the Pauli matrices

$$\sigma_x = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}, \sigma_y = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}, \sigma_z = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}.$$

The value of $\mathrm{Tr}\left(\sigma_z[\sigma_x, \sigma_y]\right)$ is

(A) $2i$

(B) i

(C) $4i$

(D) $\frac{i}{2}$

Q38. [Marks: 2 | MCQ] Nuclear and Particle Physics · Particle Physics

Gate 2026	MCQ	2M

Which one of the following statements is true?

(A) In the decay $\mu^+ \rightarrow e^+ + \nu_e + \bar{\nu}_\mu$, CPT is violated.

(B) The decay $\Lambda \rightarrow p^+ + \pi^-$ is allowed and strangeness is violated.

(C) The decay $p^+ \rightarrow e^+ + \gamma$ is allowed.

(D) The decay $\Omega^- \rightarrow \Xi^0 + K^-$ is allowed.

Q39. [Marks: 2 | MCQ] Quantum Mechanics · Quantum Harmonic Oscillator

Gate 2026	MCQ	2M

The Hamiltonian for a quantum particle of mass m is given below, where $\omega < \Omega$. The Schrödinger equation for this system can be solved exactly using the orthogonal transformations: $x = \frac{x_1 - x_2}{\sqrt{2}}$ and $y = \frac{x_1 + x_2}{\sqrt{2}}$.

$$H = -\frac{\hbar^2}{2m}\left[\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right] + \frac{1}{2}m\Omega^2\left(x^2 + y^2\right) + m\omega^2 xy$$

The ground state energy of this system is

(A) $\frac{\hbar}{2}\left[\sqrt{\Omega^2 - \omega^2} + \sqrt{\Omega^2 + \omega^2}\right]$

(B) $\hbar\left[\sqrt{\Omega^2 - \omega^2} + \sqrt{\Omega^2 + \omega^2}\right]$

(C) $\frac{\hbar}{2}\left[\sqrt{\Omega^2 + \Omega\omega} + \sqrt{\Omega^2 - \Omega\omega}\right]$

(D) $\hbar\left[\sqrt{\Omega^2 + \Omega\omega} - \sqrt{\Omega^2 - \Omega\omega}\right]$

Q40. [Marks: 2 | MCQ] Quantum Mechanics · Spin and Total Angular momentum

Gate 2026	MCQ	2M

Consider two particles with angular momenta $j_1 = 2\hbar$ and $j_2 = \hbar/2$. If the expression

$$|j = 5/2, m = 3/2\rangle = \begin{cases} c_1|j_1 = 2, m_1 = 1\rangle|j_2 = 1/2, m_2 = 1/2\rangle + \\ c_2|j_1 = 2, m_1 = 2\rangle|j_2 = 1/2, m_2 = -1/2\rangle \end{cases}$$

gives an eigenstate of the total angular momentum of the two particles, using standard notation. Which of the following is true?

$$\left(\text{Hint: } \hat{J}_{\pm}|j, m\rangle = \sqrt{j(j+1) - m(m \pm 1)}|j, m \pm 1\rangle\right)$$

(A) $c_1 = \frac{2}{\sqrt{5}}, c_2 = \frac{1}{\sqrt{5}}$

(B) $c_1 = \frac{1}{\sqrt{5}}, c_2 = \frac{2}{\sqrt{5}}$

(C) $c_1 = \frac{1}{\sqrt{2}}, c_2 = \frac{1}{\sqrt{2}}$

(D) $c_1 = 0, c_2 = 1$

Q41. [Marks: 2 | MCQ] Quantum Mechanics · Quantum Harmonic Oscillator

Gate 2026	MCQ	2M

The energy E and degeneracy d of the second excited state of a three-dimensional, isotropic quantum harmonic oscillator with angular frequency ω are

(A) $E = \frac{7}{2}\hbar\omega, d = 6$

(B) $E = \frac{7}{2}\hbar\omega, d = 3$

(C) $E = \frac{5}{2}\hbar\omega, d = 3$

(D) $E = \frac{5}{2}\hbar\omega, d = 6$

Q42. [Marks: 2 | MCQ] Statistical Mechanics · Microcanonical ensemble

Gate 2026	MCQ	2M

Two identical particles with a fixed total energy $E = 2\hbar\omega$ are in thermal equilibrium in a one-dimensional harmonic oscillator potential $\frac{1}{2}m\omega^2x^2$. Let the entropy of the particles be denoted by S_F if they are fermions with spin $\frac{1}{2}\left(S_Z = \pm\frac{\hbar}{2}\right)$ and S_B if they are bosons with spin 0 . Then, which of the following options is correct? (k_B is the Boltzmann constant)

(A) $S_F = k_B \ln 2, \quad S_B = k_B \ln 2$

(B) $S_F = 2k_B \ln 2, \quad S_B = 0$

(C) $S_F = 4k_B \ln 2, \quad S_B = 0$

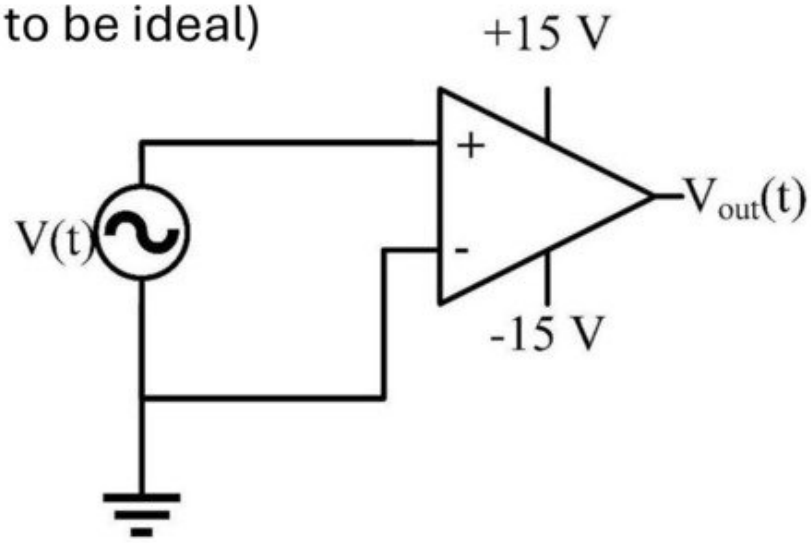
(D) $S_F = 2k_B \ln 2, \quad S_B = k_B \ln 2$

Q43. [Marks: 2 | MCQ] Electronics · OPAMP

Gate 2026	MCQ	2M

In the circuit shown, $V(t) = 2\sin(2000\pi t)$ Volts, where t is in seconds, which of the following options is correct?

(take the opamp to be ideal)



(A) $V_{out}(t)$ is square wave with peak-to-peak voltage = 30 V and time period is 1 ms .

(B) $V_{out}(t)$ is a sine wave with peak-to-peak voltage = 4 V and time period is 1 ms .

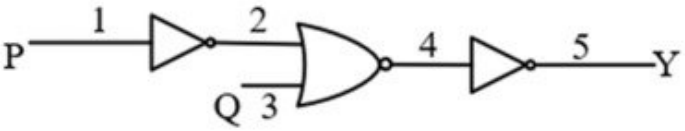
(C) $V_{out}(t)$ is sine wave with peak-to-peak voltage = 30 V and time period of 1 ms .

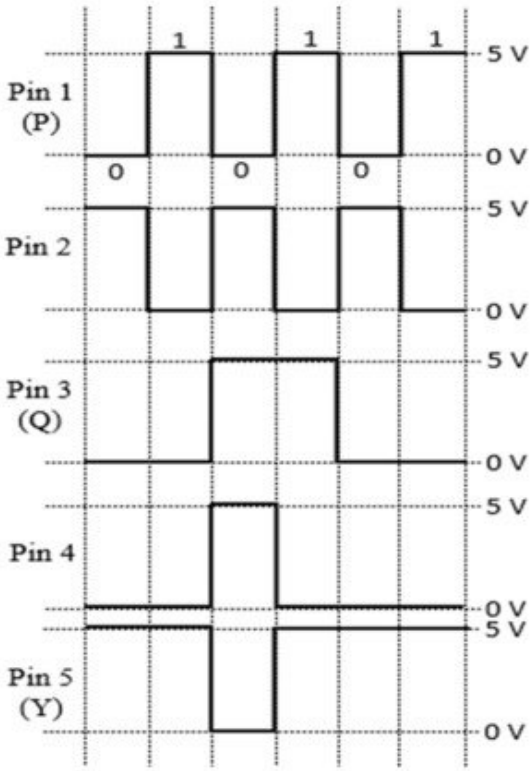
(D) $V_{out}(t)$ is square wave with peak-to-peak voltage = 4 V and time period is 1 ms .

Q44. [Marks: 2 | MCQ] Electronics · Logic Gates

Gate 2026	MCQ	2M

Considering the circuit and the associated signals measured at different pins (numbered as 1,2,3,4,5) shown in the figure, the correct option is





(A) NOT gate between pins 1 and 2 is faulty.

(B) NOR gate is faulty.

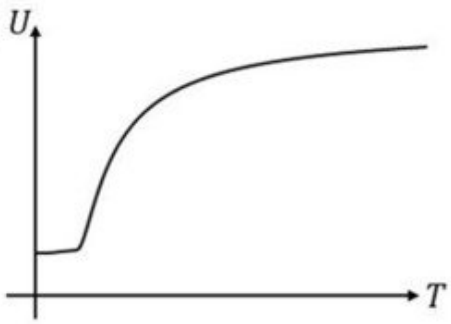
(C) NOT gate between pins 4 and 5 is faulty.

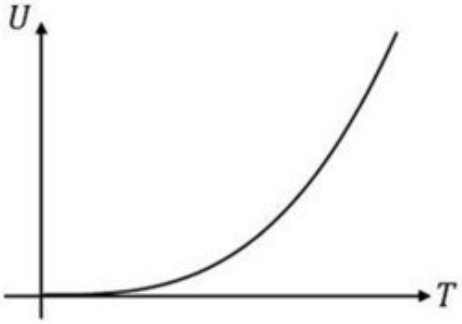
(D) The NOR and output NOT gates, are both faulty.

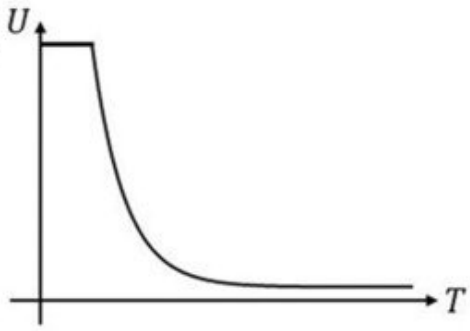
Q45. [Marks: 2 | MCQ] Statistical Mechanics · Canonical ensemble

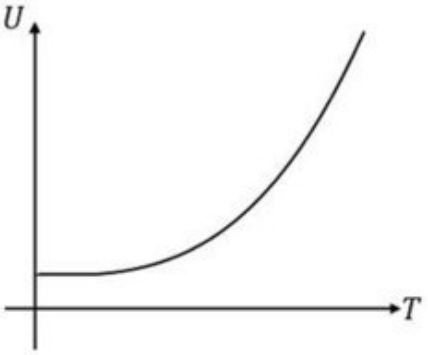
Gate 2026	MCQ	2M

A gas of N classical particles that can occupy energy levels, ϵ_1 and $\epsilon_2 = \epsilon_1 + \Delta$ is in equilibrium with a reservoir at temperature T. From the schematics shown below, choose the correct dependence of the internal energy U on T.

(A) 

(B) 

(C) 

(D) 

Q46. [Marks: 2 | MCQ] Classical Mechanics · Lagrangian and Hamiltonian

Gate 2026	MCQ	2M

The Lagrangian

$$L_0 = \frac{1}{2}m\dot{q}^2 - \frac{1}{2}m\omega^2 q^2$$

with the generalized coordinate q is transformed to $L = L_0 + \alpha\frac{df(q)}{dt}$. Consider the following statements:

(i) Expression for the canonical momentum does not change.

(ii) The equation of the motion does not change.

Which of the following options is correct for the above statements?

(A) Both (i) and (ii) are correct.

(B) Both (i) and (ii) are not correct.

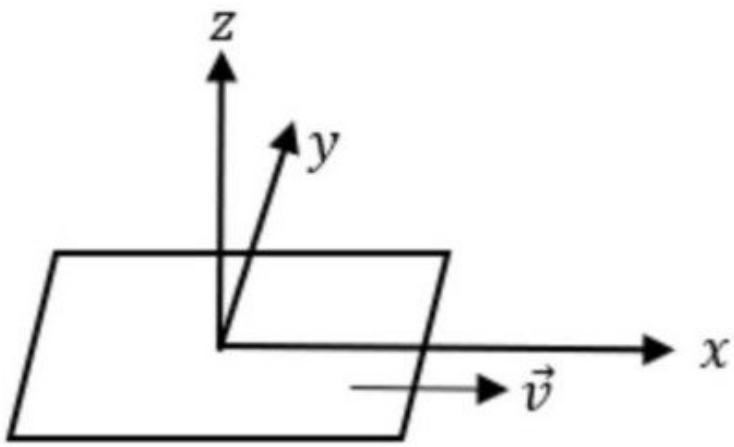
(C) (i) is correct and (ii) is not correct.

(D) (i) is not correct and (ii) is correct.

Q47. [Marks: 2 | MCQ] Electromagnetism · EM Waves

Gate 2026	MCQ	2M

An infinitely large thin sheet in the xy-plane carries uniform positive charge density and is moving with constant velocity $\vec{v}$ in the $+x$ direction (see figure below). The direction of the corresponding Poynting vector is



(A) $+x$ for both $z < 0$ and $z > 0$

(B) $+x$ for $z < 0$ and $-x$ for $z > 0$

(C) $-x$ for $z < 0$ and $+x$ for $z > 0$

(D) $-x$ for both $z < 0$ and $z > 0$

Q48. [Marks: 2 | MCQ] Electromagnetism · Electrostatics

Gate 2026	MCQ	2M

A positive point charge is fixed at the origin. At some distance from it on the x axis, a point dipole is kept pointing in the $+y$ direction. The force on the dipole is

(A) 0

(B) in the $+y$ direction

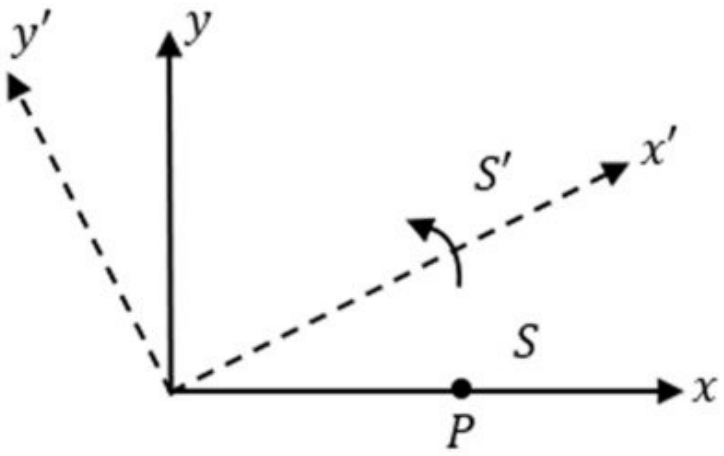
(C) in the $-y$ direction

(D) in the $+x$ direction

Q49. [Marks: 2 | MCQ] Classical Mechanics · Pseudo Forces

Gate 2026	MCQ	2M

Two frames S (solid lines) and S' (dashed lines) with common origin are shown in the figure below. Frame S is inertial while S' is rotating about the common z-axis. There is a point mass fixed at P on the x-axis of the S frame. The magnitude of the centrifugal force and the Coriolis force experienced by the mass in the S' frame is F_{cen} and F_{cor}, respectively. Which of the following options is correct for these forces?



(A) $F_{cen} = 0$ and $F_{cor} = 0$

(B) $F_{cen} \neq 0$ and $F_{cor} \neq 0$ and $F_{cen} = \frac{F_{cor}}{2}$

(C) $F_{cen} \neq 0$ and $F_{cor} \neq 0$ and $F_{cen} = 2F_{cor}$

(D) $F_{cen} \neq 0$ and $F_{cor} \neq 0$ and $F_{cen} = F_{cor}$

Q50. [Marks: 2 | MSQ] Mathematical Physics · Differential Equations

Gate 2026	MSQ	2M

Which of the following operators is/are self-adjoint?

(A) $x^2\frac{d^2}{dx^2}+3x\frac{d}{dx}+x^2$

(B) $\left(1-x^2\right)\frac{d^2}{dx^2}-2x\frac{d}{dx}+3x$

(C) $\left(3x-4x^3\right)\frac{d^2}{dx^2}+\left(3-12x^2\right)\frac{d}{dx}+12$

(D) $x\frac{d^2}{dx^2}+x^2\frac{d}{dx}+\frac{5x}{3}$

Q51. [Marks: 2 | MSQ] Quantum Mechanics · Basics Quantum Mechanics

Gate 2026	MSQ	2M

Consider two operators $\hat{A}$ and $\hat{B}$ which are related as $\hat{A}=\exp(i\theta\hat{B})$. If θ is a non-zero real number, which of the following statements is/are true?

(A) If $\hat{B}$ is Hermitian, then $\hat{A}$ is unitary.

(B) If $\hat{B}$ is anti-Hermitian, then $\hat{A}$ is unitary.

(C) If $\hat{B}$ is Hermitian, then $|\mathrm{Det}(\hat{A})|=1$.

(D) If $\hat{B}$ is anti-Hermitian, then $\hat{A}$ is Hermitian.

Q52. [Marks: 2 | MSQ] Quantum Mechanics · Basics Quantum Mechanics

Gate 2026	MSQ	2M

Consider operators $\hat{A}, \hat{B}$, and $\hat{C}$ for three observables of a quantum system satisfying $[\hat{A}, \hat{B}] = 0, [\hat{B}, \hat{C}] = 0$, and $[\hat{A}, \hat{C}] \neq 0$, with uncertainties $\Delta A, \Delta B, \Delta C$, respectively. From the options given below, which is/are implied by the commutation relations among $\hat{A}, \hat{B}$, and $\hat{C}$?

(A) $\Delta A \Delta B > 0$

(B) $\Delta A \Delta C > 0$

(C) $\hat{A}, \hat{B}$ can be simultaneously diagonalized.

(D) $\hat{A}, \hat{B}, \hat{C}$ can be simultaneously diagonalized.

Q53. [Marks: 2 | MSQ] Mathematical Physics · Probability

Gate 2026	MSQ	2M

Consider the distribution of outcomes generated by $N (N \gg 1)$ independent throws of (i) a coin or (ii) a six-sided dice. A coin (dice) is unbiased if both (all) its sides have equal probability to show up in a throw; it is biased otherwise. For the cases (i) and (ii) above, which of the following statements is/are true?

(A) The entropy of an unbiased coin is smaller than that of an unbiased dice.

(B) The entropy of an unbiased coin is greater than that of an unbiased dice.

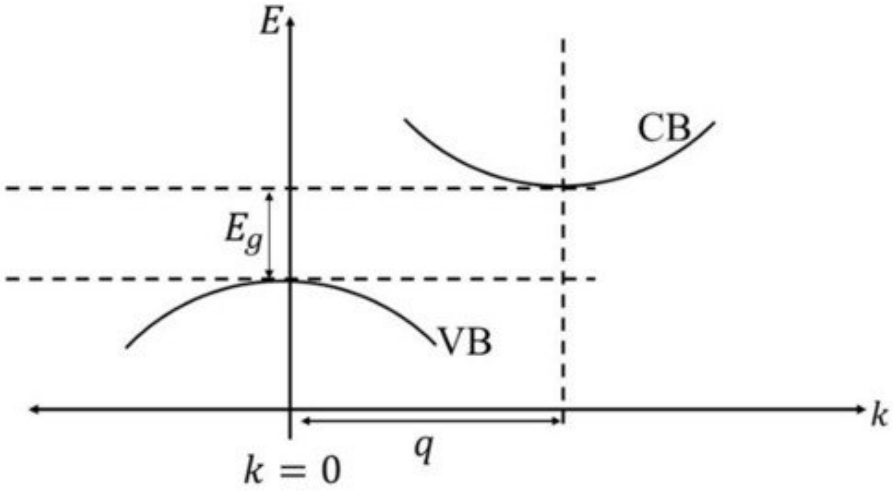
(C) The entropy of a biased dice is smaller than that of an unbiased dice.

(D) The entropy of a biased coin is greater than that of an unbiased coin.

Q54. [Marks: 2 | MSQ] Solid State Physics · Semiconductor Physics

Gate 2026	MSQ	2M

The dispersion ($E(k)$) of the conduction band (CB) and valence band (VB) for a semiconductor are shown schematically in the figure. Considering the possibility of an electron making a transition from the bottom of the CB to the top of the VB , which of the following options is/are correct?



(A) The transition is forbidden.

(B) A photon can be emitted with an energy exactly equal to E_g.

(C) A photon can be emitted with an energy less than E_g.

(D) A phonon can be created with a crystal momentum $\hbar q$.

Q55. [Marks: 2 | MSQ] Classical Mechanics · Rotation Motion

Gate 2026	MSQ	2M

A symmetric rigid body has moment of inertia I_1, I_2, I_3 about its principal axes 1,2 , and 3, respectively, with $I_1 = I_3 = I_\perp$ and $I_2 \neq I_\perp$. It is rotating in space with no torque on it so that its angular momentum $\vec{L}$ is constant. Let $\omega_1, \omega_2, \omega_3$ be the components of its angular velocity along the principal axes 1, 2, and 3, respectively. Which of the following quantities is/are constant during the motion of this rigid body?

(A) $\omega_1 + \omega_3$

(B) $\omega_1^2 + \omega_3^2$

(C) Angle between axis 2 and $\vec{L}$

(D) ω_2

Q56. [Marks: 2 | MSQ] Atomic and Molecular Physics · Model of atom

Gate 2026	MSQ	2M

An α particle moves towards a fixed nucleus carrying charge Ze, with initial speed v_0 and impact parameter b. Starting from a large distance from the nucleus, its distance of closest approach is r_m and its speed there is v_m. Then which of the following options is/are correct?

$$\left(k = \frac{1}{4\pi\epsilon_0} \text{ and } r_0 = k\frac{Ze^2}{mv_0^2}\right)$$

(A) $v_0 b = v_m r_m$

(B) $v_0 b = 2v_m r_0$

(C) For $\frac{b}{r_0} \ll 1, r_m = 4r_0 + \frac{b^2}{2r_0}$ ignoring higher order corrections in $\frac{b}{r_0}$

(D) For $\frac{b}{r_0} \ll 1, r_m = 4r_0 + \frac{b^2}{8r_0}$ ignoring higher order corrections in $\frac{b}{r_0}$

Q57. [Marks: 2 | NAT] Electromagnetism · Magnetism

Gate 2026	NAT	2M

Consider a particle of mass $m = 9.0 \times 10^{-5}$ kg and charge $q = 3.0 \times 10^{-4}$C in a uniform electromagnetic field $\vec{E} = 2\hat{x}\ \mathrm{V.m^{-1}}, \vec{B} = 3\hat{z}\ \mathrm{V.m^{-2}}$. s. The particle is released from the coordinates (0,5 m, 0) at time $t = 0$. Starting from initial speed zero, it comes back to the y-axis for the first time at time t. The value of t in seconds (rounded off to two decimal places) is ___

Q58. [Marks: 2 | NAT] Atomic and Molecular Physics · Lasers

Gate 2026	NAT	2M

An atom has two energy levels with energy difference 2.2 eV between them. A gas of these atoms is with 8×10^{20} atoms in the upper state and 5×10^{20} atoms in the lower state. Ignoring spontaneous emission, the maximum possible energy released by this gas of atoms by stimulated emission is E Joules. The value of E (rounded off to one decimal place) is ___ $\left(e = 1.6 \times 10^{-19}\mathrm{C}\right)$

Q59. [Marks: 2 | NAT] Atomic and Molecular Physics · Vector Model

Gate 2026	NAT	2M

The Hamiltonian of two interacting spin-1/2 particles is

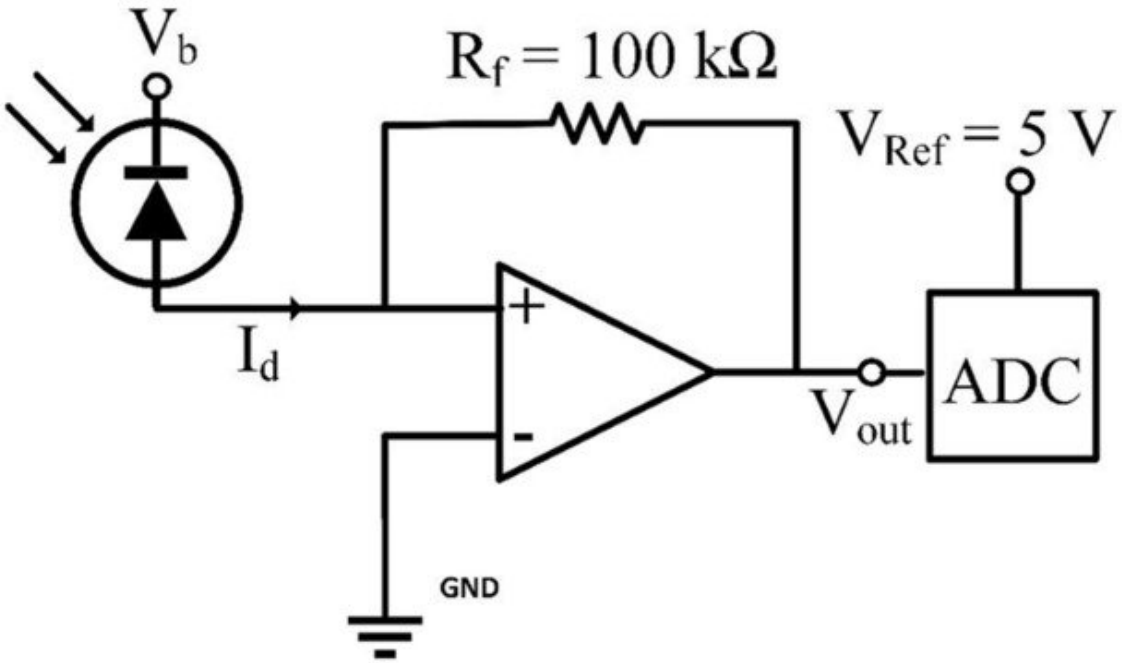
$$H = \frac{A}{\hbar^2}\vec{S}_1 \cdot \vec{S}_2$$

where $\vec{S}_1$ and $\vec{S}_2$ are the spin angular momenta of particles 1 and 2, respectively. Here, $A = 10.56\text{eV}$. The energy in eV required to induce an excitation from the ground state to the excited state (rounded off to two decimal places) is ___

Q60. [Marks: 2 | NAT] Electronics · OPAMP

Gate 2026	NAT	2M

The output signal (current I_d) of a reversed biased (with a voltage V_b) photodiode, on which light is incident, is fed to an amplifier (see figure). The output voltage is digitized by a 10 bit Analogue to Digital convertor (ADC) which has a reference voltage of 5 V . The smallest current I_d which can be measured by the circuit in nano-Amperes (rounded off to one decimal place) is ___



Q61. [Marks: 2 | NAT] Electromagnetism · Electrodynamics

Gate 2026	NAT	2M

A capacitor is made of two circular metal plates of radius 1 m separated by a distance of $d = 1\,\text{mm}$. The space between them is filled by a dielectric with permittivity $\epsilon_r = 5$. The capacitor is connected to a voltage $V = 10\sin(2\pi \times 10^6 \times t)$ volts, where t is in seconds. The maximum value of the magnetic field in between the plates at a radial distance $r = 0.5\,\text{m}$ from the centre of the capacitor is $B \times 10^{-6}\,\text{T}$. The value of B (rounded off to two decimal places) is ___

(Speed of light in vacuum $c = 3 \times 10^8\,\text{m.s}^{-1}$)

Q62. [Marks: 2 | NAT] Atomic and Molecular Physics · Molecular Physics

Gate 2026	NAT	2M

Rotational spectrum of a diatomic molecule consists of lines of equal spacing with an interval of $20.0\ \mathrm{cm}^{-1}$. Its moment of inertia is found to be $I_0 \times 10^{-47}\ \mathrm{kg.m}^2$, the value of I_0 (rounded off to one decimal place) is ___

$$\begin{pmatrix} h = 6.6 \times 10^{-34}\ \mathrm{J.s}, \\ \text{speed of light in vacuum } c = 3 \times 10^{8}\ \mathrm{m.s}^{-1} \end{pmatrix}$$

Q63. [Marks: 2 | NAT] Solid State Physics · Free electron model

Gate 2026	NAT	2M

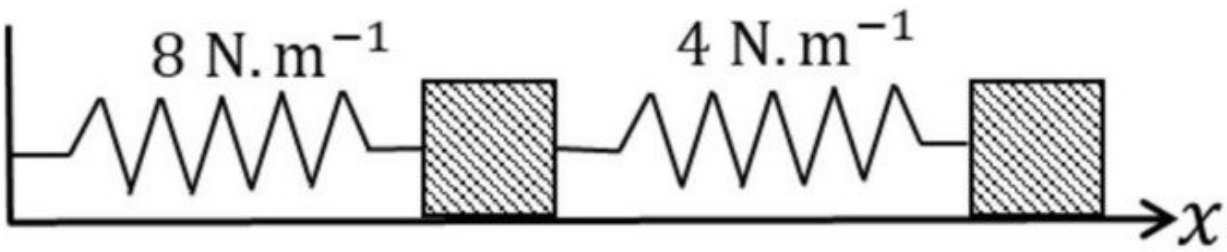
Copper has an electron number density of $8.3 \times 10^{28}\ \mathrm{m}^{-3}$. Its Fermi energy in eV (rounded off to one decimal place) is ___

$$\begin{pmatrix} \hbar = 1.06 \times 10^{-34}\ \mathrm{J.s}, \\ \text{mass of electron me} = 9.10 \times 10^{-31}\ \mathrm{kg} \\ \text{charge of electron } = 1.60 \times 10^{-19}\mathrm{C} \end{pmatrix}$$

Q64. [Marks: 2 | NAT] Classical Mechanics · Small Oscillations

Gate 2026	NAT	2M

Two 1 kg blocks are connected to two massless springs of spring constants $8\,\mathrm{N.m^{-1}}$ and $4\,\mathrm{N.m^{-1}}$. The system is kept on a frictionless horizontal floor with one end of a spring attached to a wall (see figure below). They are performing oscillatory motion along the x-axis with the normal mode frequencies ω_H and $\omega_L(\omega_H > \omega_L)$. The ratio $\frac{\omega_H}{\omega_L}$ (rounded off to two decimal places) is ___

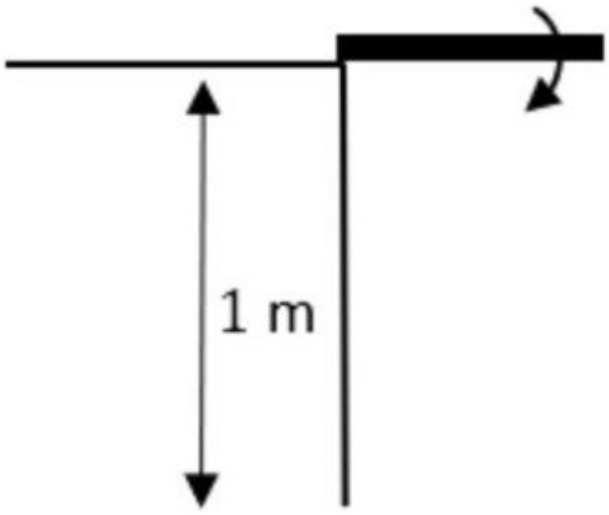


Q65. [Marks: 2 | NAT] Classical Mechanics · Rotation Motion

Gate 2026	NAT	2M

A 15 cm long scale is held horizontally with one of its ends on the edge of a 1 m high table and the other end resting on one's index finger. As the finger is removed (see figure below), the scale starts rotating about its end on the table. After 0.1 s , during which it has rotated by a negligibly small angle but has gained a rotational speed as it leaves the table and falls vertically towards the ground. When its centre of mass has fallen by 0.5 m , it has rotated by an angle θ. The value of θ in degrees (rounded off to one decimal place) is ___

$(g = 9.8\ \mathrm{m.s^{-2}})$



Answer Key

65 questions · Subject & topic for quick revision · Official keys (IIT/IISc)

Q.No	Subject	Topic	Type	Marks	Answer
Q1	General Aptitude	English	MCQ	1	**A**
Q2	General Aptitude	Reasoning	MCQ	1	**B**
Q3	General Aptitude	Reasoning	MCQ	1	**A**
Q4	General Aptitude	Mathematical Analysis	MCQ	1	**B**
Q5	General Aptitude	Mathematical Analysis	MCQ	1	**C**
Q6	General Aptitude	English	MCQ	2	**D**
Q7	General Aptitude	Reasoning	MCQ	2	**A**
Q8	General Aptitude	Mathematical Analysis	MCQ	2	**D**
Q9	General Aptitude	Reasoning	MCQ	2	**C**
Q10	General Aptitude	Geometry	MCQ	2	**C**
Q11	Electromagnetism	EM Waves	MCQ	1	**B**
Q12	Electromagnetism	Electrostatics	MCQ	1	**A**
Q13	Quantum Mechanics	Basics Quantum Mechanics	MCQ	1	**A**
Q14	Mathematical Physics	Vector Analysis	MCQ	1	**A**
Q15	Electromagnetism	Relativistic EMT	MCQ	1	**C**
Q16	Classical Mechanics	Basic Mechanics	MCQ	1	**C**
Q17	Thermodynamics	Carnot Cycle	MCQ	1	**A**
Q18	Statistical Mechanics	Quantum Statistical Mechanics	MCQ	1	**B**
Q19	Optics	Polarization	MCQ	1	**C**
Q20	Statistical Mechanics	Quantum Statistical Mechanics	MCQ	1	**C**
Q21	Mathematical Physics	Tensors	MCQ	1	**A**
Q22	Mathematical Physics	Vector Analysis	MCQ	1	**C**
Q23	Nuclear and Particle Phy…	Particle Physics	MCQ	1	**A**
Q24	Nuclear and Particle Phy…	Particle Physics	MSQ	1	**A,B**
Q25	Atomic and Molecular Ph…	Molecular Physics	MSQ	1	**A,D**
Q26	Quantum Mechanics	Perturbation Theory	MSQ	1	**A,B**
Q27	Mathematical Physics	Vector Analysis	MSQ	1	**C,D**
Q28	Classical Mechanics	Lagrangian and Hamiltonian	NAT	1	**0.32 to 0.34**
Q29	Quantum Mechanics	Orbital angular momentum and hydr…	NAT	1	**4 to 4**
Q30	Electromagnetism	Electric field in matter	NAT	1	**9.0 to 10.0**
Q31	Solid State Physics	Superconductivity	NAT	1	**2.0 to 2.0**
Q32	Solid State Physics	Tight binding model	NAT	1	**0.30 to 0.32**
Q33	Thermodynamics	Laws of thermodynamics	NAT	1	**21.1 to 21.3**
Q34	Atomic and Molecular Ph…	Molecular Physics	NAT	1	**4901 to 4905**
Q35	Classical Mechanics	Special theory of relativity	NAT	1	**7.60 to 8.00**
Q36	Mathematical Physics	Complex Analysis	MCQ	2	**B**

Answer Key

65 questions · Subject & topic for quick revision · Official keys (IIT/IISc)

Q.No	Subject	Topic	Type	Marks	Answer
Q37	Mathematical Physics	Matrices	MCQ	2	**C**
Q38	Nuclear and Particle Phy…	Particle Physics	MCQ	2	**B**
Q39	Quantum Mechanics	Quantum Harmonic Oscillator	MCQ	2	**A**
Q40	Quantum Mechanics	Spin and Total Angular momentum	MCQ	2	**A**
Q41	Quantum Mechanics	Quantum Harmonic Oscillator	MCQ	2	**A**
Q42	Statistical Mechanics	Microcanonical ensemble	MCQ	2	**B**
Q43	Electronics	OPAMP	MCQ	2	**A**
Q44	Electronics	Logic Gates	MCQ	2	**B**
Q45	Statistical Mechanics	Canonical ensemble	MCQ	2	**A**
Q46	Classical Mechanics	Lagrangian and Hamiltonian	MCQ	2	**D**
Q47	Electromagnetism	EM Waves	MCQ	2	**A**
Q48	Electromagnetism	Electrostatics	MCQ	2	**B**
Q49	Classical Mechanics	Pseudo Forces	MCQ	2	**B**
Q50	Mathematical Physics	Differential Equations	MSQ	2	**B,C**
Q51	Quantum Mechanics	Basics Quantum Mechanics	MSQ	2	**A,C,D**
Q52	Quantum Mechanics	Basics Quantum Mechanics	MSQ	2	**B,C**
Q53	Mathematical Physics	Probability	MSQ	2	**A,C**
Q54	Solid State Physics	Semiconductor Physics	MSQ	2	**C,D**
Q55	Classical Mechanics	Rotation Motion	MSQ	2	**B,C,D**
Q56	Atomic and Molecular Ph…	Model of atom	MSQ	2	**A**
Q57	Electromagnetism	Magnetism	NAT	2	**0.60 to 0.70**
Q58	Atomic and Molecular Ph…	Lasers	NAT	2	**52.0 to 53.0**
Q59	Atomic and Molecular Ph…	Vector Model	NAT	2	**10.56 to 10.56**
Q60	Electronics	OPAMP	NAT	2	**47.5 to 50**
Q61	Electromagnetism	Electrodynamics	NAT	2	**0.80 to 0.90**
Q62	Atomic and Molecular Ph…	Molecular Physics	NAT	2	**2.6 to 3.0**
Q63	Solid State Physics	Free electron model	NAT	2	**6.5 to 7.5**
Q64	Classical Mechanics	Small Oscillations	NAT	2	**2.35 to 2.45**
Q65	Classical Mechanics	Rotation Motion	NAT	2	**179.0 to 180.0**