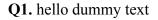
JEE Main 2023 (24 Jan Shift 1) Question Paper

Physics Questions



- (1) A III, B I, C II, D IV
- (2) A III, B IV, C I, D II
- (3) A II, B IV, C III, D I
- (4) A I, B III, C IV, D II
- **Q2.** The maximum vertical height to which a man can throw a ball is 136 m. The maximum horizontal distance upto which he can throw the same ball is
- (1) 192 m
- (2) 136 m
- (3) 272 m
- (4) 68 m
- Q3. As per given figure, a weightless pulley P is attached on a double inclined frictionless surface. The tension in the string (massless) will be (if $g = 10 \text{ m/s}^2$)
- (1) $4\sqrt{3} + 1$ N
- (2) $4\sqrt{3} + 1$ N
- (3) $4\sqrt{3} 1 \text{ N}$
- $(4) 4\sqrt{3} 1 N$
- **Q4.** Given below are two statements:

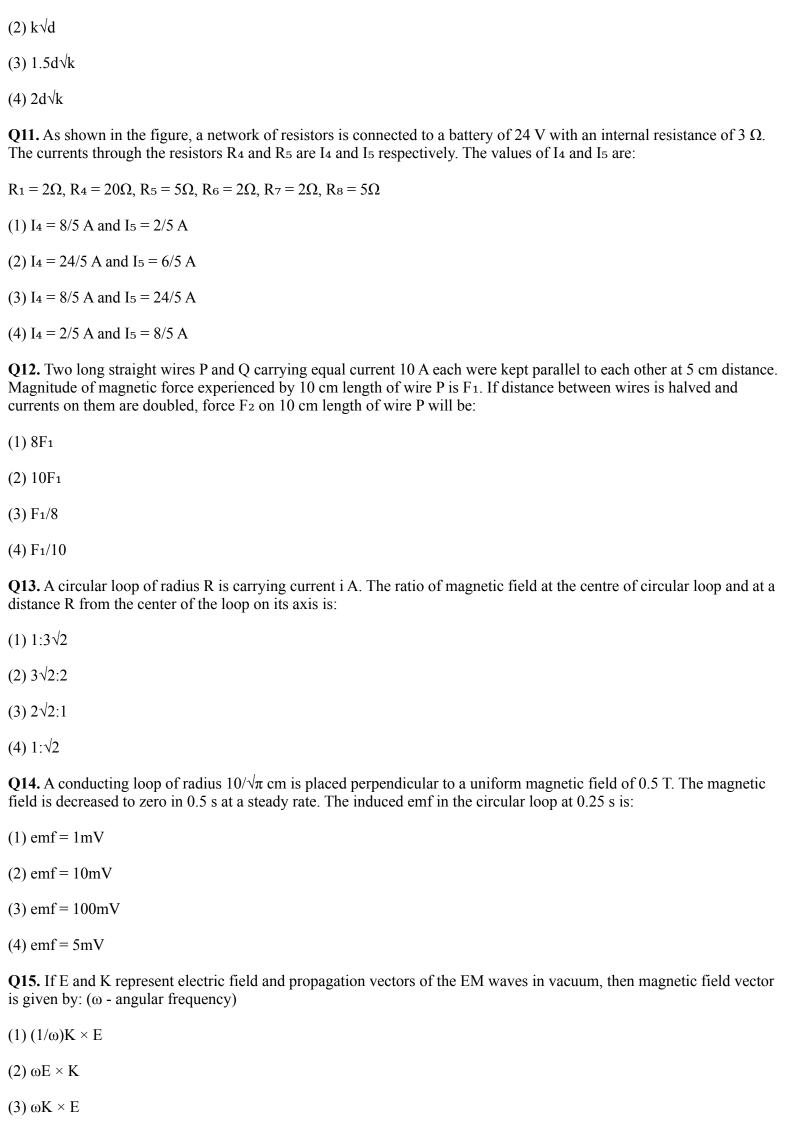
Statement I: An elevator can go up or down with uniform speed when its weight is balanced with the tension of its cable.

Statement II: Force exerted by the floor of an elevator on the foot of a person standing on it is more than his/her weight when the elevator goes down with increasing speed.

In the light of the above statements, choose the correct answer from the options given below:

- (1) Both Statement I and Statement II are false
- (2) Statement I is true but Statement II is false
- (3) Both Statement I and Statement II are true
- (4) Statement I is false but Statement II is true
- **Q5.** The weight of a body at the surface of earth is 18 N. The weight of the body at an altitude of 3200 km above the earth's surface is (given, radius of earth $R_e = 6400$ km)
- (1) 9.8 N
- (2) 4.9 N

(3) 19.6 N
(4) 8 N
Q6. A 100 m long wire having cross-sectional area 6.25×10^{-4} m² and Young's modulus is 10^{10} N/m² is subjected to a load of 250 N, then the elongation in the wire will be:
$(1) 6.25 \times 10^{-3} \text{ m}$
$(2) 4 \times 10^{-4} \mathrm{m}$
$(3) 6.25 \times 10^{-6} \mathrm{m}$
$(4) 4 \times 10^{-3} \text{ m}$
Q7. 1 g of a liquid is converted to vapour at 3×10^5 Pa pressure. If 10% of the heat supplied is used for increasing the volume by 1600 cm ³ during this phase change, then the increase in internal energy in the process will be:
(1) 4320 J
(2) 432000 J
(3) 4800 J
$(4) 4.32 \times 10^8 \mathrm{J}$
Q8. Given below are two statements:
Statement I: The temperature of a gas is -73 °C. When the gas is heated to 527 °C, the root mean square speed of the molecules is doubled.
Statement II: The product of pressure and volume of an ideal gas will be equal to translational kinetic energy of the molecules.
In the light of the above statements, choose the correct answer from the options given below:
(1) Both Statement I and Statement II are true
(2) Statement I is true but Statement II is false
(3) Both Statement I and Statement II are false
(4) Statement I is false but Statement II is true
Q9. A travelling wave is described by the equation $y(x,t) = 0.05 \sin(8x - 4t)$ m. The velocity of the wave is:
[All the quantities are in SI unit]
(1) 4 m/s
(2) 2 m/s
(3) 0.5 m/s
(4) 8 m/s
$\mathbf{Q10.}$ If two charges $\mathbf{q_1}$ and $\mathbf{q_2}$ are separated with distance d and placed in a medium of dielectric constant k. What will be the equivalent distance between charges in air for the same electrostatic force?
$(1) d\sqrt{k}$



(4) $K \times E$

Q16. Given below are two statements:

Statement I: If the Brewster's angle for the light propagating from air to glass is θ_B , then Brewster's angle for the light propagating from glass to air is $\pi/2 - \theta_B$.

Statement II: The Brewster's angle for the light propagating from glass to air is $tan^{-1}(\mu_g)$, where μ_g is the refractive index of glass.

In the light of the above statements, choose the correct answer from the options given below:

- (1) Both Statements I and Statement II are true.
- (2) Statement I is true but Statement II is false.
- (3) Both Statement I and Statement II are false.
- (4) Statement I is false but Statement II is true.

Q17. From the photoelectric effect experiment, following observations are made. Identify which of these are correct

- A. The stopping potential depends only on the work function of the metal.
- B. The saturation current increases as the intensity of incident light increases.
- C. The maximum kinetic energy of a photo electron depends on the intensity of the incident light.
- D. Photoelectric effect can be explained using wave theory of light.

Choose the correct answer from the options given below:

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

Q18. Consider the following radioactive decay process:

$$^{218}84A \rightarrow A_1 \rightarrow A_2 \rightarrow A_3 \rightarrow A_4 \rightarrow A_5 \rightarrow A_6$$

The mass number and the atomic number of A₆ are given by:

- (1) 210 and 82
- (2) 210 and 84
- (3) 210 and 80
- (4) 211 and 80

Q19. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: Photodiodes are preferably operated in reverse bias condition for light intensity measurement.

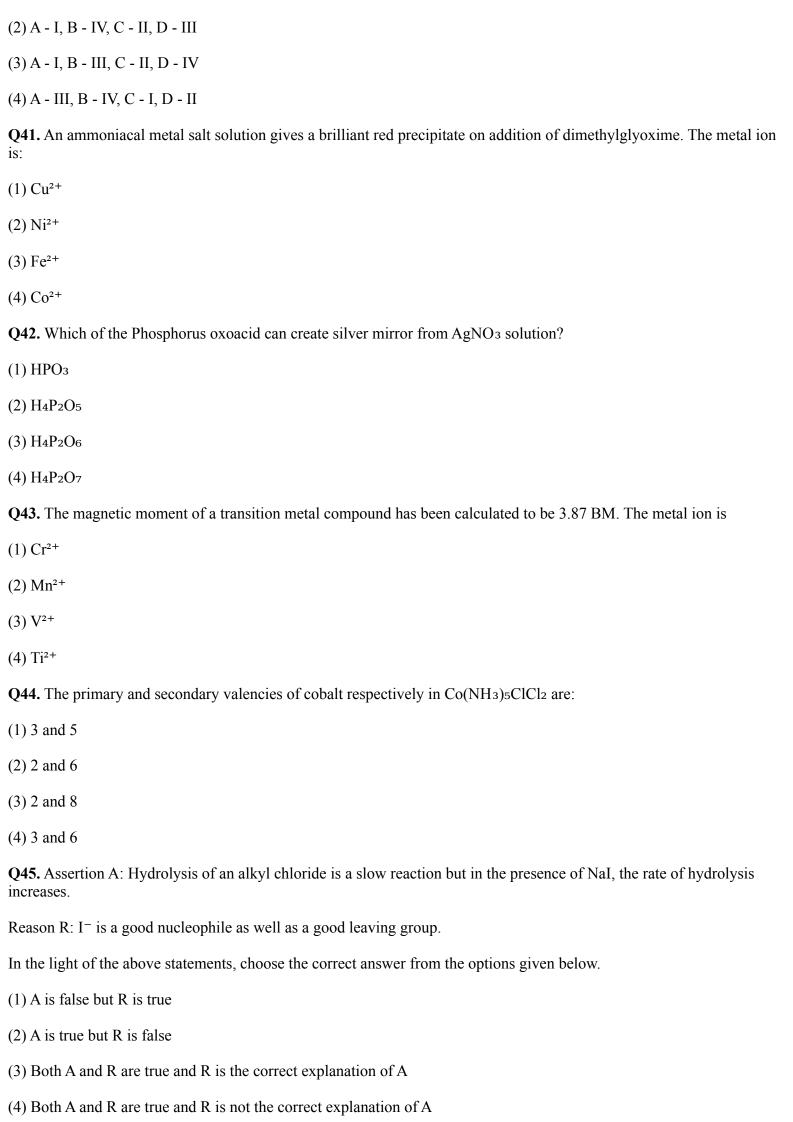
Reason R: The current in the forward bias is more than the current in the reverse bias for a p-n junction diode.

In the light of the above statement, choose the correct answer from the options given below:

(1) A is false but R is true
(2) Both A and R are true but R is NOT the correct explanation of A
(3) A is true but R is false
(4) Both A and R are true and R is the correct explanation of A
Q20. A modulating signal is a square wave, as shown in the figure. If the carrier wave is given as $c(t) = 2\sin(8\pi t)$ volts, the modulation index is:
(1) 1/4
(2) 1/2
(3) 1/3
(4) 1/2
Chemistry Questions
Q32. Decreasing order of the hydrogen bonding in following forms of water is correctly represented by
A. Liquid water
B. Ice
C. Impure water
(1) A = B > C
(2) B > A > C
(3) C > B > A
(4) A > B > C
Q33. Order of Covalent bond;
A. $KF > KI$; $LiF > KF$
B. $KF < KI$; $LiF > KF$
C. SnCl ₄ > SnCl ₂ ; CuCl > NaCl
D. LiF > KF; CuCl > NaCl
E. KF < KI; CuCl > NaCl
(1) C, E Only
(2) B, C Only
(3) B, C, E Only
(4) A, B Only
Q34. Match Column I with Column II
Column I

A. Soda ash
B. Chlorophyll
C. Used in Whitewashing
D. Dentistry, ornamental work
Column II
I. CaSO ₄
II. Ca(OH)2
III. Na ₂ CO ₃
IV. Mg ²⁺ ions
(1) A - III, B - IV, C - I, D - II
(2) A - II, B - I, C - III, D - IV
(3) A - III, B - I, C - II, D - IV
(4) A - II, B - III, C - IV, D - I
Q35. Reaction of BeO with ammonia and hydrogen fluoride gives 'A' which on thermal decomposition gives BeF $_2$ and NH ₄ F. What is 'A'?
(1) H ₃ NBeF ₃
(2) (NH ₄) ₂ BeF ₄
(3) NH ₄ BeF ₃
(4) (NH ₄) ₂ Be ₂ F ₆
Q36. Increasing order of stability of the resonance structure is:
A. [Structure A]
B. [Structure B]
C. [Structure C]
D. [Structure D]
(1) C, D, B, A
(2) C, A, B, D
(3) D, C, A, B
(4) D, C, B, A
Q37. Which of the following is true about freons?
(1) These are chlorofluorocarbon compounds
(2) These are chemicals causing skin cancer

(3) These are radicals of chlorine and chlorine monoxide
(4) All radicals are called freons
Q38. In the depression of freezing point experiment
A. Vapour pressure of the solution is less than that of pure solvent
B. Vapour pressure of the solution is more than that of pure solvent
C. Only solute molecules solidify at the freezing point
D. Only solvent molecules solidify at the freezing point
(1) A and D only
(2) B and C only
(3) A and C only
(4) A only
Q39. Statement I: For colloidal particles, the values of colligative properties are of small order as compared to values shown by true solutions at same concentration.
Statement II: For colloidal particles, the potential difference between the fixed layer and the diffused layer of same charges is called the electrokinetic potential or zeta potential.
In the light of the above statements, chooses the correct answer from the options given below.
(1) Statement I is true but statement II is false
(2) Statement I is false but Statement II is true
(3) Both Statement I and Statement II are true
(4) Both Statement I and Statement II are false
Q40. Match List I with List II.
List I
A. Reverberatory furnace
B. Electrolytic cell
C. Blast furnace
D. Zone refining furnace
List II
I. Pig iron
II. Aluminium
III. Silicon
IV. Copper
(1) A - IV, B - II, C - I, D - III



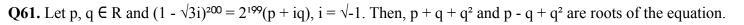
Q46. In the following given reaction 'A' is
$CH_3C=CH_2 + HBr \rightarrow 'A' $ (major product)
(1) CH ₃ CBrCH ₃
(2) CH ₃ CH ₂ CH ₂ Br
(3) CH ₃ CHBrCH ₃
(4) CH ₃ CBr ₂ CH ₃
Q47. A' and 'B' formed in the following set of reactions are:
$OH-CH_2OH + HBr \rightarrow A$
$O-CH_2OH + HBr \rightarrow B$
(1) A = [Structure 1], B = [Structure 2]
(2) A = [Structure 3], B = [Structure 4]
(3) A = [Structure 5], B = [Structure 6]
(4) A = [Structure 7], B = [Structure 8]
Q48. 'R' formed in the following sequence of reaction is:
NaCN/HOAc \rightarrow 'P' \rightarrow EtOH/H ⁺ \rightarrow 'Q' \rightarrow (i) 2MeMgBr (ii) H ₃ O ⁺ \rightarrow 'R' (major product)
(1) [Structure 1]
(2) [Structure 2]
(3) [Structure 3]
(4) [Structure 4]
Q49. Compound X undergoes following sequence of reactions to give the Lactone Y.
(1) [Structure 1]
(2) [Structure 2]
(3) [Structure 3]
(4) [Structure 4]
Q50. Given below are two statements:
Statement I: Noradrenaline is a neurotransmitter.
Statement II: Low level of noradrenaline is not the cause of depression in human.
In the light of the above statements, choose the correct answer from the options given below
(1) Roth statement 1 and 2 are correct

(3) Statement 1 is incorrect but statement 2 is correct

(2) Statement 1 is correct but statement 2 is incorrect

(4) Both statement 1 and 2 are correct

Mathematics Questions



- (1) $x^2 + 4x 1 = 0$
- (2) $x^2 4x + 1 = 0$
- (3) $x^2 + 4x + 1 = 0$
- (4) $x^2 4x 1 = 0$

Q62. For three positive integers p, q, r, $x^{(pq^2)} = y^{(qr)} = z^{(p^2r)}$ and r = pq + 1 such that 3, $3\log_y x$, $3\log_z y$, $7\log_z x$ are in A.P. with common difference 1/2. The r - p - q is equal to

- (1)2
- (2) 6
- (3) 12
- (4) -6

Q63. The value of $\sum (r=0 \text{ to } 22)^{23}C_r$ is

- $(1)^{45}C_{23}$
- $(2)^{44}C_{23}$
- (3) $^{45}C_{24}$
- (4) $^{44}C_{22}$

Q64. Let a tangent to the curve $y^2 = 24x$ meet the curve xy = 2 at the points A and B. Then the midpoints of such line segments AB lie on a parabola with the

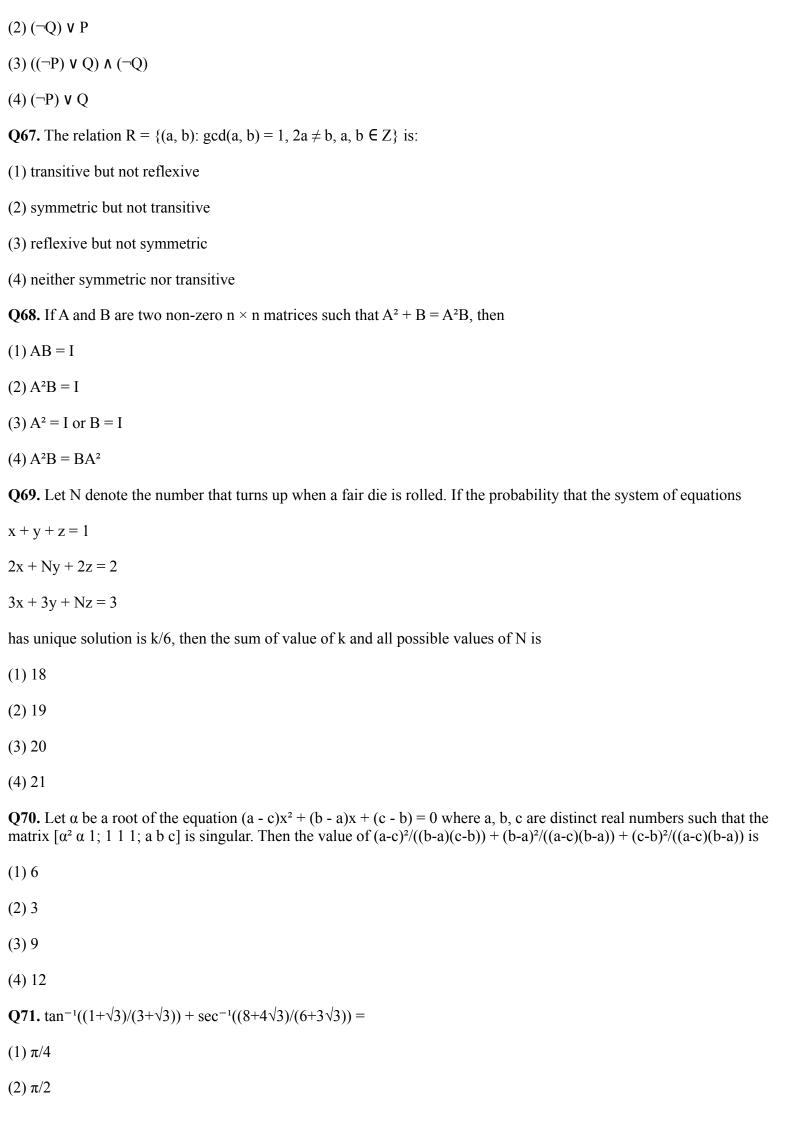
- (1) directrix 4x = 3
- (2) directrix 4x = -3
- (3) Length of latus rectum 3/2
- (4) Length of latus rectum 2

Q65. $\lim(t\to 0) \left[\frac{1}{\sin^2 t} + \frac{1}{2\sin^2 t} + \frac{1}{3\sin^2 t} + \dots + \frac{1}{(n\sin^2 t)} \right]$ is equal to

- $(1) n^2 + n$
- (2) n
- (3) (n+1)/2
- $(4) n^2$

Q66. The compound statement $(\neg (P \land Q)) \lor ((\neg P) \land Q) \Rightarrow ((\neg P) \land (\neg Q))$ is equivalent to

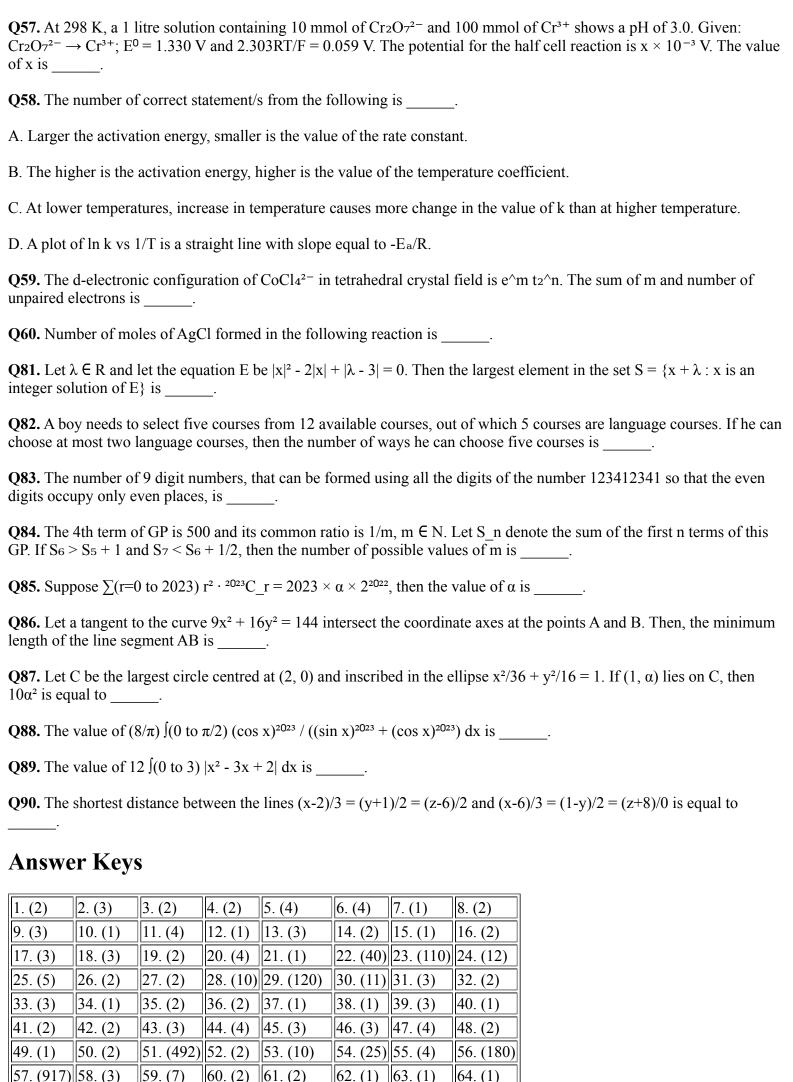
 $(1) ((\neg P) \lor Q) \land ((\neg Q) \lor P)$



$(3) \pi/3$
$(4) \pi/6$
Q72. The equation $x^2 - 4x + [x] + 3 = x[x]$, where [x] denotes the greatest integer function, has:
(1) exactly two solutions in $(-\infty, \infty)$
(2) no solution
(3) a unique solution in $(-\infty, 1)$
(4) a unique solution in $(-\infty, \infty)$
Q73. Let $f(x) = \{0; x=0, x^2\sin(1/x); x\neq 0\}$ then at $x = 0$
(1) f is continuous but not differentiable
(2) f is continuous but f is not continuous
(3) both f and f' are continuous
(4) f' is continuous but not differentiable
Q74. The area enclosed between the curves $y^2 + 4x = 4$ and $y - 2x = 2$ is
(1) 25/3
(2) 22/3
(3) 9
(4) 23/3
Q75. Let $y = y(x)$ be the solution of the differential equation $x^3dy + (xy - 1)dx = 0$, $x > 0$, $y(1/2) = 3$ - e. Then $y(1)$ is equal to
(1) 1
(2) e
(3) 2 - e
(4) 3
Q76. Let $u = i - j + 2k$, $v = 2i + j - k$, $v \cdot w = 2$ and $v \times w = u + \lambda v$, then $u \cdot w$ is equal to
(1) 1
(2) 3/2
(3) 2
(4) 2/3
Q77. Let PQR be a triangle. The points A, B and C are on the sides QR, RP and PQ respectively such that QA/AR = RB/BP = PC/CQ = $1/2$. Then (Area Δ PQR)/(Area Δ ABC) is equal to
(1) 4
(2) 1

(3) 2
(4) 5/2
Q78. The distance of the point (7, -3, -4) from the plane containing the points (2, -3, 1), (-1, 1, -2) and (3, -4, 2) is equal to:
(1) 4
(2) 5
(3) $5\sqrt{2}$
$(4) \ 4\sqrt{2}$
Q79. The distance of the point (-1, 9, -16) from the plane $2x + 3y - z = 5$ measure parallel to the line $(x+4)/3 = (2-y)/4 = (z-3)/12$ is
(1) $13\sqrt{2}$
(2) 31
(3) 26
$(4)\ 20\sqrt{3}$
Q80. Let Ω be the sample space and $A \subseteq \Omega$ be an event. Given below are two statements:
(S1): If $P(A) = 0$, then $A = \varphi$
(S2): If $P(A) = 1$, then $A = \Omega$
Then
(1) only (S1) is true
(2) only (S2) is true
(3) both (S1) and (S2) are true
(4) both (S1) and (S2) are false
Numerical Answer Questions
Q21. Vectors $a(i + bj + k)$ and $2i - 3j + 4k$ are perpendicular to each other when $3a + 2b = 7$, the ratio of a to b is $x/2$. The value of x is
Q22. A spherical body of mass 2 kg starting from rest acquires a kinetic energy of 10000 J at the end of 5th second. The force acted on the body is N.
Q23. Solid sphere A is rotating about an axis PQ. If the radius of the sphere is 5 cm, then its radius of gyration about PQ will be \sqrt{x} cm. The value of x is
Q24. A hole is drilled in a metal sheet. At 27 °C, the diameter of hole is 5 cm. When the sheet is heated to 177 °C, the change in the diameter of hole is $d \times 10^{-3}$ cm. The value of d will be, if coefficient of linear expansion of the metal is 1.6×10^{-5} /°C.
Q25. A block of mass 2 kg is attached with two identical springs of spring constant 20 N/m each. The block is placed on a frictionless surface and the ends of the springs are attached to rigid supports. When the mass is displaced from its equilibrium position, it executes a simple harmonic motion. The time period of oscillation is π/\sqrt{x} in SI unit. The value of

x is
Q26. A stream of a positively charged particles having $q/m = 2 \times 10^{11}$ C/kg and velocity $v_0 = 3 \times 10^7$ i m/s is deflected by an electric field 1.8 i kV/m. The electric field exists in a region of 10 cm along x direction. Due to the electric field, the deflection of the charge particles in the y direction is mm.
Q27. A hollow cylindrical conductor has length of 3.14 m, while its inner and outer diameters are 4 mm and 8 mm respectively. The resistance of the conductor is $n \times 10^{-3} \Omega$. If the resistivity of the material is $2.4 \times 10^{-8} \Omega$ m. The value of n is
Q28. In the circuit shown in the figure, the ratio of the quality factor and the band width is s.
Q29. As shown in the figure, a combination of a thin plano-concave lens and a thin plano-convex lens is used to image an object placed at infinity. The radius of curvature of both the lenses is 30 cm and refraction index of the material for both the lenses is 1.75. Both the lenses are placed at distance of 40 cm from each other. Due to the combination, the image of the object is formed at distance $x = \underline{}$ cm, from concave lens.
Q30. Assume that protons and neutrons have equal masses. Mass of a nucleon is 1.6×10^{-27} kg and radius of nucleus is 1.5×10^{-15} A^(1/3) m. The approximate ratio of the nuclear density and water density is $n \times 10^{13}$. The value of n is
Q31. It is observed that characteristic X-ray spectra of elements show regularity. When frequency to the power 'n' i.e. v ⁿ of X-rays emitted is plotted against atomic number Z, the following graph is obtained. The value of 'n' is
Q51. If wavelength of the first line of the Paschen series of hydrogen atom is 720 nm, then the wavelength of the second line of this series is nm. (Nearest integer)
Q52. For independent process at 300 K.
$Process \mid \Delta H \mid kJmol^{-1} \mid \Delta S \mid JK^{-1}$
A -25 -80
B -22 40
C 25 -50
D 22 20
The number of non-spontaneous process from the following is
Q53. The dissociation constant of acetic is $x \times 10^{-5}$. When 25 mL of 0.2 M CH ₃ COONa solution is mixed with 25 mL of 0.02 M CH ₃ COOH solution, the pH of the resultant solution is found to be equal to 5. The value of x is
Q54. Uracil is base present in RNA with the following structure. % of N in uracil is
Q55. When Fe _{0.93} O is heated in presence of oxygen, it converts to Fe ₂ O ₃ . The number of correct statement/s from the following is
A. The equivalent weight of Feo.93O is
B. The number of moles of Fe ²⁺ and Fe ³⁺ in 1 mole of Fe _{0.93} O is 0.79 and 0.14 respectively.
C. Fe _{0.93} O is metal deficient with lattice comprising of cubic closed packed arrangement of O ²⁻ ions.
D. The % composition of Fe ²⁺ and Fe ³⁺ in Fe _{0.93} O is 85% and 15% respectively.
Q56. 5 g of NaOH was dissolved in deionized water to prepare a 450 mL stock solution. What volume (in mL) of this solution would be required to prepare 500 mL of 0.1 M solution? Given: Molar Mass of Na, O and H is 23, 16 and 1 g mol ⁻¹ respectively.



65. (2)

66. (1)

67. (4)

68. (4)

69. (3)

70. (2)

||71.(3)|

72. (4)

73. (2)	74. (3)	75. (1)	76. (1)	77. (2)	78. (3)	79. (3)	80. (3)
81. (5)	82. (546)	83. (60)	84. (12)	85. (1012)	86. (7)	87. (118)	88. (2)
89. (22)	90. (14)						