

JEE Main Practice Paper

Based on JEE Main Pattern

Generated: December 01, 2025 | Difficulty: Medium

Instructions:

- This paper contains 90 questions (30 per subject).
- Each subject has 20 MCQs and 10 Integer Type questions.
- MCQ: +4 for correct, -1 for incorrect.
- Integer: +4 for correct, 0 for incorrect.
- Time: 3 hours | Maximum Marks: 360

Physics

Section A: Multiple Choice Questions (MCQ)

Q1. The least amount of energy necessary for a hydrogen atom in its ground state to emit radiation in the Balmer series is approximately:

- (A) 1.5 eV
- (B) 13.6 eV
- (C) 1.9 eV
- (D) 12.1 eV

Q2. The kinetic energy of translation of the molecules in 60 g of gas at is

- (A) 5025.6 J
- (B) 4902.4 J
- (C) 3582.7 J
- (D) 3986.3 J

Q3. A light source with a specific wavelength shines on a metal surface, causing electrons to be emitted with a maximum kinetic energy of 2 eV. If the same metal surface is exposed to a light source of a different wavelength, what will be the maximum kinetic energy of the emitted electrons? (The work function of the metal is 1 eV)

- (A) 3 eV
- (B) 2 eV
- (C) 6 eV
- (D) 5 eV

Q4. The de Broglie wavelengths associated with a proton and an α particle are λ and 2λ respectively. What is the ratio of the velocities of the proton to the α particle?

- (A) 1 : 8
- (B) 1 : 2
- (C) 4 : 1

(D) 8 : 1

Q5. An electric dipole is situated at a distance of 2 cm from an infinite plane sheet with a positive charge density. Select the correct option from the choices below.

- (A) Potential energy and torque both are maximum.
- (B) Torque on dipole is zero and net force is directed away from the sheet.
- (C) Torque on dipole is zero and net force acts towards the sheet.
- (D) Potential energy of dipole is minimum and torque is zero.

Q6. A light bulb and a capacitor are arranged in series connected to an alternating current supply. Subsequently, a dielectric material is introduced between the capacitor's plates. The brightness of the bulb:

- (A) increases
- (B) decreases
- (C) remains same
- (D) becomes zero

Q7. By what percentage will the illumination of the lamp decrease if the current drops by 15%?

- (A) 22%
- (B) 29%
- (C) 18%
- (D) 34%

Q8. A slender plano-convex lens composed of glass with a refractive index of 1.5 is placed in a liquid that has a refractive index of 1.2. When the flat surface of the lens is coated with silver for total reflection, the lens is submerged in the liquid 2025 (24 Jan Shift 1)

- (A) 0.20 m
- (B) 0.25 m
- (C) 0.15 m
- (D) 0.10 m

Q9. If two vectors \vec{A} and \vec{B} , both having the same magnitude R , are positioned at an angle θ , then

- (A) $\vec{A} - \vec{B} = \sqrt{2}R \sin \frac{\theta}{2}$
- (B) $\vec{A} + \vec{B} = 2R \sin \frac{\theta}{2}$
- (C) $\vec{A} + \vec{B} = 2R \cos \frac{\theta}{2}$
- (D) $\vec{A} - \vec{B} = 2R \cos \frac{\theta}{2}$

Q10. The following two statements are presented: Statement (I): It is not possible to define both the linear momentum and the position of a particle with arbitrary precision at the same time. Statement (II): If the uncertainties in the measurements of position and momentum are equal for an electron, then the uncertainty in the measurement of velocity is . Based on the above statements, select the correct answer from the options provided below:

- (A) Statement I is false but Statement II is true

- (B) Both Statement I and Statement II are false
- (C) Both Statement I and Statement II are true
- (D) Statement I is true but Statement II is false

Q11. A ball that is hung by a thread swings within a vertical plane such that the magnitudes of acceleration at both the extreme position and the lowest position are identical. The angle (θ) of thread deflection at the extreme position will be:

- (A) $\tan^{-1}(\sqrt{2})$
- (B) $2\tan^{-1}\left(\frac{1}{2}\right)$
- (C) $\tan^{-1}\left(\frac{1}{2}\right)$
- (D) $2\tan^{-1}\left(\frac{1}{\sqrt{5}}\right)$

Q12. In Young's double slit experiment, the width of one slit is denoted as d , while the other slit has a width of d' . If the ratio of the maximum intensity to the minimum intensity observed in the interference pattern on the screen is given, what is the value of this ratio? (Assume that the electric field strength varies based on the width of the slits.)

- (A) 4
- (B) 5
- (C) 3
- (D) 2

Q13. A particle traveling in a circular path with a radius of R at a constant speed requires a time T to make one complete revolution. If this particle is launched with the same speed at an angle θ relative to the horizontal, the peak height it reaches is $4R$. The angle of launch θ can then be expressed as:

- (A) $\sin(-12) gT^2\pi^2 R^{1/2} \sin^{-1}\pi^2 R^2 g T^2 1/2$
- (B) $\cos^{-1} 2gT^2\pi^2 R^{1/2} \cos^{-1}\pi R^2 g T^2 1/2$

Q14. A body of mass 3 kg begins to move under the action of a time dependent force given by $\vec{F} = 9t\hat{i} + 4t^2\hat{j}$ N. The power developed by the force at the time t is given by:

- (A) $9 t^4 + 12 t^5$ W
- (B) $4 t^3 + 9 t^5$ W
- (C) $12 t^5 + 9 t^3$ W
- (D) $12 t^3 + 9 t^5$ W

Q15. The mass number of nucleus having radius equal to half of the radius of nucleus with mass number 256 is:

- (A) 64
- (B) 80
- (C) 100
- (D) 50

Q16. Two conductors possess identical resistances at a temperature of 0°C , yet their temperature coefficients of resistance are α_1 and α_2 . What are the corresponding temperature coefficients for their series and parallel arrangements?

- (A) $\alpha_1 + \alpha_2, \alpha_1 + \frac{\alpha_2}{2}$

- (B) $\alpha_1 + \frac{\alpha_2}{2}, \alpha_1 + \frac{\alpha_2}{2}$
- (C) $\alpha_1 + \alpha_2, \alpha_1\alpha_2\alpha_1 + \alpha_2$
- (D) $\alpha_1 + \frac{\alpha_2}{2}, \alpha_1 + \alpha_2$

Q17. A transparent film of refractive index, 1.8 is coated on a glass slab of refractive index, 1.5. What is the minimum thickness of transparent film to be coated for the maximum transmission of Green light of wavelength 600 nm. [Assume that the light is incident nearly perpendicular to the glass surface.]

- (A) 150 nm
- (B) 300 nm
- (C) 100 nm
- (D) 75 nm

Q18. A massless spring gets elongated by amount under a tension of 6 N. Its elongation is under the tension of 8 N. For the elongation of , the tension in the spring will be,

- (A) 32 N
- (B) 18 N
- (C) 14 N
- (D) 24 N

Q19. During a nuclear fission process involving an isotope with mass M , three identical daughter nuclei of equal mass are produced. The velocity of one of the daughter nuclei in relation to the mass defect ΔM will be:

- (A) $\sqrt{2}\vec{M}\vec{M}$
- (B) $\vec{M}\Delta M^{\frac{2}{3}}$
- (C) $\vec{M}\sqrt{2}\Delta MM$
- (D) $\vec{M}\sqrt{3}\Delta MM$

Q20. A beam of unpolarised light with an intensity of I_0 passes through a polaroid A and subsequently through another polaroid B , which is positioned such that its principal plane forms an angle of 45° with respect to that of A . What is the intensity of the light that emerges?

- (A) $\frac{I_0}{4}$
- (B) I_0
- (C) $\frac{I_0}{2}$
- (D) $\frac{I_0}{8}$

Section B: Integer Type Questions

Q21. Mercury is filled in a tube of radius $r = 0.01$ m up to a height of $h = 0.5$ m. The force exerted by mercury on the bottom of the tube is calculated using the formula $F = P_{total} \cdot A$, where $P_{total} = \rho gh + P_{atm}$, ρ is the density of mercury ($\rho = 13560 \text{ kg m}^{-3}$), and g is the acceleration due to gravity ($g = 9.81 \text{ m s}^{-2}$). Calculate the force exerted by mercury on the bottom of the tube in Newtons.

Q22. Two soap bubbles of radius 3 cm and 5 cm, respectively, are in contact with each other. The radius of curvature of the common surface, in cm, is _____.

Q23. An electric field \vec{E} passes through a surface of area A having unit vector \hat{n} . The electric flux Φ_E for that surface is given by the equation $\Phi_E = \vec{E} \cdot \hat{n}A$. If the electric field strength is 3 N/C and the area is 4 m^2 , what is the electric flux for that surface?

Q24. In Young's double slit experiment, monochromatic light of wavelength 6000 \AA is used. The slits are 0.8 mm apart and screen is placed at 1.2 m away from slits. The distance from the centre of the screen where intensity becomes half of the maximum intensity for the first time is $\times 10^{-6}\text{ m}$.

Q25. A particle is moving in one dimension (along x axis) under the action of a variable force. Its initial position was 20 m right of origin. The variation of its position x with time t is given as $x = -4t^3 + 24t^2 + 20t$, where x is in m and t is in s. The velocity of the particle when its acceleration becomes zero is m/s^{-1} .

Q26. Three moles of an ideal gas are compressed isothermally from a volume of $V_1 = 10\text{ L}$ to a volume of $V_2 = 5\text{ L}$ using a constant pressure of $P = 2\text{ atm}$. The heat exchange for the compression is $L\text{ atm.}$

Q27. A square loop of edge length L carrying a current I is placed with its edges parallel to the x and y axes. A magnetic field is passing through the plane and expressed as $B = B_0\hat{k}$, where B_0 is a constant. The net magnetic force experienced by the loop is given by the formula $F = ILB \sin\theta$, where θ is the angle between the current direction and the magnetic field. Calculate the net magnetic force experienced by the loop.

Q28. A 2 A current carrying straight metal wire of resistance R , resistivity ρ , area of cross-section A , and mass m is suspended horizontally in mid air by applying a uniform magnetic field B . The magnitude of the magnetic field B required to suspend the wire is $R = 5\text{ }\Omega$, $(\text{given, } \rho = 1.68 \times 10^{-8}\Omega \cdot \text{m}, A = 1 \times 10^{-6}\text{ m}^2, m = 0.1\text{ kg})$.

Q29. A ball rolls off the top of a stairway with horizontal velocity v_0 . The steps are high h and wide w . The minimum velocity with which that ball just hits the step of the stairway will be $v_{min} = \sqrt{2gh}$, where g is the acceleration due to gravity.

Q30. A particle is projected at an angle of 30° from the horizontal at a speed of 20 m/s. The height traversed by the particle in the first second is $h_1 = 5\text{ m}$ and the height traversed in the last second, before it reaches the maximum height, is $h_2 = 20\text{ m}$. The ratio $\frac{h_1}{h_2}$ is $g = 9.8\text{ m/s}^2$ [Take,

Chemistry

Section A: Multiple Choice Questions (MCQ)

Q31. The density of a 3 M NaCl solution is 1.19 g/mL. The molality of the solution is calculated using the formula: molality = $\frac{\text{moles of solute}}{\text{mass of solvent (kg)}}$. What is the molality of the solution?

- (A) 1.79 m
- (B) 2.79 m
- (C) 2 m
- (D) 3 m

Q32. The equation representing the integrated rate law for a first-order reaction in the gas phase is expressed as (where P_i denotes the initial pressure and P_t represents the pressure at time t)

- (A) $k = 2.303t \times \log P_i 2P_i - P_t$
- (B) $k = 2.303t \times \log 2P_i 2P_i - P_t$
- (C) $k = 2.303t \times \log 2P_i - P_t P_i$
- (D) $k = 2.303t \times P_i 2P_i - P_t$

Q33. The material utilized in adsorption chromatography is/are - A. silica gel B. alumina C. quick lime D. magnesia Select the most suitable answer from the options provided below:

- (A) A only
- (B) B only
- (C) C and D only
- (D) A and B only

Q34. Following are the four molecules "P", "Q", "R" and "S". Which one among the four molecules will react with at the fastest rate?

- (A) R
- (B) P
- (C) Q
- (D) S

Q35. Which of the following statements are true? A. Glycerol is purified through vacuum distillation since it decomposes at its typical boiling point. B. Aniline can be purified using steam distillation because it is miscible in water. C. Ethanol can be isolated from an ethanol-water mixture via azeotropic distillation due to its ability to form an azeotrope. D. An organic compound is considered pure if the mixed melting point remains constant. Select the most suitable answer from the options provided below:

- (A) A, B, C only
- (B) A, C, D only
- (C) A, B, D only
- (D) B, C, D only

Q36. Presented below are two statements: one is designated as Assertion (A) and the other as Reason (R). Assertion (A): The reaction of A occurs more readily than the reaction of B. Reason (R): The partially bonded unhybridized *p*-orbital that forms in the trigonal bipyramidal transition state is stabilized through conjugation with the phenyl ring. Based on the above statements, select the most suitable answer from the options provided below:

- (A) (A) is correct but (R) is not correct
- (B) (A) is not correct but (R) is correct
- (C) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- (D) Both (A) and (R) are correct and (R) is the correct explanation of

Q37. Identify the correct sequence of reactivity for the electrophilic substitution reaction among the given compounds:

- (A) B > C > A > D

- (B) D > C > B > A
- (C) A > B > C > D
- (D) B > A > C > D

Q38. In a multielectron atom, which of the following orbitals characterized by three quantum numbers will possess identical energy when electric and magnetic fields are absent? Choose the correct answer from the options provided below:

- (A) B and C Only
- (B) A and B Only
- (C) C and D Only
- (D) D and E Only

Q39. Consider the given chemical reaction : Product " " is :

- (A) picric acid
- (B) acetic acid
- (C) adipic acid
- (D) oxalic acid

Q40. Among the following compounds, which one exhibits the least ionic character?

- (A) BaCl₂
- (B) AgCl
- (C) KCl
- (D) CoCl₂

Q41. A quantity of ice with a certain mass and temperature is converted into vapor at a specific temperature by the addition of heat. The total work needed for this transformation is, (Consider, specific heat of ice, specific heat of water, specific heat of steam, latent heat of ice, and latent heat of steam)

- (A) 3043 J
- (B) 3024 J
- (C) 3003 J
- (D) 3022 J

Q42. Which of the following oxidation reactions are performed by both species in an acidic environment? A. B. C. D. E. Select the correct response from the choices provided below:

- (A) C, D and E Only
- (B) B, C and D Only
- (C) A, D and E Only
- (D) A, B and C Only

Q43. If the root mean square velocity of hydrogen molecule at a given temperature and pressure is $3 \times 10^3 \text{ m s}^{-1}$, the root mean square velocity of oxygen at the same condition in m s^{-1} is :

1.0 0.6 1.2 0.4

The atomic mass of ${}_{6}^{12}\text{C}$ is 12.000000 u, while that of ${}_{6}^{13}\text{C}$ is 13.003354 u. The energy needed to detach a neutron from ${}_{6}^{13}\text{C}$, given that the mass of the neutron is 1.008665 u, is:

- (A) 62.5MeV
- (B) 6.25MeV
- (C) 4.95MeV
- (D) 49.5MeV

The property that is constant for molecules of all gases at a specific temperature is:

- (A) kinetic energy
- (B) momentum
- (C) mass
- (D) speed

A container at a temperature of 1000 K has a pressure of 0.5 atm. A portion of it is transformed into CO upon the introduction of graphite. If the total pressure at equilibrium reaches 0.8 atm, what is the value of K_p ?

- (A) 1.8 atm
- (B) 0.3 atm
- (C) 3 atm
- (D) 0.18 atm

Below are two assertions: Assertion (I): The formation of Ce^{+4} in the Lanthanoids is favored due to its noble gas configuration. Assertion (II): Ce^{+4} acts as a strong oxidizing agent, reverting to the more common +3 oxidation state. Based on the above assertions, select the most suitable answer from the options provided below:

- (A) Statement I is false but Statement II is true
- (B) Both Statement I and Statement II are true
- (C) Statement I is true but Statement II is false
- (D) Both Statement I and Statement II are false

Identify the quantity of elements from the list below that are not classified as lanthanoids.

- (A) 3
- (B) 4
- (C) 1
- (D) 5

The IUPAC designation for the hydrocarbon shown below is:

- (A) 2-Ethyl-3,6-dimethylheptane
- (B) 2,5,6-Trimethyloctane
- (C) 3,4,7-Trimethyloctane
- (D) 2-Ethyl-2,6-diethylheptane

The following are two statements: Statement I: One mole of propyne reacts with an excess of sodium to release half a mole of gas. Statement II: Four g of propyne reacts to produce gas that occupies 224 mL at STP. Based on the above statements, select the most suitable answer from the options provided below:

- (A) Statement I is incorrect but Statement II is correct
- (B) Both Statement I and Statement II are correct
- (C) Statement I is correct but Statement II is incorrect
- (D) Both Statement I and Statement II are incorrect

Section B: Integer Type Questions

Q51. The number of halobenzenes from the following that can be prepared by Sandmeyer's reaction is _____.

reaction is determined by the presence of appropriate functional groups. Consider the following compounds: 1) Chlorobenzene, 2) Bromobenzene, 3) Iodobenzene, 4) Fluorobenzene. The number of halobenzenes from the following that can be prepared by Sandmeyer's

Q52. Cyclohexene is _____ type of an organic compound.

Q53. Number of metal ions characterized by flame test among the following is _____.
 Sr^{2+} , Ba^{2+} , Ca^{2+} , Cu^{2+} , Zn^{2+} , Co^{2+} , Fe^{2+} .

Q54. In the Claisen-Schmidt reaction to prepare dibenzalacetone using acetone, the amount of benzaldehyde required is _____ g. (Nearest integer)

Q55. The total number of molecules with zero dipole moment among the following options is _____. Consider the following molecules: A) CO_2 , B) H_2O , C) CH_4 , D) NH_3 , E) CCl_4 .

Q56. If the following chemical equation is balanced with integer coefficients: $4\text{Fe} + 3\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3$, the value of the coefficient for Fe is _____.

Q57. Phthalimide is made to undergo a sequence of reactions involving hydrolysis, followed by a nucleophilic substitution and a reduction. The final product 'P' contains a total number of bonds. Total number of bonds present in product 'P' is/are _____.

Q58. An ideal gas, with an initial temperature of $T_1 = 300\text{ K}$ and an initial pressure of $P_1 = 1\text{ atm}$, is expanded adiabatically against a constant pressure of 1 atm until it doubles in volume. If the molar heat capacity at constant volume is $C_V = 3R$, then the final temperature is _____ (nearest integer).

Q59. A star has a helium composition. It starts to convert three helium nuclei into one carbon nucleus via the triple alpha process as energy is released. The mass of the star is $M_{\text{star}} = 2 \times 10^{30}\text{ kg}$ and it generates energy at the rate of $L = 3.8 \times 10^{26}\text{ W}$. The rate of converting these helium nuclei to carbon is $R = \frac{L}{\Delta E}$, where ΔE is the energy released per reaction. [Take, mass of helium $m_{\text{He}} = 4\text{ u}$, mass of carbon $m_C = 12\text{ u}$]

Q60. An artificial cell is made by encapsulating a glucose solution within a semipermeable membrane. The osmotic pressure developed when the artificial cell is placed within a solution of 0.5 M glucose at 25°C is _____ bar. (nearest integer). [Given: $R = 0.0831\text{ L bar K}^{-1}\text{ mol}^{-1}$] Assume completed dissociation of glucose into its constituent molecules.

Mathematics

Section A: Multiple Choice Questions (MCQ)

Q61. Let be a function defined by $f(x) = 3x^2 + 5x + 2$, then the value of $f(10)$ is

- (A) 352
- (B) 425
- (C) 375
- (D) 450

Q62. Given that $0 < c < b < a$, consider the equation $(a+b-2c)x^2 + (b+c-2a)x + (c+a-2b) = 0$, with $\alpha \neq 1$ being one of its roots. Then, evaluate the following two statements: (I) If $\alpha \in (-1, 0)$, then b cannot be the geometric mean of a and c . (II) If $\alpha \in (0, 1)$, then b may be the geometric mean of a and c .

- (A) Both (I) and (II) are true
- (B) Neither (I) nor (II) is true
- (C) Only (II) is true
- (D) Only (I) is true

Q63. Consider the image of the point $(1, 0, 7)$ on the line defined by $x_1 = y - 1 = z - 2$. Let this image be represented by the point (α, β, γ) . Which of the following points lies on the line that passes through (α, β, γ) and forms angles of $\frac{2\pi}{3}$ and $\frac{3\pi}{4}$ with the y -axis and z -axis, respectively, while also making an acute angle with the x -axis?

- (A) $(1, -2, 1 + \sqrt{2})$
- (B) $(1, 2, 1 - \sqrt{2})$
- (C) $(3, 4, 3 - 2\sqrt{2})$
- (D) $(3, -4, 3 + 2\sqrt{2})$

Q64. Let $f(x) = 2x + 4$ for some function. Then $f(1)$ is equal to

- (A) 6
- (B) 8
- (C) 10
- (D) 4

Q65. Let $x = 12$ and $y = 3$. Then $x \div y$ is equal to :

- (A) 4
- (B) 3
- (C) 6
- (D) 2

Q66. For $0 < a < 1$, the value of the integral $\int_0^\pi \frac{dx}{1-1.5a \cos x + a^2}$ is:

- (A) $\frac{\pi}{2} + a^2$
- (B) $\frac{\pi}{2} - a^2$
- (C) $\pi - a^2$
- (D) $\pi + a^2$

Q67. Two marbles are drawn in succession from a box containing 12 red, 24 white, 18 blue and 10 orange marbles, with replacement being made after each drawing. Then the probability, that first drawn marble is red and second drawn marble is white, is

- (A) $3/25$
- (B) $6/25$
- (C) $5/12$
- (D) $2/15$

Q68. Let e and l denote the eccentricity and the length of the latus rectum of the ellipse. If $e = 0.6$ and $l = 10$, then l is equal to.

- (A) 6
- (B) 12
- (C) 8
- (D) 16

Q69. The remainder, when 123 is divided by 29, is equal to :

- (A) 6
- (B) 8
- (C) 5
- (D) 4

Q70. Let for all x . Consider a function such that for all x . Then the value of $f(x)$ is :

- (A) 2
- (B) 8
- (C) 4
- (D) 16

Q71. Let be the values of m , for which the equations and have infinitely many solutions. Then the value of is equal to:

- (A) 2800
- (B) 640
- (C) 2910
- (D) 520

Q72. Consider m and n as the coefficients of the seventh and thirteenth terms, respectively, in the expansion of $1\frac{3}{x} + \frac{1}{2}x^{\frac{2}{3}}18$. Then, the value of $nm\frac{1}{3}$ is:

- (A) 4/9
- (B) 1/9
- (C) 1/4
- (D) 9/4

Q73. A container holds 8 balls, which are either black or white. When 4 balls are randomly selected without replacement, it was determined that 2 of them are white and the other 2 are black. What is the probability that there is an equal number of white and black balls in the bag?

- (A) 2/5
- (B) 2/7
- (C) 1/7
- (D) 1/5

Q74. Let the sum of the maximum and the minimum values of the function be x , where $x = 2 + 3$. Then x is equal to :

- (A) 5
- (B) 6
- (C) 7

(D) 8

Q75. Let e_1 be the eccentricity of the hyperbola $x^2 - \frac{y^2}{25 - \frac{y^2}{16}} = 1$ and e_2 be the eccentricity of the ellipse $x^2 + \frac{y^2}{a^2 + \frac{y^2}{b^2}} = 1$, $a > b$, which passes through the foci of the hyperbola. If $e_1 e_2 = 1$, then the length of the chord of the ellipse passing through $(0, 3)$ is :

- 6 $\sqrt{5}$ 12 $\sqrt{5}/5$ 15 $\sqrt{5}/5$ 4 $\sqrt{5}$

The 20 th term from the end of the progression $30, 29 \frac{1}{2}, 29, 28 \frac{1}{2}, \dots, -139 \frac{1}{2}$ is :-

- (A) -128
(B) -120
(C) -125
(D) -110

If one of the diameters of the circle $x^2 + y^2 - 10x + 4y + 13 = 0$ is a chord of another circle C , whose center is the point of intersection of the lines $2x + 3y = 12$ and $3x - 2y = 5$, then the radius of the circle C is:

- (A) $\sqrt{20}$
(B) 4
(C) 6
(D) $3\sqrt{2}$

A circle is inscribed in an equilateral triangle of side of length 12 . If the area and perimeter of any square inscribed in this circle are and , respectively, then is equal to

- (A) 408
(B) 414
(C) 396
(D) 312

If $x = 10$ and $y = 0$, then what is the value of $x^2 + y^2$?

- (A) 64
(B) 196
(C) 144
(D) 100

Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a function defined by $f(x) = \frac{x}{1+x^{4/4}}$ and let $g(x) = f(f(f(f(x))))$. Then evaluate the integral $18 \int_0^{\sqrt{2}} \sqrt{5} x^2 g(x) dx$.

- (A) 33
(B) 36
(C) 42
(D) 39

Section B: Integer Type Questions

Q81. Consider the function defined by $f(x) = 2^x$. If the composition of f with itself, denoted as $f(f(x))$, is evaluated at $x = 5$, then the value of $f(f(5))$ is equal to

Q82. Let for any three distinct consecutive terms of an A.P., denoted as a , $a + d$, and $a + 2d$, the lines represented by the equations $x + y = a$, $2x - y = a + d$, and $x - 2y = a + 2d$ be concurrent at a point. If the system of equations has infinitely many solutions, then the value of d is equal to

Q83. Consider the matrices $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix}$. Let the set of all x , for which the system of equations $Ax = B$ has a negative solution (i.e., $x_1 < 0$ and $x_2 < 0$), be the interval (a, b) . Then $b - a$ is equal to

Q84. If r_1 and r_2 are the roots of the quadratic equation $x^2 - 7x + 6 = 0$, then $r_1 + r_2$ is equal to

Q85. Let $A = \{1, 2, 3\}$. The number of relations on A , containing the elements $(1, 1)$, $(2, 2)$, and $(3, 3)$, which are reflexive and transitive but not symmetric, is

Q86. Let $f(x) = \frac{1}{x}$ for $x > 0$ and $f(x) = 0$ for $x \leq 0$. Let $[.]$ denote the greatest integer function. If A and B are the number of points where f is not continuous and is not differentiable, respectively, then $A + B$ equals

Q87. The number of distinct real roots of the equation $x^3 - 6x^2 + 11x - 6 = 0$ is

Q88. What is the remainder when $x^3 + 2x^2 + 3x + 4$ is divided by $x + 1$?

Q89. Let x be a real number such that $x + 3 = 8$. Then x is equal to

Q90. The number of real solutions of the equation $x(x^2 + 3|x| + 5|x - 1| + 6|x - 2|) = 0$ is

Answer Key

Physics

Section A (MCQ):

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
(4)	(1)	(4)	(4)	(4)	(1)	(2)	(4)	(3)	(3)
Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
(2)	(2)	(1)	(1)	(1)	(2)	(1)	(1)	(3)	(1)

Section B (Integer):

Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30
177	4	12	125	52	200	160	5	2	5

Chemistry

Section A (MCQ):

Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
(2)	(1)	(2)	(3)	(2)	(4)	(4)	(4)	(3)	(2)
Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50
(1)	(4)	(2)	(3)	(1)	(1)	(2)	(1)	(2)	(3)

Section B (Integer):

Q51	Q52	Q53	Q54	Q55	Q56	Q57	Q58	Q59	Q60
2	4	4	318	3	4	8	274	15	25

Mathematics

Section A (MCQ):

Q61	Q62	Q63	Q64	Q65	Q66	Q67	Q68	Q69	Q70
(1)	(1)	(3)	(1)	(1)	(1)	(1)	(1)	(3)	(3)
Q71	Q72	Q73	Q74	Q75	Q76	Q77	Q78	Q79	Q80
(1)	(4)	(2)	(1)	(3)	(3)	(3)	(1)	(4)	(4)

Section B (Integer):

Q81	Q82	Q83	Q84	Q85	Q86	Q87	Q88	Q89	Q90
1024	113	450	6	3	5	3	1	5	1