

Paper:	B.E_B.Tech
SET:	Set 10

Topic:	Mathematics-Section A
Item No:	1
Question ID:	156941
Question Type:	MCQ
Question:	For $z \in \mathbb{C}$ if the minimum value of $\left(z - 3\sqrt{2} + z - p\sqrt{2}i \right)$ is $5\sqrt{2}$, then a value of p is _____.
A:	3
B:	$\frac{7}{2}$
C:	4
D:	$\frac{9}{2}$

Topic:	Mathematics-Section A
Item No:	2
Question ID:	156942
Question Type:	MCQ
Question:	The number of real values of λ , such that the system of linear equations $2x - 3y + 5z = 9$ $x + 3y - z = -18$ $3x - y + (\lambda^2 - \lambda)z = 16$ has no solutions, is
A:	0
B:	1
C:	2
D:	4

Topic:	Mathematics-Section A
Item No:	3
Question ID:	156943
Question Type:	MCQ
Question:	The number of bijective functions $f : \{1, 3, 5, 7, \dots, 99\} \rightarrow \{2, 4, 6, 8, \dots, 100\}$, such that $f(3) \geq f(9) \geq f(15) \geq f(21) \geq \dots \geq f(99)$, is _____

A:	${}^{50}P_{17}$
B:	${}^{50}P_{33}$
C:	$33! \times 17!$
D:	$\frac{50!}{2}$

Topic:	Mathematics-Section A
Item No:	4
Question ID:	156944
Question Type:	MCQ
Question:	The remainder when $(11)^{1011} + (1011)^{11}$ is divided by 9 is
A:	1
B:	4
C:	6
D:	8

Topic:	Mathematics-Section A
Item No:	5
Question ID:	156945
Question Type:	MCQ
Question:	The sum $\sum_{n=1}^{21} \frac{3}{(4n-1)(4n+3)}$ is equal to
A:	$\frac{7}{87}$
B:	$\frac{7}{29}$
C:	$\frac{14}{87}$
D:	$\frac{21}{29}$

Topic:	Mathematics-Section A
Item No:	6
Question ID:	156946
Question Type:	MCQ
Question:	$\lim_{x \rightarrow \frac{\pi}{4}} \frac{8\sqrt{2} - (\cos x + \sin x)^7}{\sqrt{2} - \sqrt{2} \sin 2x}$ is equal to
A:	14

B:	7
C:	$14\sqrt{2}$
D:	$7\sqrt{2}$

Topic:	Mathematics-Section A
Item No:	7
Question ID:	156947
Question Type:	MCQ
Question:	$\lim_{n \rightarrow \infty} \frac{1}{2^n} \left(\frac{1}{\sqrt{1 - \frac{1}{2^n}}} + \frac{1}{\sqrt{1 - \frac{2}{2^n}}} + \frac{1}{\sqrt{1 - \frac{3}{2^n}}} + \dots + \frac{1}{\sqrt{1 - \frac{2^n - 1}{2^n}}} \right)$ is equal to
A:	$\frac{1}{2}$
B:	1
C:	2
D:	-2

Topic:	Mathematics-Section A
Item No:	8
Question ID:	156948
Question Type:	MCQ
Question:	If A and B are two events such that $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{5}$ and $P(A \cup B) = \frac{1}{2}$, then $P(A B') + P(B A')$ is equal to
A:	$\frac{3}{4}$
B:	$\frac{5}{8}$
C:	$\frac{5}{4}$
D:	$\frac{7}{8}$

Topic:	Mathematics-Section A
Item No:	9
Question ID:	156949
Question Type:	MCQ

Question:	Let $[t]$ denote the greatest integer less than or equal to t . Then the value of the integral $\int_{-3}^{101} ([\sin(\pi x)] + e^{\cos(2\pi x)}) dx$ is equal to
A:	$\frac{52(1-e)}{e}$
B:	$\frac{52}{e}$
C:	$\frac{52(2+e)}{e}$
D:	$\frac{104}{e}$

Topic:	Mathematics-Section A
Item No:	10
Question ID:	1569410
Question Type:	MCQ
Question:	Let the point $P(\alpha, \beta)$ be at a unit distance from each of the two lines $L_1 : 3x - 4y + 12 = 0$, and $L_2 : 8x + 6y + 11 = 0$. If P lies below L_1 and above L_2 , then $100(\alpha + \beta)$ is equal to
A:	-14
B:	42
C:	-22
D:	14

Topic:	Mathematics-Section A
Item No:	11
Question ID:	1569411
Question Type:	MCQ
Question:	Let a smooth curve $y = f(x)$ be such that the slope of the tangent at any point (x, y) on it is directly proportional to $\left(\frac{-y}{x}\right)$. If the curve passes through the points $(1, 2)$ and $(8, 1)$, then $\left y\left(\frac{1}{8}\right)\right $ is equal to
A:	$2\log_e 2$
B:	4
C:	1
D:	$4\log_e 2$

Topic:	Mathematics-Section A
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Item No:	12
Question ID:	1569412
Question Type:	MCQ
Question:	If the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ meets the line $\frac{x}{7} + \frac{y}{2\sqrt{6}} = 1$ on the x -axis and the line $\frac{x}{7} - \frac{y}{2\sqrt{6}} = 1$ on the y -axis, then the eccentricity of the ellipse is
A:	$\frac{5}{7}$
B:	$\frac{2\sqrt{6}}{7}$
C:	$\frac{3}{7}$
D:	$\frac{2\sqrt{5}}{7}$

Topic:	Mathematics-Section A
Item No:	13
Question ID:	1569413
Question Type:	MCQ
Question:	The tangents at the points $A(1, 3)$ and $B(1, -1)$ on the parabola $y^2 - 2x - 2y = 1$ meet at the point P . Then the area (in unit ²) of the triangle PAB is:
A:	4
B:	6
C:	7
D:	8

Topic:	Mathematics-Section A
Item No:	14
Question ID:	1569414
Question Type:	MCQ
Question:	Let the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{7} = 1$ and the hyperbola $\frac{x^2}{144} - \frac{y^2}{\alpha} = \frac{1}{25}$ coincide. Then the length of the latus rectum of the hyperbola is :
A:	$\frac{32}{9}$
B:	$\frac{18}{5}$
C:	$\frac{27}{4}$

D:	$\frac{27}{10}$
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Topic:	Mathematics-Section A
Item No:	15
Question ID:	1569415
Question Type:	MCQ
Question:	A plane E is perpendicular to the two planes $2x - 2y + z = 0$ and $x - y + 2z = 4$, and passes through the point $P(1, -1, 1)$. If the distance of the plane E from the point $Q(a, a, 2)$ is $3\sqrt{2}$, then $(PQ)^2$ is equal to
A:	9
B:	12
C:	21
D:	33

Topic:	Mathematics-Section A
Item No:	16
Question ID:	1569416
Question Type:	MCQ
Question:	The shortest distance between the lines $\frac{x+7}{-6} = \frac{y-6}{7} = z$ and $\frac{7-x}{2} = y-2 = z-6$ is
A:	$2\sqrt{29}$
B:	1
C:	$\sqrt{\frac{37}{29}}$
D:	$\frac{\sqrt{29}}{2}$

Topic:	Mathematics-Section A
Item No:	17
Question ID:	1569417
Question Type:	MCQ
Question:	Let $\vec{a} = \hat{i} - \hat{j} + 2\hat{k}$ and let $\vec{b}$ be a vector such that $\vec{a} \times \vec{b} = 2\hat{i} - \hat{k}$ and $\vec{a} \cdot \vec{b} = 3$. Then the projection of $\vec{b}$ on the vector $\vec{a} - \vec{b}$ is :
A:	$\frac{2}{\sqrt{21}}$

B:	$2\sqrt{\frac{3}{7}}$
C:	$\frac{2}{3}\sqrt{\frac{7}{3}}$
D:	$\frac{2}{3}$

Topic:	Mathematics-Section A
Item No:	18
Question ID:	1569418
Question Type:	MCQ
Question:	If the mean deviation about median for the numbers 3, 5, 7, $2k$, 12, 16, 21, 24, arranged in the ascending order, is 6 then the median is
A:	11.5
B:	10.5
C:	12
D:	11

Topic:	Mathematics-Section A
Item No:	19
Question ID:	1569419
Question Type:	MCQ
Question:	$2 \sin\left(\frac{\pi}{22}\right) \sin\left(\frac{3\pi}{22}\right) \sin\left(\frac{5\pi}{22}\right) \sin\left(\frac{7\pi}{22}\right) \sin\left(\frac{9\pi}{22}\right)$ is equal to :
A:	$\frac{3}{16}$
B:	$\frac{1}{16}$
C:	$\frac{1}{32}$
D:	$\frac{9}{32}$

Topic:	Mathematics-Section A
Item No:	20
Question ID:	1569420
Question Type:	MCQ

Question:	Consider the following statements : P : Ramu is intelligent. Q : Ramu is rich. R : Ramu is not honest. The negation of the statement “Ramu is intelligent and honest if and only if Ramu is not rich” can be expressed as :
A:	$((P \wedge (\sim R)) \wedge Q) \wedge ((\sim Q) \wedge ((\sim P) \vee R))$
B:	$((P \wedge R) \wedge Q) \vee ((\sim Q) \wedge ((\sim P) \vee (\sim R)))$
C:	$((P \wedge R) \wedge Q) \wedge ((\sim Q) \wedge ((\sim P) \vee (\sim R)))$
D:	$((P \wedge (\sim R)) \wedge Q) \vee ((\sim Q) \wedge ((\sim P) \vee R))$

Topic:	Mathematics-Section B
Item No:	21
Question ID:	1569421
Question Type:	Numeric Answer
Question:	Let $A = \{1, 2, 3, 4, 5, 6, 7\}$. Define $B = \{T \subseteq A : \text{either } 1 \notin T \text{ or } 2 \in T\}$ and $C = \{T \subseteq A : T \text{ the sum of all the elements of } T \text{ is a prime number}\}$. Then the number of elements in the set $B \cup C$ is _____.

Topic:	Mathematics-Section B
Item No:	22
Question ID:	1569422
Question Type:	Numeric Answer
Question:	Let $f(x)$ be a quadratic polynomial with leading coefficient 1 such that $f(0) = p$, $p \neq 0$, and $f(1) = \frac{1}{3}$. If the equations $f(x) = 0$ and $f(f(f(f(f(x)))) = 0$ have a common real root, then $f(-3)$ is equal to _____.

Topic:	Mathematics-Section B
Item No:	23
Question ID:	1569423
Question Type:	Numeric Answer
Question:	Let $A = \begin{bmatrix} 1 & a & a \\ 0 & 1 & b \\ 0 & 0 & 1 \end{bmatrix}$, $a, b \in \mathbb{R}$. If for some $n \in \mathbb{N}$, $A^n = \begin{bmatrix} 1 & 48 & 2160 \\ 0 & 1 & 96 \\ 0 & 0 & 1 \end{bmatrix}$ then $n + a + b$ is equal to _____.

Topic:	Mathematics-Section B
Item No:	24
Question ID:	1569424

Question Type:	Numeric Answer
Question:	The sum of the maximum and minimum values of the function $f(x) = 5x - 7 + [x^2 + 2x]$ in the interval $\left[\frac{5}{4}, 2\right]$, where $[t]$ is the greatest integer $\leq t$, is _____.

Topic:	Mathematics-Section B
Item No:	25
Question ID:	1569425
Question Type:	Numeric Answer
Question:	Let $y = y(x)$ be the solution of the differential equation $\frac{dy}{dx} = \frac{4y^3 + 2yx^2}{3xy^2 + x^3}$, $y(1) = 1$. If for some $n \in \mathbb{N}$, $y(2) \in [n - 1, n)$, then n is equal to _____.

Topic:	Mathematics-Section B
Item No:	26
Question ID:	1569426
Question Type:	Numeric Answer
Question:	Let f be a twice differentiable function on $\mathbb{R}$. If $f'(0) = 4$ and $f(x) + \int_0^x (x-t)f'(t)dt = (e^{2x} + e^{-2x})\cos 2x + \frac{2}{a}x$, then $(2a + 1)^5 a^2$ is equal to _____.

Topic:	Mathematics-Section B
Item No:	27
Question ID:	1569427
Question Type:	Numeric Answer
Question:	Let $a_n = \int_{-1}^n \left(1 + \frac{x}{2} + \frac{x^2}{3} + \dots + \frac{x^{n-1}}{n}\right) dx$ for every $n \in \mathbb{N}$. Then the sum of all the elements of the set $\{n \in \mathbb{N} : a_n \in (2, 30)\}$ is _____.

Topic:	Mathematics-Section B
Item No:	28
Question ID:	1569428
Question Type:	Numeric Answer

Question:	If the circles $x^2 + y^2 + 6x + 8y + 16 = 0$ and $x^2 + y^2 + 2(3 - \sqrt{3})x + 2(4 - \sqrt{6})y = k + 6\sqrt{3} + 8\sqrt{6}$, $k > 0$, touch internally at the point $P(\alpha, \beta)$, then $(\alpha + \sqrt{3})^2 + (\beta + \sqrt{6})^2$ is equal to _____.
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Topic:	Mathematics-Section B
Item No:	29
Question ID:	1569429
Question Type:	Numeric Answer
Question:	Let the area enclosed by the x -axis, and the tangent and normal drawn to the curve $4x^3 - 3xy^2 + 6x^2 - 5xy - 8y^2 + 9x + 14 = 0$ at the point $(-2, 3)$ be A . Then $8A$ is equal to _____.

Topic:	Mathematics-Section B
Item No:	30
Question ID:	1569430
Question Type:	Numeric Answer
Question:	Let $x = \sin(2\tan^{-1} \alpha)$ and $y = \sin\left(\frac{1}{2}\tan^{-1} \frac{4}{3}\right)$. If $S = \{a \in \mathbb{R} : y^2 = 1 - x\}$, then $\sum_{\alpha \in S} 16\alpha^3$ is equal to _____.

Topic:	Physics-Section A
Item No:	31
Question ID:	1569431
Question Type:	MCQ
Question:	In AM modulation, a signal is modulated on a carrier wave such that maximum and minimum amplitudes are found to be 6 V and 2 V respectively. The modulation index is :
A:	100%
B:	80%
C:	60%
D:	50%

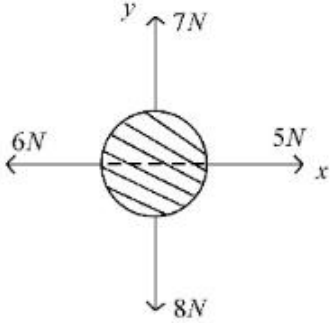
Topic:	Physics-Section A
Item No:	32
Question ID:	1569432
Question Type:	MCQ

Question:	The electric current in a circular coil of 2 turns produces a magnetic induction B_1 at its centre. The coil is unwound and is rewound into a circular coil of 5 turns and the same current produces a magnetic induction B_2 at its centre. The ratio of $\frac{B_2}{B_1}$ is
A:	$\frac{5}{2}$
B:	$\frac{25}{4}$
C:	$\frac{5}{4}$
D:	$\frac{25}{2}$

Topic:	Physics-Section A
Item No:	33
Question ID:	1569433
Question Type:	MCQ
Question:	A drop of liquid of density ρ is floating half immersed in a liquid of density σ and surface tension $7.5 \times 10^{-4} \text{ Ncm}^{-1}$. The radius of drop in cm will be : ($g = 10 \text{ ms}^{-2}$)
A:	$\frac{15}{\sqrt{(2\rho - \sigma)}}$
B:	$\frac{15}{\sqrt{(\rho - \sigma)}}$
C:	$\frac{3}{2\sqrt{(\rho - \sigma)}}$
D:	$\frac{3}{20\sqrt{(2\rho - \sigma)}}$

Topic:	Physics-Section A
Item No:	34
Question ID:	1569434
Question Type:	MCQ
Question:	Two billiard balls of mass 0.05 kg each moving in opposite directions with 10 ms^{-1} collide and rebound with the same speed. If the time duration of contact is $t = 0.005 \text{ s}$, then what is the force exerted on the ball due to each other ?
A:	100 N
B:	200 N
C:	300 N

D:	400 N
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Topic:	Physics-Section A
Item No:	35
Question ID:	1569435
Question Type:	MCQ
Question:	For a free body diagram shown in the figure, the four forces are applied in the 'x' and 'y' directions. What additional force must be applied and at what angle with positive x-axis so that the net acceleration of body is zero ? 
A:	$\sqrt{2}N, 45^\circ$
B:	$\sqrt{2}N, 135^\circ$
C:	$\frac{2}{\sqrt{3}}N, 30^\circ$
D:	$2N, 45^\circ$

Topic:	Physics-Section A
Item No:	36
Question ID:	1569436
Question Type:	MCQ
Question:	Capacitance of an isolated conducting sphere of radius R_1 becomes n times when it is enclosed by a concentric conducting sphere of radius R_2 connected to earth. The ratio of their radii $\left(\frac{R_2}{R_1}\right)$ is :
A:	$\frac{n}{n-1}$
B:	$\frac{2n}{2n+1}$
C:	$\frac{n+1}{n}$
D:	$\frac{2n+1}{n}$

Topic:	Physics-Section A
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Item No:	37
Question ID:	1569437
Question Type:	MCQ
Question:	The ratio of wavelengths of proton and deuteron accelerated by potential V_p and V_d is $1:\sqrt{2}$. Then, the ratio of V_p to V_d will be :
A:	1:1
B:	$\sqrt{2}:1$
C:	2 : 1
D:	4 : 1

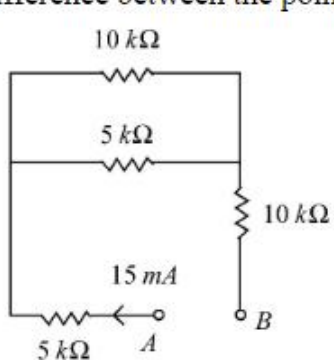
Topic:	Physics-Section A
Item No:	38
Question ID:	1569438
Question Type:	MCQ
Question:	For an object placed at a distance 2.4 m from a lens, a sharp focused image is observed on a screen placed at a distance 12 cm from the lens. A glass plate of refractive index 1.5 and thickness 1 cm is introduced between lens and screen such that the glass plate plane faces parallel to the screen. By what distance should the object be shifted so that a sharp focused image is observed again on the screen ?
A:	0.8 m
B:	3.2 m
C:	1.2 m
D:	5.6 m

Topic:	Physics-Section A
Item No:	39
Question ID:	1569439
Question Type:	MCQ
Question:	Light wave traveling in air along x-direction is given by $E_y = 540 \sin \pi \times 10^4 (x - ct) \text{Vm}^{-1}$. Then, the peak value of magnetic field of wave will be (Given $c = 3 \times 10^8 \text{ms}^{-1}$)
A:	$18 \times 10^{-7} \text{ T}$
B:	$54 \times 10^{-7} \text{ T}$
C:	$54 \times 10^{-8} \text{ T}$
D:	$18 \times 10^{-8} \text{ T}$

Topic:	Physics-Section A
Item No:	40

Question ID:	1569440
Question Type:	MCQ
Question:	When you walk through a metal detector carrying a metal object in your pocket, it raises an alarm. This phenomenon works on :
A:	Electromagnetic induction
B:	Resonance in ac circuits
C:	Mutual induction in ac circuits
D:	Interference of electromagnetic waves

Topic:	Physics-Section A
Item No:	41
Question ID:	1569441
Question Type:	MCQ
Question:	An electron with energy 0.1 keV moves at right angle to the earth's magnetic field of $1 \times 10^{-4} \text{ Wbm}^{-2}$. The frequency of revolution of the electron will be (Take mass of electron = $9.0 \times 10^{-31} \text{ kg}$)
A:	$1.6 \times 10^5 \text{ Hz}$
B:	$5.6 \times 10^5 \text{ Hz}$
C:	$2.8 \times 10^6 \text{ Hz}$
D:	$1.8 \times 10^6 \text{ Hz}$

Topic:	Physics-Section A
Item No:	42
Question ID:	1569442
Question Type:	MCQ
Question:	A current of 15 mA flows in the circuit as shown in figure. The value of potential difference between the points A and B will be : 
A:	50 V
B:	75 V
C:	150 V
D:	275 V

Topic:	Physics-Section A
Item No:	43
Question ID:	1569443
Question Type:	MCQ
Question:	The length of a seconds pendulum at a height $h = 2R$ from earth surface will be : (Given R = Radius of earth and acceleration due to gravity at the surface of earth, $g = \pi^2 \text{ ms}^{-2}$)
A:	$\frac{2}{9} \text{ m}$
B:	$\frac{4}{9} \text{ m}$
C:	$\frac{8}{9} \text{ m}$
D:	$\frac{1}{9} \text{ m}$

Topic:	Physics-Section A
Item No:	44
Question ID:	1569444
Question Type:	MCQ
Question:	Sound travels in a mixture of two moles of helium and n moles of hydrogen. If rms speed of gas molecules in the mixture is $\sqrt{2}$ times the speed of sound, then the value of n will be :
A:	1
B:	2
C:	3
D:	4

Topic:	Physics-Section A
Item No:	45
Question ID:	1569445
Question Type:	MCQ
Question:	Let η_1 is the efficiency of an engine at $T_1 = 447^\circ\text{C}$ and $T_2 = 147^\circ\text{C}$ while η_2 is the efficiency at $T_1 = 947^\circ\text{C}$ and $T_2 = 47^\circ\text{C}$ The ratio $\frac{\eta_1}{\eta_2}$ will be :
A:	0.41
B:	0.56
C:	0.73

D:	0.70
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Topic:	Physics-Section A
Item No:	46
Question ID:	1569446
Question Type:	MCQ
Question:	An object is taken to a height above the surface of earth at a distance $\frac{5}{4}R$ from the centre of the earth. Where radius of earth, $R = 6400$ km. The percentage decrease in the weight of the object will be :
A:	36%
B:	50%
C:	64%
D:	25%

Topic:	Physics-Section A
Item No:	47
Question ID:	1569447
Question Type:	MCQ
Question:	A bag of sand of mass 9.8 kg is suspended by a rope. A bullet of 200 g travelling with speed 10 ms^{-1} gets embedded in it, then loss of kinetic energy will be :
A:	4.9 J
B:	9.8 J
C:	14.7 J
D:	19.6 J

Topic:	Physics-Section A
Item No:	48
Question ID:	1569448
Question Type:	MCQ
Question:	A ball is projected from the ground with a speed 15 ms^{-1} at an angle θ with horizontal so that its range and maximum height are equal, then 'tan θ ' will be equal to :
A:	$\frac{1}{4}$
B:	$\frac{1}{2}$
C:	2
D:	4

Topic:	Physics-Section A
Item No:	49
Question ID:	1569449
Question Type:	MCQ
Question:	The maximum error in the measurement of resistance, current and time for which current flows in an electrical circuit are 1%, 2% and 3% respectively. The maximum percentage error in the detection of the dissipated heat will be :
A:	2
B:	4
C:	6
D:	8

Topic:	Physics-Section A
Item No:	50
Question ID:	1569450
Question Type:	MCQ
Question:	Hydrogen atom from excited state comes to the ground state by emitting a photon of wavelength λ . The value of principal quantum number 'n' of the excited state will be : (R : Rydberg constant)
A:	$\sqrt{\frac{\lambda R}{\lambda - 1}}$
B:	$\sqrt{\frac{\lambda R}{\lambda R - 1}}$
C:	$\sqrt{\frac{\lambda}{\lambda R - 1}}$
D:	$\sqrt{\frac{\lambda R^2}{\lambda R - 1}}$

Topic:	Physics-Section B
Item No:	51
Question ID:	1569451
Question Type:	Numeric Answer
Question:	A particle is moving in a straight line such that its velocity is increasing at 5 ms^{-1} per meter. The acceleration of the particle is _____ ms^{-2} at a point where its velocity is 20 ms^{-1} .

Topic:	Physics-Section B
Item No:	52
Question ID:	1569452
Question Type:	Numeric Answer

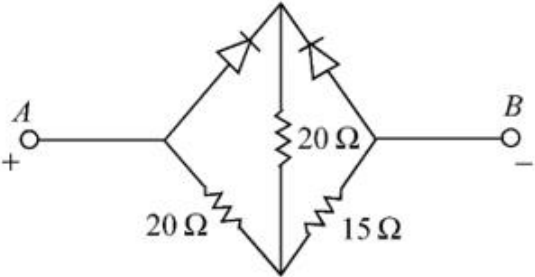
Question:	Three identical spheres each of mass M are placed at the corners of a right angled triangle with mutually perpendicular sides equal to 3 m each. Taking point of intersection of mutually perpendicular sides as origin, the magnitude of position vector of centre of mass of the system will be $\sqrt{x}$ m. The value of x is _____.
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Topic:	Physics-Section B
Item No:	53
Question ID:	1569453
Question Type:	Numeric Answer
Question:	A block of ice of mass 120 g at temperature 0°C is put in 300 g of water at 25°C . The x g of ice melts as the temperature of the water reaches 0°C . The value of x is _____. [Use specific heat capacity of water = $4200 \text{ J kg}^{-1}\text{K}^{-1}$, Latent heat of ice = $3.5 \times 10^5 \text{ J kg}^{-1}$]

Topic:	Physics-Section B
Item No:	54
Question ID:	1569454
Question Type:	Numeric Answer
Question:	$\frac{x}{x+4}$ is the ratio of energies of photons produced due to transition of an electron of hydrogen atom from its (i) third permitted energy level to the second level and (ii) the highest permitted energy level to the second permitted level. The value of x will be _____.

Topic:	Physics-Section B
Item No:	55
Question ID:	1569455
Question Type:	Numeric Answer
Question:	In a potentiometer arrangement, a cell of emf 1.20 V gives a balance point at 36 cm length of wire. This cell is now replaced by another cell of emf 1.80 V. The difference in balancing length of potentiometer wire in above conditions will be _____ cm.

Topic:	Physics-Section B
Item No:	56
Question ID:	1569456
Question Type:	Numeric Answer

Question:	Two ideal diodes are connected in the network as shown in figure. The equivalent resistance between A and B is _____ Ω. 
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Topic:	Physics-Section B
Item No:	57
Question ID:	1569457
Question Type:	Numeric Answer
Question:	Two waves executing simple harmonic motions travelling in the same direction with same amplitude and frequency are superimposed. The resultant amplitude is equal to the $\sqrt{3}$ times of amplitude of individual motions. The phase difference between the two motions is _____ (degree).

Topic:	Physics-Section B
Item No:	58
Question ID:	1569458
Question Type:	Numeric Answer
Question:	Two parallel plate capacitors of capacity C and 3C are connected in parallel combination and charged to a potential difference 18 V. The battery is then disconnected and the space between the plates of the capacitor of capacity C is completely filled with a material of dielectric constant 9. The final potential difference across the combination of capacitors will be _____ V.

Topic:	Physics-Section B
Item No:	59
Question ID:	1569459
Question Type:	Numeric Answer
Question:	A convex lens of focal length 20 cm is placed in front of a convex mirror with principal axis coinciding each other. The distance between the lens and mirror is 10 cm. A point object is placed on principal axis at a distance of 60 cm from the convex lens. The image formed by combination coincides the object itself. The focal length of the convex mirror is _____ cm.

Topic:	Physics-Section B
Item No:	60
Question ID:	1569460
Question Type:	Numeric Answer

Question:	Magnetic flux (in weber) in a closed circuit of resistance $20\ \Omega$ varies with time $t(s)$ as $\phi = 8t^2 - 9t + 5$. The magnitude of the induced current at $t = 0.25\ s$ will be _____ mA.
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Topic:	Chemistry-Section A										
Item No:	61										
Question ID:	1569461										
Question Type:	MCQ										
Question:	Match List I with List II : <table border="1"> <thead> <tr> <th>List I (molecule)</th><th>List II (hybridization ; shape)</th></tr> </thead> <tbody> <tr> <td>A. XeO_3</td><td>I. sp^3d ; linear</td></tr> <tr> <td>B. XeF_2</td><td>II. sp^3 ; pyramidal</td></tr> <tr> <td>C. XeOF_4</td><td>III. sp^3d^3 ; distorted octahedral</td></tr> <tr> <td>D. XeF_6</td><td>IV. sp^3d^2 ; square pyramidal</td></tr> </tbody> </table> Choose the correct answer from the options given below:	List I (molecule)	List II (hybridization ; shape)	A. XeO_3	I. sp^3d ; linear	B. XeF_2	II. sp^3 ; pyramidal	C. XeOF_4	III. sp^3d^3 ; distorted octahedral	D. XeF_6	IV. sp^3d^2 ; square pyramidal
List I (molecule)	List II (hybridization ; shape)										
A. XeO_3	I. sp^3d ; linear										
B. XeF_2	II. sp^3 ; pyramidal										
C. XeOF_4	III. sp^3d^3 ; distorted octahedral										
D. XeF_6	IV. sp^3d^2 ; square pyramidal										
A:	A-II, B-I, C-IV, D-III										
B:	A-II, B-IV, C-III, D-I										
C:	A-IV, B-II, C-III, D-I										
D:	A-IV, B-II, C-I, D-III										

Topic:	Chemistry-Section A
Item No:	62
Question ID:	1569462
Question Type:	MCQ
Question:	Two solutions A and B are prepared by dissolving 1 g of non-volatile solutes X and Y, respectively in 1 kg of water. The ratio of depression in freezing points for A and B is found to be 1:4. The ratio of molar masses of X and Y is
A:	1:4
B:	1:0.25
C:	1:0.20
D:	1:5

Topic:	Chemistry-Section A
Item No:	63
Question ID:	1569463
Question Type:	MCQ
Question:	K_{a_1}, K_{a_2} and K_{a_3} are the respective ionization constants for the following reactions (a), (b), and (c). (a) $H_2C_2O_4 = H^+ + HC_2O_4^-$ (b) $HC_2O_4^- = H^+ + HC_2O_4^{2-}$ (c) $H_2C_2O_4 = 2H^+ + C_2O_4^{2-}$ The relationship between K_{a_1}, K_{a_2} and K_{a_3} is given as
A:	$K_{a_3} = K_{a_1} + K_{a_2}$
B:	$K_{a_3} = K_{a_1} - K_{a_2}$
C:	$K_{a_3} = K_{a_1} / K_{a_2}$
D:	$K_{a_3} = K_{a_1} \times K_{a_2}$

Topic:	Chemistry-Section A
Item No:	64
Question ID:	1569464
Question Type:	MCQ
Question:	The molar conductivity of a conductivity cell filled with 10 moles of 20 mL NaCl solution is Λ_{m1} and that of 20 moles another identical cell heaving 80 mL NaCl solution is Λ_{m2}, The conductivities exhibited by these two cells are same. The relationship between Λ_{m2} and Λ_{m1} is
A:	$\Lambda_{m2} = 2\Lambda_{m1}$
B:	$\Lambda_{m2} = \Lambda_{m1} / 2$
C:	$\Lambda_{m2} = \Lambda_{m1}$
D:	$\Lambda_{m2} = 4\Lambda_{m1}$

Topic:	Chemistry-Section A
Item No:	65
Question ID:	1569465
Question Type:	MCQ

Question:	For micelle formation, which of the following statements are correct ? A. Micelle formation is an exothermic process. B. Micelle formation is an endothermic process. C. The entropy change is positive. D. The entropy change is negative.
A:	A and D only
B:	A and C only
C:	B and C only
D:	B and D only

Topic:	Chemistry-Section A
Item No:	66
Question ID:	1569466
Question Type:	MCQ
Question:	The first ionization enthalpies of Be, B, N and O follow the order
A:	$O < N < B < Be$
B:	$Be < B < N < O$
C:	$B < Be < N < O$
D:	$B < Be < O < N$

Topic:	Chemistry-Section A
Item No:	67
Question ID:	1569467
Question Type:	MCQ
Question:	Given below are two statements. Statement I: Pig iron is obtained by heating cast iron with scrap iron. Statement II: Pig iron has a relatively lower carbon content than that of cast iron. In the light of the above statements, choose the <i>correct</i> answer from the options given below.
A:	Both Statement I and Statement II are correct.
B:	Both Statement I and Statement II are not correct.
C:	Statement I is correct but Statement II is not correct.
D:	Statement I is not correct but Statement II is correct.

Topic:	Chemistry-Section A
Item No:	68
Question ID:	1569468
Question Type:	MCQ

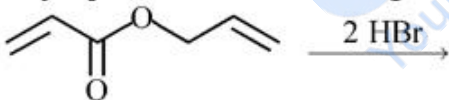
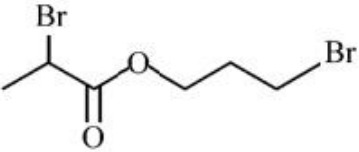
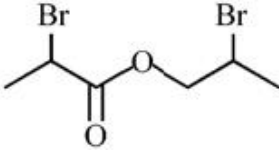
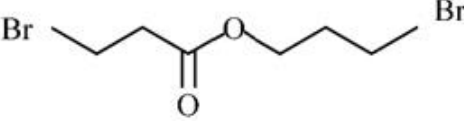
Question:	High purity (>99.95%) dihydrogen is obtained by
A:	reaction of zinc with aqueous alkali.
B:	electrolysis of acidified water using platinum electrodes.
C:	electrolysis of warm aqueous barium hydroxide solution between nickel electrodes.
D:	reaction of zinc with dilute acid.

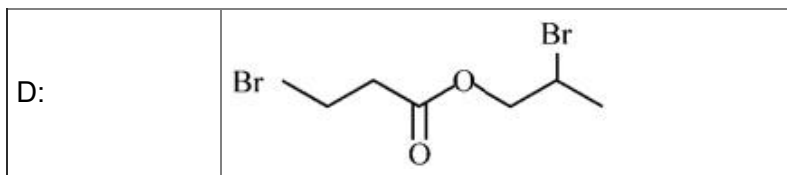
Topic:	Chemistry-Section A
Item No:	69
Question ID:	1569469
Question Type:	MCQ
Question:	The correct order of density is
A:	Be > Mg > Ca > Sr
B:	Sr > Ca > Mg > Be
C:	Sr > Be > Mg > Ca
D:	Be > Sr > Mg > Ca

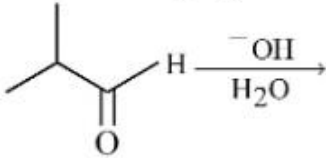
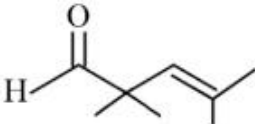
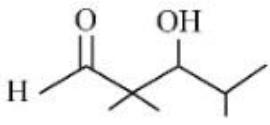
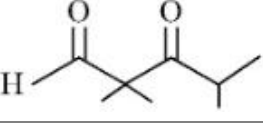
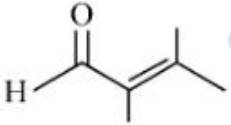
Topic:	Chemistry-Section A
Item No:	70
Question ID:	1569470
Question Type:	MCQ
Question:	The total number of acidic oxides from the following list is NO, N ₂ O, B ₂ O ₃ , N ₂ O ₅ , CO, SO ₃ , P ₄ O ₁₀
A:	3
B:	4
C:	5
D:	6

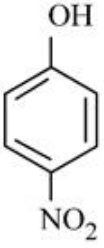
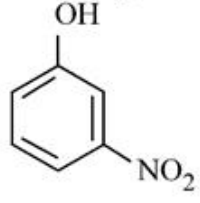
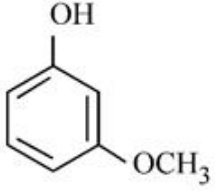
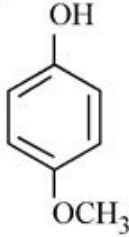
Topic:	Chemistry-Section A
Item No:	71
Question ID:	1569471
Question Type:	MCQ
Question:	The correct order of energy of absorption for the following metal complexes is A : [Ni(en) ₃] ²⁺ , B : [Ni(NH ₃) ₆] ²⁺ , C : [Ni(H ₂ O) ₆] ²⁺
A:	C < B < A
B:	B < C < A
C:	C < A < B
D:	A < C < B

Topic:	Chemistry-Section A										
Item No:	72										
Question ID:	1569472										
Question Type:	MCQ										
Question:	Match List I with List II. <table border="1"> <thead> <tr> <th>List I</th><th>List II</th></tr> </thead> <tbody> <tr> <td>A. Sulphate</td><td>I. Pesticide</td></tr> <tr> <td>B. Fluoride</td><td>II. Bending of bones</td></tr> <tr> <td>C. Nicotine</td><td>III. Laxative effect</td></tr> <tr> <td>D. Sodium arsenite</td><td>IV. Herbicide</td></tr> </tbody> </table> Choose the correct answer from the options given below:	List I	List II	A. Sulphate	I. Pesticide	B. Fluoride	II. Bending of bones	C. Nicotine	III. Laxative effect	D. Sodium arsenite	IV. Herbicide
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C. Nicotine	III. Laxative effect										
D. Sodium arsenite	IV. Herbicide										
A:	A-II, B-III, C-IV, D-I										
B:	A-IV, B-III, C-II, D-I										
C:	A-III, B-II, C-I, D-IV										
D:	A-III, B-II, C-IV, D-I										

Topic:	Chemistry-Section A
Item No:	73
Question ID:	1569473
Question Type:	MCQ
Question:	Major product of the following reaction is 
A:	
B:	
C:	



Topic:	Chemistry-Section A
Item No:	74
Question ID:	1569474
Question Type:	MCQ
Question:	What is the major product of the following reaction ? 
A:	
B:	
C:	
D:	

Topic:	Chemistry-Section A
Item No:	75
Question ID:	1569475
Question Type:	MCQ
Question:	Arrange the following in decreasing acidic strength.  (A)  (B)  (C)  (D)
A:	A > B > C > D
B:	B > A > C > D

C:	$D > C > A > B$
D:	$D > C > B > A$

Topic:	Chemistry-Section A
Item No:	76
Question ID:	1569476
Question Type:	MCQ
Question:	$\text{CH}_3 - \text{CH}_2 - \text{CN} \xrightarrow[\text{Ether}]{\text{CH}_3\text{MgBr}} \text{A} \xrightarrow{\text{H}_3\text{O}^+} \text{B} \xrightarrow[\text{HCl}]{\text{Zn-Hg}} \text{C}$ The correct structure of C is
A:	$\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$
B:	$\begin{array}{c} \text{O} \\ \\ \text{CH}_3 - \text{CH}_2 - \text{C} - \text{CH}_3 \end{array}$
C:	$\begin{array}{c} \text{OH} \\ \\ \text{CH}_3 - \text{CH}_2 - \text{CH} - \text{CH}_3 \end{array}$
D:	$\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH}_2$

Topic:	Chemistry-Section A										
Item No:	77										
Question ID:	1569477										
Question Type:	MCQ										
Question:	Match List I with List II : <table border="1"> <thead> <tr> <th>List I Polymer</th><th>List II used for items</th></tr> </thead> <tbody> <tr> <td>A. Nylon 6,6</td><td>I. Buckets</td></tr> <tr> <td>B. Low density polythene</td><td>II. Non-stick utensils</td></tr> <tr> <td>C. High density polythene</td><td>III. Bristles of brushes</td></tr> <tr> <td>D. Teflon</td><td>IV. Toys</td></tr> </tbody> </table> Choose the correct answer from the options given below:	List I Polymer	List II used for items	A. Nylon 6,6	I. Buckets	B. Low density polythene	II. Non-stick utensils	C. High density polythene	III. Bristles of brushes	D. Teflon	IV. Toys
List I Polymer	List II used for items										
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D. Teflon	IV. Toys										
A:	A-III, B-I, C-IV, D-II										
B:	A-III, B-IV, C-I, D-II										
C:	A-II, B-I, C-IV, D-III										
D:	A-II, B-IV, C-I, D-III										

Topic:	Chemistry-Section A
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Item No:	78
Question ID:	1569478
Question Type:	MCQ
Question:	Glycosidic linkage between C1 of α -glucose and C2 of β -fructose is found in
A:	maltose
B:	sucrose
C:	lactose
D:	amylose

Topic:	Chemistry-Section A
Item No:	79
Question ID:	1569479
Question Type:	MCQ
Question:	Some drugs bind to a site other than the active site of an enzyme. This site is known as
A:	non-active site
B:	allosteric site
C:	competitive site
D:	therapeutic site

Topic:	Chemistry-Section A
Item No:	80
Question ID:	1569480
Question Type:	MCQ
Question:	In base vs. acid titration, at the end point methyl orange is present as
A:	quinonoid form
B:	heterocyclic form
C:	phenolic form
D:	benzenoid form

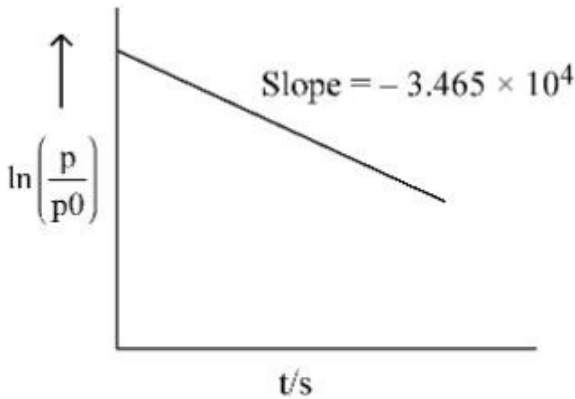
Topic:	Chemistry-Section B
Item No:	81
Question ID:	1569481
Question Type:	Numeric Answer
Question:	56.0 L of nitrogen gas is mixed with excess of hydrogen gas and it is found that 20 L of ammonia gas is produced. The volume of unused nitrogen gas is found to be __ L.

Topic:	Chemistry-Section B
Item No:	82
Question ID:	1569482
Question Type:	Numeric Answer
Question:	A sealed flask with a capacity of 2 dm^3 contains 11 g of propane gas. The flask is so weak that it will burst if the pressure becomes 2 MPa. The minimum temperature at which the flask will burst is _____ $^{\circ}\text{C}$. [Nearest integer] (Given: $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$, Atomic masses of C and H are 12u and 1u, respectively.)(Assume that propane behaves as an ideal gas.)

Topic:	Chemistry-Section B
Item No:	83
Question ID:	1569483
Question Type:	Numeric Answer
Question:	When the excited electron of a H atom from $n = 5$ drops to the ground state, the maximum number of emission lines observed are _____.

Topic:	Chemistry-Section B
Item No:	84
Question ID:	1569484
Question Type:	Numeric Answer
Question:	While performing a thermodynamics experiment, a student made the following observations. $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O} \quad \Delta H = -57.3 \text{ kJ mol}^{-1}$ $\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O} \quad \Delta H = -55.3 \text{ kJ mol}^{-1}$ The enthalpy of ionization of CH_3COOH as calculated by the student is _____ kJ mol^{-1}. (nearest integer)

Topic:	Chemistry-Section B
Item No:	85
Question ID:	1569485
Question Type:	Numeric Answer

Question:	For the decomposition of azomethane, $\text{CH}_3\text{N}_2\text{CH}_3(\text{g}) \rightarrow \text{CH}_3\text{CH}_3(\text{g}) + \text{N}_2(\text{g})$, a first order reaction, the variation in partial pressure with time at 600 K is given as  The half life of the reaction is $___ \times 10^{-5}$ s. [Nearest integer]
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Topic:	Chemistry-Section B
Item No:	86
Question ID:	1569486
Question Type:	Numeric Answer
Question:	The sum of number of lone pairs of electrons present on the central atoms of XeO_3 , XeOF_4 and XeF_6 , is $______$

Topic:	Chemistry-Section B
Item No:	87
Question ID:	1569487
Question Type:	Numeric Answer
Question:	The spin-only magnetic moment value of M^{3+} ion (in gaseous state) from the pairs $\text{Cr}^{3+}/\text{Cr}^{2+}$, $\text{Mn}^{3+}/\text{Mn}^{2+}$, $\text{Fe}^{3+}/\text{Fe}^{2+}$ and $\text{Co}^{3+}/\text{Co}^{2+}$ that has negative standard electrode potential, is $___ \text{ B.M.}$ [Nearest integer]

Topic:	Chemistry-Section B
Item No:	88
Question ID:	1569488
Question Type:	Numeric Answer
Question:	A sample of 4.5 mg of an unknown monohydric alcohol, R-OH was added to methylmagnesium iodide. A gas is evolved and is collected and its volume measured to be 3.1 mL. The molecular weight of the unknown alcohol is $___ \text{ g/mol.}$ [Nearest integer]

Topic:	Chemistry-Section B
Item No:	89

Question ID:	1569489
Question Type:	Numeric Answer
Question:	The separation of two coloured substances was done by paper chromatography. The distances travelled by solvent front, substance A and substance B from the base line are 3.25 cm, 2.08 cm and 1.05 cm, respectively. The ratio of R_f values of A to B is _____.

Topic:	Chemistry-Section B
Item No:	90
Question ID:	1569490
Question Type:	Numeric Answer
Question:	The total number of monobromo derivatives formed by the alkanes with molecular formula C_5H_{12} is (excluding stereo isomers) _____.