

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 accurate form of Bernoulli's equation is (the symbols represent their standard meanings):

- (A) constant
- (B) constant
- (C) constant
- (D) constant

Q2. A mass ' m ' is launched from the origin into a vertical plane at an angle to the x-axis with an initial velocity. When the object reaches its maximum height, the magnitude and direction of its angular momentum relative to the origin will be [g denotes the acceleration due to gravity]

- (A) along negative -axis
- (B) along positive -axis
- (C) along negative -axis
- (D) along positive -axis

Q3. What is the threshold frequency of a metal that has a work function of 6.63 eV?

- (A) 16×10^{15} Hz
- (B) 16×10^{12} Hz
- (C) 1.6×10^{12} Hz
- (D) 1.6×10^{15} Hz

Q4. In a straight co-axial cable, if the inner and outer conductors carry equal currents flowing in opposite directions, the magnetic field will be nonexistent:

- (A) outside the cable
- (B) inside the outer conductor
- (C) inside the inner conductor

(D) in between the two conductors

Q5. A proton traveling at a uniform speed traverses a certain area without altering its speed. If \vec{E} and \vec{B} denote the electric and magnetic fields respectively, then this area might possess:

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

Q6. The following two statements are provided: Statement I: In vernier callipers, a division on the vernier scale is always less than a division on the main scale. Statement II: The vernier constant is calculated by multiplying one main scale division by the number of divisions on the vernier scale. Based on these statements, select the accurate answer from the options listed below.

- (A) Statement I is true but Statement II is false
- (B) Statement I is false but Statement II is true
- (C) Both Statement I and Statement II are false
- (D) Both Statement I and Statement II are true 2025 (22 Jan Shift 1)

Q7. For an ideal gas, the relationship between pressure and volume is expressed as $PV^{\frac{3}{2}} = K(\text{Constant})$. WI

$$2 (83543 1 83549 1 - 83543 2 83549 2) 2 (83543 2 83549 2 - 83543 1 83549 1) \\ 221a83543 1 83549 1 - 221a83543 2 83549 2 221a83543 2 - 83543 1 221a83549 1$$

A uniform magnetic field of 3×10^{-3} T acts along positive Y-direction. A rectangular loop of sides 25 cm and 15 cm with current of 6 A is in Y-Z plane. The current is in anticlockwise sense with reference to negative X axis. Magnitude and direction of the torque is :

- (A) $3 \times 10^{-4} \text{ N}$ along positive Z direction $3 \times 10^{-4} \text{ N}$ along negative Z direction
- (B) $3 \times 10^{-4} \text{ N}$ along positive X direction $3 \times 10^{-4} \text{ N}$ along positive Y direction
- 12 divisions on the main scale of a Vernier calliper coincide with 14 divisions on the Vernier scale. If each division on the main scale is of 6 units, the least count of the instrument is :

 - (A) 6/14
 - (B) 12/14
 - (C) 72/14
 - (D) 6/7

The maximum percentage error in the measurement of density of a wire is [Given, mass of wire 2.5 kg, radius of wire 0.4 cm, length of wire 1.8 m]

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

A simple pendulum of length 1.5 m has a wooden bob of mass 1.5 kg. It is struck by a bullet of mass 0.015 kg moving with a speed of 150 m s^{-1} . The bullet gets embedded into the bob. The height to which the bob rises before swinging back is. (use $g = 10 \text{ m s}^{-2}$)

- (A) 0.45 m
- (B) 0.25 m
- (C) 0.30 m

(D) 0.50 m

Associate the items in List-I with those in List-II: Select the correct response from the options provided below:

- (A) (A)-(IV), (B)-(I), (C)-(III), (D)-(II)
- (B) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)
- (C) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)
- (D) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

Force between two point charges 1 and 2 placed in vacuum at $r = 4$ cm apart is . Force between them when placed in a medium having dielectric $K=6$ at $r = 6$ cm apart will be:

- (A) 83539 12
- (B) 683539
- (C) 83539 4
- (D) 2483539

Below are two statements: one is referred to as Assertion (A) and the other as Reason (R). Assertion (A): To ascertain the position and momentum at any given moment for simple harmonic motion with a specified angular frequency, it suffices to know the initial position and initial momentum. Reason (R): The amplitude and phase can be represented in terms of and . Based on the above statements, select the correct answer from the following options:

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

A capacitor and a bulb are arranged in series with an AC power source. Subsequently, a dielectric material is introduced between the capacitor's plates. What happens to the brightness of the bulb?

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

In a plane electromagnetic wave, the electric field varies sinusoidally with a frequency of 5×10^{10} Hz and an amplitude of 50 V m $^{-1}$. What is the total average energy density of the electromagnetic field of this wave? [Use $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$]

- (A) 1.106 $\times 10^{-13}$ J m $^{-2}$
- (B) 4.425 $\times 10^{-13}$ J m $^{-2}$
- (C) 2.212 $\times 10^{-13}$ J m $^{-2}$
- (D) 2.212 $\times 10^{-13}$ J m $^{-2}$

A heavy iron bar of weight 18 kg is having its one end on the ground and the other on the shoulder of a man. The rod makes an angle 60° with the horizontal, the normal force applied by the man on bar is:

- (A) 9 kg - wt
- (B) 18 kg - wt
- (C) 4.5 kg - wt
- (D) 9 $\times 10^3$ kg - wt

As the temperature increases, how does the Young's modulus of elasticity behave?

- (A) changes erratically

- (B) decreases
- (C) increases
- (D) remains unchanged

Two point charges $+3 \mu C$ and $-3\mu C$, constituting an electric dipole, are replaced at 0.2 m and 0.4 m in a uniform field of 18.4 mJ 16.4 mJ 14.4 mJ 12.4 mJ

A transparent film of refractive index, 1.8 is coated on a glass slab of refractive index, 1.55. What is the minimum thickness of transparent film to be coated for the maximum transmission of Green light of wavelength 520 nm. [Assume that the light is incident nearly perpendicular to the glass surface.]

- (A) 104 nm
- (B) 208 nm
- (C) 130 nm
- (D) 78 nm

Section B: Integer Type Questions

Q21. A double slit interference experiment performed with a light of wavelength 660 nm forms an interference fringe pattern on a screen with 10 th bright fringe having its centre at a distance of 12 mm from the central maximum. Distance of the centre of the same 10 th bright fringe from the central maximum when the source of light is replaced by another source of wavelength 720 nm would be _____ mm.

Q22. The depth below the surface of sea to which a rubber ball be taken so as to decrease its volume by 0.02% is ____ m. (Take density of sea water = 10^3 kg m^{-3} , Bulk modulus of rubber = $8 \times 10^8 \text{ N m}^{-2}$, and $g = 9.8 \text{ m s}^{-2}$)

Q23. An electric field of strength E passes through a surface of area A having a unit vector n. The electric flux Φ_E for that surface is given by the formula $\Phi_E = E \cdot A \cdot n$. If the electric field strength is 12 N/C, the area is 1 m^2 , and the angle between the electric field and the normal to the surface is 0 degrees, what is the electric flux for that surface?

Q24. A hypothetical electromagnetic wave is shown below. The frequency of the wave is measured to be approximately $5 \times 10^{14} \text{ Hz}$, which is in the visible spectrum. What is the frequency of the wave in Hz, rounded to the nearest integer?

Q25. Two identical charged spheres are suspended by strings of equal lengths. The string make an angle of 45° with each other. When suspended in a liquid of density 0.9 g cm^{-3} , the angle remains same. If density of material of the sphere is 1.8 g cm^{-3} , the dielectric constant of the liquid is _____ $\tan 45^\circ = 1$

Q26. What is the frequency of the de-Broglie wave of an electron in Bohr's first orbit of a hydrogen atom, calculated using the formula $f = \frac{E}{h}$ where E is the energy of the electron and h is Planck's constant? Provide the answer to the nearest integer.

Q27. A simple pendulum is placed at a place where its distance from the earth's surface is equal to the radius of the earth. If the length of the string is 5 m, then the time period of small oscillations will be _____ s. [take $g = 10 \text{ m s}^{-2}$]

Q28. A horizontal straight wire long extending from east to west falling freely at right angles to the horizontal component of the earth's magnetic field. The instantaneous value of emf induced in the wire when its velocity is 4 m/s is _____.

Q29. Three capacitors of capacitances $C_1 = 4 \mu\text{F}$, $C_2 = 6 \mu\text{F}$, and $C_3 = 8 \mu\text{F}$ are connected in parallel to a supply of voltage $V = 12 \text{ V}$. The energy stored in the above combination is E . When these capacitors are connected in series to the same supply, the stored energy is E_{series} . The value of E_{series} is _____.

Q30. A nucleus has mass number $A_1 = 12$ and volume V_1 . Another nucleus has mass number $A_2 = 4A_1 = 48$, then $V_2/V_1 =$ _____.

Chemistry

Section A: Multiple Choice Questions (MCQ)

Q31. Which structure has the highest to lowest relative stability?

- (A) I > II > III
- (B) II > I > III
- (C) I = II = III
- (D) III > II > I

Q32. A mixture of CaCO_3 and MgCO_3 with a total mass of 2.21 g was heated until a stable mass of 1.152 g was achieved. What is the composition of this mixture? (Molar masses are given in g mol⁻¹: $\text{CaCO}_3 : 100$, $\text{MgCO}_3 : 84$)

- (A) 1.187 g $835368354e8353683542$ $3 + 1.023$ g $Mg8353683542$ 3
- (B) 1.023 g $835368354e8353683542$ $3 + 1.023$ g $Mg8353683542$ 3
- (C) 1.187 g $835368354e8353683542$ $3 + 1.187$ g $Mg8353683542$ 3
- (D) 1.023 g $835368354e8353683542$ $3 + 1.187$ g $Mg8353683542$ 3

Q33. The density of a ' ' solution with a concentration of ' ' molar is , whereas the solution's concentration in terms of molality is . What is then ? (Given: The molar mass of is)

- (A) 3.5
- (B) 3.8
- (C) 2.8
- (D) 3.0

Q34. The techniques employed for the purification of organic substances rely on:

- (A) nature of compound and presence of impurity.
- (B) neither on nature of compound nor on the impurity present.
- (C) nature of compound only.
- (D) presence of impurity only.

Q35. Among the four molecules labeled as 'P', 'Q', 'R', and 'S', which molecule will undergo a reaction at the highest speed?

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

Q36. Listed below are the atomic numbers for several group 14 elements. Which element has the lowest melting point based on its atomic number?

- (A) 6
- (B) 82
- (C) 14
- (D) 50

Q37. Below are two statements: one is referred to as Assertion (A) and the other as Reason (R). Assertion (A): the reaction of occurs more readily than the reaction of . 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 statements provided, select the most suitable answer from the options listed 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

Q38. Which purification technique utilizes the principle of 'Adsorption'?

- (A) Extraction
- (B) Chromatography
- (C) Distillation
- (D) Sublimation

Q39. The following statements pertain to specific thermodynamic properties: (A) Internal energy, volume (V), and mass (M) are classified as extensive variables. (B) Pressure (P), temperature (T), and density () are categorized as intensive variables. (C) Volume (V), temperature (T), and density () are extensive variables. (D) Mass (M), temperature (T), and internal energy are regarded as intensive variables. Select the correct response from the options provided below:

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

Q40. A certain mass of ice at a given temperature is converted into vapor at a specified temperature by the addition of heat. The total work needed for this process 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

Q41. The following two statements are presented: Statement (I): reactions are termed 'stereospecific', which means they yield solely one stereo-isomer as the product. Statement (II): reactions typically lead to the production of racemic mixtures. Based on the statements above, select the correct option from those provided below:

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

Q42. For a non-metallic element 'E' from group 15 that has the least strong bond, what is the highest covalency it can achieve?

- (A) 4
- (B) 6
- (C) 3
- (D) 5

Q43. The equation for the integrated rate law for a first order reaction occurring in the gas phase is expressed as (where P_0 denotes the initial pressure and P_t represents the total pressure at time t)

- (A) $P_t = 2.303 t \log \frac{P_0}{P_t}$
- (B) $P_t = 2.303 t \log \frac{P_0}{P_t} - 2.303 t$
- (C) $P_t = 2.303 t \log \frac{P_0}{P_t} - 2.303 t \log \frac{P_0}{P_t}$
- (D) $P_t = 2.303 t \log \frac{P_0}{P_t} - 2.303 t$

Q44. Below are two statements, one termed Assertion (A) and the other termed Reason (R). Assertion (A): is a representation of an allyl halide. Reason (R): Allyl halides refer to compounds where the halogen atom is bonded to a hybridized carbon atom.

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

Q45. What type of protein structure stays unchanged after the coagulation of egg white when boiled?

- (A) Primary
- (B) Tertiary
- (C) Secondary
- (D) Quaternary

Q46. Below are two statements: Statement I: One mole of propyne reacts with an excess of sodium to produce half a mole of gas. Statement II: Four grams of propyne reacts to produce gas that occupies 224 mL at STP. Based on the aforementioned 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 2025 (22 Jan Shift 1)

Q47. Below are two assertions: Assertion I: The metallic radius of is and the ionic radius of is smaller than . Assertion II: Ions are consistently smaller in size than their respective elements. Based on these assertions, select the accurate answer from the options provided below:

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

Q48. A vessel at 1100 K contains with a pressure of 0.6 atm. Some of is converted into CO on addition of graphite. If total pressure at equilibrium is 0.9 atm, then K_p is:

- (A) 2.2 atm
- (B) 0.4 atm
- (C) 3.2 atm
- (D) 0.24 atm

Q49. Below are two assertions: Assertion I: The bromination of phenol in a solvent with low polarity, such as or, necessitates a Lewis acid catalyst. Assertion II: The Lewis acid catalyst facilitates the polarization of bromine to produce . Considering the above assertions, select the appropriate answer from the options provided below:

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

Q50. The atomic mass of ${}_{6}^{12}\text{C}$ is 12.000000 u and that of ${}_{6}^{14}\text{C}$ is 14.003242 u. The required energy to remove a neutron from ${}_{6}^{14}\text{C}$, if mass of neutron is 1.008665 u, will be:

- (A) 62.5MeV
- (B) 6.25MeV
- (C) 5.12MeV
- (D) 49.5MeV

Section B: Integer Type Questions

- Q51.** The number of molecules/ions that show linear geometry among the following is _____. Consider the following: A) BeCl₂ B) CO₂ C) H₂O D) CCl₄ E) N₂ F) ClF₃
- Q52.** Niobium (Nb) and ruthenium (Ru) have 4 and 8 number of electrons in their respective 4d orbitals. The value of the difference in electrons between them is _____.
- Q53.** On a thin layer chromatographic plate, an organic compound moved by a distance of 3 cm, while the solvent front moved by a distance of 21 cm. The retardation factor (R_f) of the organic compound is calculated using the formula R_f = (distance moved by the compound) / (distance moved by the solvent). Therefore, the retardation factor of the organic compound is _____.
- Q54.** The molar mass of the water insoluble product formed from the fusion of chromite ore with sodium carbonate in the presence of air is _____.
- Q55.** If the combustion reaction of octane (C₈H₁₈) is balanced with integer coefficients, the value of the coefficient for O₂ is _____. The balanced equation for the combustion of octane is: C₈H₁₈ + O₂ → CO₂ + H₂O.
- Q56.** A first row transition metal with the highest enthalpy of atomisation is Chromium (Cr), which upon reaction with oxygen at high temperature forms oxides of formula CrO₃ and CrO. The 'spin-only' magnetic moment value of the amphoteric oxide (CrO) from the above oxides is _____ (near integer) (Given atomic number: 24)
- Q57.** The concentration of a salt solution at which the salt begins to precipitate from a solution containing ions is known as the solubility product (K_{sp}). If the K_{sp} of a certain salt is 9, what is the concentration at which it begins to precipitate?
- Q58.** If 100 g of water and 100 g of acetic acid are mixed, the freezing point of the solution will be approximately X °C. Consider that acetic acid does not dimerize in water, nor dissociates in water. Calculate X (nearest integer). [Given: Molar mass of water: 18 g/mol, Molar mass of acetic acid: 60 g/mol, Freezing point of acetic acid: 16.6 °C]
- Q59.** In the Claisen-Schmidt reaction to prepare, dibenzalacetone from 6.8 g of benzaldehyde, a total of 4.25 g of product was obtained. The percentage yield in this reaction was _____ %.
- Q60.** In the given compound, butanoic acid (C₄H₈O₂), the number of carbon atoms is _____.

Mathematics

Section A: Multiple Choice Questions (MCQ)

- Q61.** The number of triangles whose vertices are at the vertices of a regular octagon but none of whose sides is a side of the octagon is
 (A) 48

- (B) 32
- (C) 24
- (D) 40

Q62. If the domain of the function is , then is equal to :

- (A) 40
- (B) 28
- (C) 36
- (D) 42

Q63. Suppose $32 - , , 80 - ,$ are the coefficient of four consecutive terms in the expansion of $(1 + x)^n$. Then the value of $2 - 3$ equals

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

Q64. The sum of the series $1 \ 1 - 3 \ 1 \ 2 + 1 \ 4 + 2 \ 1 - 3 \ 2 \ 2 + 2 \ 4 + 3 \ 1 - 3 \ 3 \ 2 + 3 \ 4 + . . .$ up to 10 terms is

- (A) 50 109
- (B) - 50 109
- (C) 60 109
- (D) - 60 109

Q65. Let $A(, 0)$ and $B(0 ,)$ be the points on the line $5x + 7y = 50$. Let the point P divide the line segment AB internally in the ratio $7:3$. Let $3x - 25 = 0$ be a directrix of the ellipse $E: x^2/a^2 + y^2/b^2 = 1$ and the corresponding focus be . If from , the perpendicular on the x - axis passes through P , then the length of the latus rectum of E is equal to

- (A) $25/3$
- (B) $32/9$
- (C) $25/9$
- (D) $32/5$

Q66. If the value of x is equal to the sum of the squares of two natural numbers a and b , where $a = 4$ and $b = 6$, then x is equal to:

- (A) 40
- (B) 52
- (C) 50
- (D) 54

Q67. The frequency distribution of the age of students in a class of 42 students is given below. If the mean deviation about the median is 1.5, then is equal to :

- (A) 45
- (B) 43

- (C) 48
(D) 46

Q68. Suppose there exists a function defined by where . If the function is continuous at , what is the value of ?

- (A) 3
(B) 12
(C) 48
(D) 6

Q69. Assume that and . Given that , what is the value of ?

- (A) 36
(B) 16
(C) 1
(D) 49

Q70. Consider the area of the region as A. Therefore, 6 A is equivalent to:

- (A) 16
(B) 12
(C) 14
(D) 18

Q71. Consider the function $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = a - b\cos 2x$ for $x < 0$, $x^2 + cx + 2$ for $0 \leq x \leq 1$, and $2x + 1$ for $x > 1$. If the function f is continuous at all points in \mathbb{R} and m represents the count of points where f is not differentiable, what is the sum of $m + a + b + c$?

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

Q72. If the variance of the frequency distribution is 225, then the value of is

- (A) 6
(B) 9
(C) 7
(D) 8

Q73. Let $m = 12$ and $n = 8$. Then the number of many-one functions such that $m \rightarrow n$ is equal to:

- (A) 139
(B) 127
(C) 151
(D) 145

Q74. The value of the integral $\int_0^6 x dx \sin(5) 3x + \cos(5) 3x$ equals:

- (A) $\sqrt{2\pi} \frac{3}{12}$
- (B) $\sqrt{2\pi} \frac{3}{24}$
- (C) $\sqrt{2\pi} \frac{3}{48}$
- (D) $\sqrt{2\pi} \frac{3}{36}$

Q75. Consider the term of an A.P. If for certain values of , and , then what is the value of ?

- (A) 98
- (B) 126
- (C) 142
- (D) 112

Q76. The 20 th term from the end of the progression $25, 24 \frac{1}{4}, 23 \frac{1}{2}, 22 \frac{3}{4}, \dots, -134 \frac{1}{4}$ is :-

- (A) -123
- (B) -125
- (C) -120
- (D) -130

Q77. If all the words with or without meaning made using all the letters of the word "NAGPUR" are arranged as in a dictionary, then the word at position in this arrangement is :

- (A) NRAGUP
- (B) NRAPUG
- (C) NRAPGU
- (D) NRAGPU

Q78. Consider the vectors and . If denotes the unit vector pointing in the direction of such that , what is the value of ?

- (A) 11
- (B) 3
- (C) 9
- (D) 6

Q79. Consider a function that takes real values. If the minimum and maximum values of this function are denoted as and , what is the value of ?

- (A) 42
- (B) 38
- (C) 24
- (D) 44

Section B: Integer Type Questions

Q80. Let $P(a, b)$ be a point on the parabola $y = x^2$. If P also lies on the chord of the parabola whose mid point is $M(4, 16)$, then the value of 'a' is equal to _____.

Q81. Let $\mathbf{a}, \mathbf{b}, \mathbf{c}$ be three given vectors. If \mathbf{d} is a vector such that $\mathbf{d} = \mathbf{a} + \mathbf{b} + \mathbf{c}$ and $\mathbf{d} \cdot \mathbf{c} = 569$, then \mathbf{d} is equal to _____.

Q82. If α and β are the roots of the quadratic equation $x^2 - 8x + 12 = 0$, then the value of $\alpha + \beta$ is equal to _____.

Q83. If the equation of the line is given by $3x + 4y - 12 = 0$, and the point is $(2, 1)$, then the distance of the point from the line is _____.

Q84. Let a be a non-zero real number. Suppose $f: \rightarrow$ is a differentiable function such that $f(0) = 1$ and $\lim_{x \rightarrow -\infty} f(x) = 1$. If $f'(x) = f(x) + 3$ for all x , then find the value of $f(0) - \log(2)$.

Q85. Let x denote the fractional part of x and let $f(x) = \cos^{-1}(1 - x^2) - \sin^{-1}(1 - x) + x - x^3$, $x \neq 0$. If L and R respectively denote the left-hand limit and the right-hand limit of $f(x)$ at $x = 0$, then $32\pi^2 L^2 + R^2$ is equal to _____.

Q86. If $x + y = 10$, where $x = 2$ and $y = 8$, then $x * y$ is equal to _____.

Q87. The number of 3-digit numbers, that are divisible by 2 and 3, but not divisible by 4 and 9, is _____.

Q88. The number of solutions of the equation $x^2 - 4x + 4 = 0$, where x is a real number, is _____.

Q89. Consider A as a 2×2 real matrix and I as the identity matrix of size 2. Given that the solutions to the equation $|A - xI| = 0$ are -1 and 3, what is the total of the diagonal entries of the matrix A ?

Answer Key

Physics

Section A (MCQ):

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

Section B (Integer):

| Q21 | Q22 | Q23 | Q24 | Q25 | Q26 | Q27 | Q28 | Q29 | Q30 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 12 | 22 | 12 | 5 | 2 | 661 | 10 | 4 | 86 | 4 |

Chemistry

Section A (MCQ):

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

Section B (Integer):

| Q51 | Q52 | Q53 | Q54 | Q55 | Q56 | Q57 | Q58 | Q59 | Q60 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 6 | 11 | 0 | 160 | 8 | 0 | 9 | 31 | 62 | 3 |

Mathematics

Section A (MCQ):

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

Section B (Integer):

| Q80 | Q81 | Q82 | Q83 | Q84 | Q85 | Q86 | Q87 | Q88 | Q89 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 192 | 569 | 6 | 5 | 1 | 18 | 8 | 130 | 2 | 10 |