

Q:1
Topic Name:Mathematics-Section A

ItemCode:171
If $\sum_{k=1}^{31} \binom{31}{k} \binom{31}{k-1} - \sum_{k=1}^{30} \binom{30}{k} \binom{30}{k-1} = \frac{\alpha(60!)}{(30!)(31!)}$, where $\alpha \in \mathbb{R}$, then the
Question: value of 16α is equal to

A	1411
B	1320
C	1615
D	1855

Q:2
Topic Name:Mathematics-Section A

ItemCode:172
Let a function $f : \mathbb{N} \rightarrow \mathbb{N}$ be defined by
$$f(n) = \begin{cases} 2n, & n = 2, 4, 6, 8, \dots \\ n-1, & n = 3, 7, 11, 15, \dots \\ \frac{n+1}{2}, & n = 1, 5, 9, 13, \dots \end{cases}$$

Question: then, f is

A	one-one but not onto
B	onto but not one-one
C	neither one-one nor onto
D	one-one and onto

Q:3
Topic Name:Mathematics-Section A

ItemCode:173
If the system of linear equations
$$\begin{aligned} 2x + 3y - z &= -2 \\ x + y + z &= 4 \\ x - y + \lambda z &= 4\lambda - 4 \end{aligned}$$

Question: where $\lambda \in \mathbb{R}$, has no solution, then

A	$\lambda = 7$
B	$\lambda = -7$
C	$\lambda = 8$
D	$\lambda^2 = 1$

Q:4
Topic Name:Mathematics-Section A

ItemCode:174
Let A be a matrix of order 3×3 and $\det(A) = 2$. Then $\det(\det(A) \operatorname{adj}(5 \operatorname{adj}(A^3)))$
Question: is equal to _____.

A	512×10^6
B	256×10^6

C	1024×10^6
D	256×10^{11}

Q:5

Topic Name:Mathematics-Section A

ItemCode:175	
The total number of 5-digit numbers, formed by using the digits 1, 2, 3, 5, 6, 7	
Question: without repetition, which are multiple of 6, is	
A	36
B	48
C	60
D	72

Q:6

Topic Name:Mathematics-Section A

ItemCode:176	
Let $A_1, A_2, A_3, \dots$ be an increasing geometric progression of positive real	
numbers. If $A_1 A_3 A_5 A_7 = \frac{1}{1296}$ and $A_2 + A_4 = \frac{7}{36}$, then, the value of	
Question: $A_6 + A_8 + A_{10}$ is equal to	
A	33
B	37
C	43
D	47

Q:7

Topic Name:Mathematics-Section A

ItemCode:177	
Let $[t]$ denote the greatest integer less than or equal to t . Then, the value of the	
integral $\int_0^1 [-8x^2 + 6x - 1] dx$ is equal to	
Question:	
A	-1
B	$-\frac{5}{4}$
C	$\frac{\sqrt{17}-13}{8}$
D	$\frac{\sqrt{17}-16}{8}$

Q:8

Topic Name:Mathematics-Section A

ItemCode:178	
Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined as	
$f(x) = \begin{cases} [e^x], & x < 0 \\ ae^x + [x-1], & 0 \leq x < 1 \\ b + [\sin(\pi x)], & 1 \leq x < 2 \\ [e^{-x}] - c, & x \geq 2 \end{cases}$	
where $a, b, c \in \mathbb{R}$ and $[t]$ denotes greatest integer less than or equal to t . Then,	
Question: which of the following statements is true ?	
A	There exists $a, b, c \in \mathbb{R}$ such that f is continuous on $\mathbb{R}$.
B	If f is discontinuous at exactly one point, then $a + b + c = 1$

C	If f is discontinuous at exactly one point, then $a + b + c \neq 1$
D	f is discontinuous at atleast two points, for any values of a, b and c

Q:9

Topic Name:Mathematics-Section A

ItemCode:179	
Question: The area of the region $S = \{(x, y) : y^2 \leq 8x, y \geq \sqrt{2}x, x \geq 1\}$ is	
A	$\frac{13\sqrt{2}}{6}$
B	$\frac{11\sqrt{2}}{6}$
C	$\frac{5\sqrt{2}}{6}$
D	$\frac{19\sqrt{2}}{6}$

Q:10

Topic Name:Mathematics-Section A

ItemCode:1710	
Let the solution curve $y = y(x)$ of the differential equation	
$\left[\frac{x}{\sqrt{x^2 - y^2}} + e^{\frac{y}{x}} \right] x \frac{dy}{dx} = x + \left[\frac{x}{\sqrt{x^2 - y^2}} + e^{\frac{y}{x}} \right] y$	
Question: pass through the points $(1, 0)$ and $(2\alpha, \alpha)$, $\alpha > 0$. Then α is equal to	
A	$\frac{1}{2} \exp\left(\frac{\pi}{6} + \sqrt{e} - 1\right)$
B	$\frac{1}{2} \exp\left(\frac{\pi}{3} + e - 1\right)$
C	$\exp\left(\frac{\pi}{6} + \sqrt{e} + 1\right)$
D	$2 \exp\left(\frac{\pi}{3} + \sqrt{e} - 1\right)$

Q:11

Topic Name:Mathematics-Section A

ItemCode:1711	
Let $y = y(x)$ be the solution of the differential equation	
$x(1 - x^2) \frac{dy}{dx} + (3x^2 y - y - 4x^3) = 0, x > 1, \text{ with } y(2) = -2. \text{ Then } y(3) \text{ is equal to}$	
Question:	
A	-18
B	-12
C	-6
D	-3

Q:12

Topic Name:Mathematics-Section A

ItemCode:1712	
Question: The number of real solutions of $x^7 + 5x^3 + 3x + 1 = 0$ is equal to _____.	
A	0
B	1

C 3

D 5

Q:13

Topic Name:Mathematics-Section A

ItemCode:1713

Let the eccentricity of the hyperbola $H: \frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ be $\sqrt{\frac{5}{2}}$ and length of its

latus rectum be $6\sqrt{2}$, If $y = 2x + c$ is a tangent to the hyperbola H , then the value

Question: of c^2 is equal to

A 18

B 20

C 24

D 32

Q:14

Topic Name:Mathematics-Section A

ItemCode:1714

If the tangents drawn at the points $O(0, 0)$ and $P(1 + \sqrt{5}, 2)$ on the circle

$x^2 + y^2 - 2x - 4y = 0$ intersect at the point Q , then the area of the triangle OPQ is

Question: equal to

A $\frac{3 + \sqrt{5}}{2}$

B $\frac{4 + 2\sqrt{5}}{2}$

C $\frac{5 + 3\sqrt{5}}{2}$

D $\frac{7 + 3\sqrt{5}}{2}$

Q:15

Topic Name:Mathematics-Section A

ItemCode:1715

If two distinct points Q, R lie on the line of intersection of the planes

$-x + 2y - z = 0$ and $3x - 5y + 2z = 0$ and $PQ = PR = \sqrt{18}$ where the point P is

Question: $(1, -2, 3)$, then the area of the triangle PQR is equal to

A $\frac{2}{3}\sqrt{38}$

B $\frac{4}{3}\sqrt{38}$

C $\frac{8}{3}\sqrt{38}$

D $\sqrt{\frac{152}{3}}$

Q:16

Topic Name:Mathematics-Section A

ItemCode:1716

The acute angle between the planes P_1 and P_2 , when P_1 and P_2 are the planes

passing through the intersection of the planes $5x + 8y + 13z - 29 = 0$ and

Question: $8x - 7y + z - 20 = 0$ and the points $(2, 1, 3)$ and $(0, 1, 2)$, respectively, is

- A $\frac{\pi}{3}$
- B $\frac{\pi}{4}$
- C $\frac{\pi}{6}$
- D $\frac{\pi}{12}$

Q:17
 Topic Name:Mathematics-Section A

ItemCode:1717
 Let the plane $P: \vec{r} \cdot \vec{a} = d$ contain the line of intersection of two planes
 $\vec{r} \cdot (\hat{i} + 3\hat{j} - \hat{k}) = 6$ and $\vec{r} \cdot (-6\hat{i} + 5\hat{j} - \hat{k}) = 7$. If the plane P passes through the
 point $\left(2, 3, \frac{1}{2}\right)$, then the value of $\frac{|13\vec{a}|^2}{d^2}$ is equal to

- Question:
- A 90
- B 93
- C 95
- D 97

Q:18
 Topic Name:Mathematics-Section A

ItemCode:1718
 The probability, that in a randomly selected 3-digit number at least two digits are
 odd, is

- Question:
- A $\frac{19}{36}$
- B $\frac{15}{36}$
- C $\frac{13}{36}$
- D $\frac{23}{36}$

Q:19
 Topic Name:Mathematics-Section A

ItemCode:1719
 Let AB and PQ be two vertical poles, 160 m apart from each other. Let C be the
 middle point of B and Q, which are feet of these two poles. Let $\frac{\pi}{8}$ and θ be the
 angles of elevation from C to P and A, respectively. If the height of pole PQ is
 twice the height of pole AB, then $\tan^2\theta$ is equal to

- Question:
- A $\frac{3-2\sqrt{2}}{2}$
- B $\frac{3+\sqrt{2}}{2}$
- C $\frac{3-2\sqrt{2}}{4}$
- D $\frac{3-\sqrt{2}}{4}$

Q:20

Topic Name:Mathematics-Section A

ItemCode:1720

Let p, q, r be three logical statements. Consider the compound statements

$$S_1 : ((\sim p) \vee q) \vee ((\sim p) \vee r) \text{ and}$$

$$S_2 : p \rightarrow (q \vee r)$$

Question: Then, which of the following is **NOT** true ?

- A** If S_2 is True, then S_1 is True
- B** If S_2 is False, then S_1 is False
- C** If S_2 is False, then S_1 is True
- D** If S_1 is False, then S_2 is False

Q:21

Topic Name:Mathematics-Section B

ItemCode:1721

Let R_1 and R_2 be relations on the set $\{1, 2, \dots, 50\}$ such that

$$R_1 = \{(p, p^n) : p \text{ is a prime and } n \geq 0 \text{ is an integer}\} \text{ and}$$

$$R_2 = \{(p, p^n) : p \text{ is a prime and } n = 0 \text{ or } 1\}.$$

Question: Then, the number of elements in $R_1 - R_2$ is _____.

Q:22

Topic Name:Mathematics-Section B

ItemCode:1722

The number of real solutions of the equation $e^{4x} + 4e^{3x} - 58e^{2x} + 4e^x + 1 = 0$ is

Question: _____.

Q:23

Topic Name:Mathematics-Section B

ItemCode:1723

The mean and standard deviation of 15 observations are found to be 8 and 3 respectively. On rechecking it was found that, in the observations, 20 was misread

Question: as 5. Then, the correct variance is equal to _____.

Q:24

Topic Name:Mathematics-Section B

ItemCode:1724

If $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$, $\vec{b} = 3\hat{i} + 3\hat{j} + \hat{k}$ and $\vec{c} = c_1\hat{i} + c_2\hat{j} + c_3\hat{k}$ are coplanar

Question: vectors and $\vec{a} \cdot \vec{c} = 5$, $\vec{b} \perp \vec{c}$, then $122(c_1 + c_2 + c_3)$ is equal to _____.

Q:25

Topic Name:Mathematics-Section B

ItemCode:1725

A ray of light passing through the point P (2, 3) reflects on the x-axis at point A and the reflected ray passes through the point Q (5, 4). Let R be the point that divides the line segment AQ internally into the ratio 2:1. Let the co-ordinates of the foot of the perpendicular M from R on the bisector of the angle PAQ be (α, β) . Then, the

Question: value of $7\alpha + 3\beta$ is equal to _____.

Q:26

Topic Name:Mathematics-Section B

ItemCode:1726

Let l be a line which is normal to the curve $y = 2x^2 + x + 2$ at a point P on the curve. If the point Q(6, 4) lies on the line l and O is origin, then the area of the

Question: triangle OPQ is equal to _____.

Q:27

ItemCode:1727

Let $A = \{1, a_1, a_2, \dots, a_{18}, 77\}$ be a set of integers with $1 < a_1 < a_2 < \dots < a_{18} < 77$. Let the set $A + A = \{x + y : x, y \in A\}$ contain exactly 39 elements. Then, the value of $a_1 + a_2 + \dots + a_{18}$ is equal to

Question: _____.

Q:28

Topic Name: Mathematics-Section B

ItemCode:1728

The number of positive integers k such that the constant term in the binomial expansion of $\left(2x^3 + \frac{3}{x^k}\right)^{12}$, $x \neq 0$ is $2^8 \cdot \ell$, where ℓ is an odd integer, is _____.

Question: _____.

Q:29

Topic Name: Mathematics-Section B

ItemCode:1729

The number of elements in the set

Question: $\{z = a + ib \in \mathbb{C} : a, b \in \mathbb{Z} \text{ and } 1 < |z - 3 + 2i| < 4\}$ is _____.

Q:30

Topic Name: Mathematics-Section B

ItemCode:1730

Let the lines $y + 2x = \sqrt{11} + 7\sqrt{7}$ and $2y + x = 2\sqrt{11} + 6\sqrt{7}$ be normal to a circle

$C : (x - h)^2 + (y - k)^2 = r^2$. If the line $\sqrt{11}y - 3x = \frac{5\sqrt{77}}{3} + 11$ is tangent to the

Question: circle C , then the value of $(5h - 8k)^2 + 5r^2$ is equal to _____.

Q:31

Topic Name: Physics-Section A

ItemCode:1731

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

Assertion A : Product of Pressure (P) and time (t) has the same dimension as that of coefficient of viscosity.

Reason R : Coefficient of viscosity = $\frac{\text{Force}}{\text{Velocity gradient}}$

Question: Choose the correct answer from the options given below :

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

Q:32

Topic Name: Physics-Section A

ItemCode:1732

A particle of mass m is moving in a circular path of constant radius r such that its centripetal acceleration (a) is varying with time t as $a = k^2 r t^2$, where k is a

Question: constant. The power delivered to the particle by the force acting on it is given as

- A zero
- B $mk^2 r^2 t^2$
- C $mk^2 r^2 t$

D mk^2rt

Q:33

Topic Name:Physics-Section A

ItemCode:1733

Motion of a particle in x-y plane is described by a set of following equations

Question: $x = 4 \sin\left(\frac{\pi}{2} - \omega t\right)$ m and $y = 4 \sin(\omega t)$ m. The path of the particle will be :

- A circular
- B helical
- C parabolic
- D elliptical

Q:34

Topic Name:Physics-Section A

ItemCode:1734

Match List-I with List-II

	List - I		List - II
A.	Moment of inertia of solid sphere of radius R about any tangent.	I.	$\frac{5}{3} MR^2$
B.	Moment of inertia of hollow sphere of radius (R) about any tangent.	II.	$\frac{7}{5} MR^2$
C.	Moment of inertia of circular ring of radius (R) about its diameter.	III.	$\frac{1}{4} MR^2$
D.	Moment of inertia of circular disc of radius (R) about any diameter.	IV.	$\frac{1}{2} MR^2$

Question: Choose the correct answer from the options given below :

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

Q:35

Topic Name:Physics-Section A

ItemCode:1735

Two planets A and B of equal mass are having their period of revolutions T_A and T_B such that $T_A = 2T_B$. These planets are revolving in the circular orbits of radii r_A and r_B respectively. Which out of the following would be the correct

Question: relationship of their orbits?

- A $2r_A^2 = r_B^3$
- B $r_A^3 = 2r_B^3$
- C $r_A^3 = 4r_B^3$
- D $T_A^2 - T_B^2 = \frac{\pi^2}{GM} (r_B^3 - 4r_A^3)$

Q:36

Topic Name:Physics-Section A

ItemCode:1736

A water drop of diameter 2 cm is broken into 64 equal droplets. The surface

Question: tension of water is 0.075 N/m. In this process the gain in surface energy will be :

- A 2.8×10^{-4} J
- B 1.5×10^{-3} J

C $1.9 \times 10^{-4} \text{ J}$

D $9.4 \times 10^{-5} \text{ J}$

Q:37

Topic Name:Physics-Section A

ItemCode:1737

Given below are two statements :

Statement – I : When μ amount of an ideal gas undergoes adiabatic change from state (P_1, V_1, T_1) to state (P_2, V_2, T_2) , then work done is $W = \frac{\mu R (T_2 - T_1)}{1 - \gamma}$, where

$\gamma = \frac{C_p}{C_v}$ and R = universal gas constant.

Statement – II : In the above case, when work is done on the gas, the temperature of the gas would rise.

Question: Choose the correct answer from the options given below:

A Both statement-I and statement-II are true.

B Both statement-I and statement-II are false.

C Statement-I is true but statement-II is false.

D Statement-I is false but statement-II is true.

Q:38

Topic Name:Physics-Section A

ItemCode:1738

Given below are two statements :

Statement-I : A point charge is brought in an electric field. The value of electric field at a point near to the charge may increase if the charge is positive.

Statement-II : An electric dipole is placed in a non-uniform electric field. The net electric force on the dipole will not be zero.

Question: Choose the correct answer from the options given below :

A Both statement-I and statement-II are true.

B Both statement-I and statement-II are false.

C Statement-I is true but statement-II is false.

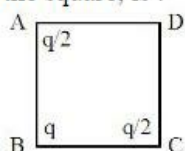
D Statement-I is false but statement-II is true.

Q:39

Topic Name:Physics-Section A

ItemCode:1739

The three charges $q/2$, q and $q/2$ are placed at the corners A, B and C of a square of side 'a' as shown in figure. The magnitude of electric field (E) at the corner D of the square, is :



Question: B

A $\frac{q}{4\pi\epsilon_0 a^2} \left(\frac{1}{\sqrt{2}} + \frac{1}{2} \right)$

B $\frac{q}{4\pi\epsilon_0 a^2} \left(1 + \frac{1}{\sqrt{2}} \right)$

C $\frac{q}{4\pi\epsilon_0 a^2} \left(1 - \frac{1}{\sqrt{2}} \right)$

D $\frac{q}{4\pi\epsilon_0 a^2} \left(\frac{1}{\sqrt{2}} - \frac{1}{2} \right)$

Q:40

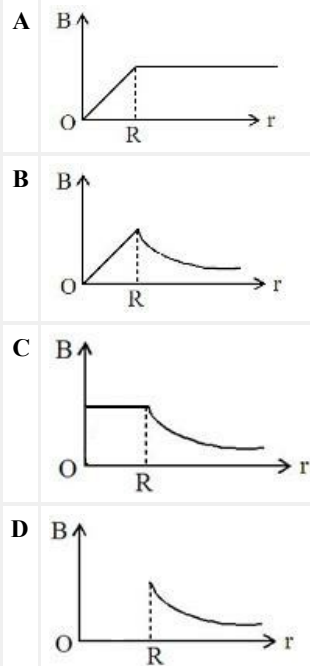
Topic Name:Physics-Section A

ItemCode:1740

An infinitely long hollow conducting cylinder with radius R carries a uniform current along its surface.

Choose the correct representation of magnetic field (B) as a function of radial distance (r) from the axis of cylinder.

Question:



Q:41

Topic Name:Physics-Section A

ItemCode:1741

A radar sends an electromagnetic signal of electric field (E_0) = 2.25 V/m and magnetic field (B_0) = 1.5×10^{-8} T which strikes a target on line of sight at a distance of 3 km in a medium. After that, a part of signal (echo) reflects back towards the radar with same velocity and by same path. If the signal was transmitted at time $t=0$ from radar, then after how much time echo will reach to the

Question: radar?

- A 2.0×10^{-5} s
- B 4.0×10^{-5} s
- C 1.0×10^{-5} s
- D 8.0×10^{-5} s

Q:42

Topic Name:Physics-Section A

ItemCode:1742

The refracting angle of a prism is A and refractive index of the material of the prism is $\cot(A/2)$. Then the angle of minimum deviation will be -

Question:

- A $180 - 2A$
- B $90 - A$
- C $180 + 2A$
- D $180 - 3A$

Q:43

Topic Name:Physics-Section A

ItemCode:1743

The aperture of the objective is 24.4 cm. The resolving power of this telescope, if a light of wavelength $2440 \text{ \AA}$ is used to see the object will be :

Question:

- A 8.1×10^6
- B 10.0×10^7
- C 8.2×10^5

D 1.0×10^{-8}

Q:44

Topic Name:Physics-Section A

ItemCode:1744

The de Broglie wavelengths for an electron and a photon are λ_e and λ_p respectively. For the same kinetic energy of electron and photon, which of the following presents the correct relation between the de Broglie wavelengths of two

Question:?

A $\lambda_p \propto \lambda_e^2$

B $\lambda_p \propto \lambda_e$

C $\lambda_p \propto \sqrt{\lambda_e}$

D $\lambda_p \propto \sqrt{\frac{1}{\lambda_e}}$

Q:45

Topic Name:Physics-Section A

ItemCode:1745

The Q-value of a nuclear reaction and kinetic energy of the projectile particle, K_p

Question:are related as :

A $Q = K_p$

B $(K_p + Q) < 0$

C $Q < K_p$

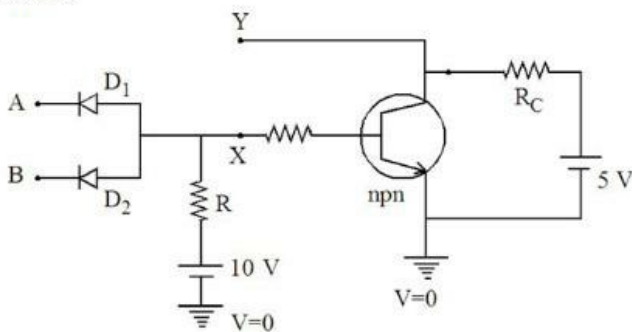
D $(K_p + Q) > 0$

Q:46

Topic Name:Physics-Section A

ItemCode:1746

In the following circuit, the correct relation between output (Y) and inputs A and B will be :



Question:

A $Y = AB$

B $Y = A + B$

C $Y = \overline{AB}$

D $Y = \overline{A + B}$

Q:47

Topic Name:Physics-Section A

ItemCode:1747

For using a multimeter to identify diode from electrical components, choose the

Question:correct statement out of the following about the diode :

A It is two terminal device which conducts current in both directions.

B It is two terminal device which conducts current in one direction only

- C** It does not conduct current gives an initial deflection which decays to zero.
- D** It is three terminal device which conducts current in one direction only between central terminal and either of the remaining two terminals

Q:48
 Topic Name:Physics-Section A

ItemCode:1748
 Given below are two statements : One is labelled as **Assertion A** and the other is labelled as **Reason R**.
Assertion A : n-p-n transistor permits more current than a p-n-p transistor.
Reason R : Electrons have greater mobility as a charge carrier.
 Question: Choose the correct answer from the options given below :

- A** Both **A** and **R** true, and **R** is correct explanation of **A**.
- B** Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.
- C** **A** is true but **R** is false.
- D** **A** is false but **R** is true.

Q:49
 Topic Name:Physics-Section A

ItemCode:1749
 Match List-I with List-II

	List - I		List - II
A.	Television signal	I.	03 KHz
B.	Radio signal	II.	20 KHz
C.	High Quality Music	III.	02 MHz
D.	Human speech	IV.	06 MHz

Question: Choose the correct answer from the options given below :

- A** A-I, B-II, C-III, D-IV
- B** A-IV, B-III, C-I, D-II
- C** A-IV, B-III, C-II, D-I
- D** A-I, B-II, C-IV, D-III

Q:50
 Topic Name:Physics-Section A

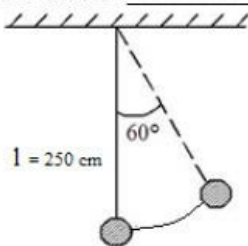
ItemCode:1750
 The velocity of sound in a gas, in which two wavelengths 4.08m and 4.16m
 Question: produce 40 beats in 12s, will be :

- A** 282.8 ms⁻¹
- B** 175.5 ms⁻¹
- C** 353.6 ms⁻¹
- D** 707.2 ms⁻¹

Q:51
 Topic Name:Physics-Section B

ItemCode:1751

A pendulum is suspended by a string of length 250 cm. The mass of the bob of the pendulum is 200 g. The bob is pulled aside until the string is at 60° with vertical as shown in the figure. After releasing the bob, the maximum velocity attained by the bob will be _____ ms^{-1} . (if $g = 10 \text{ m/s}^2$)



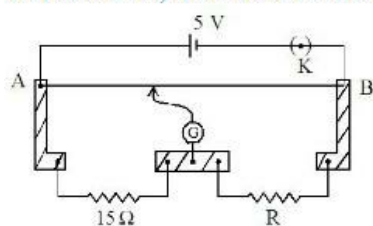
Question:

Q:52

Topic Name:Physics-Section B

ItemCode:1752

A meter bridge setup is shown in the figure. It is used to determine an unknown resistance R using a given resistor of 15Ω . The galvanometer (G) shows null deflection when tapping key is at 43 cm mark from end A. If the end correction for end A is 2 cm, then the determined value of R will be _____ Ω .



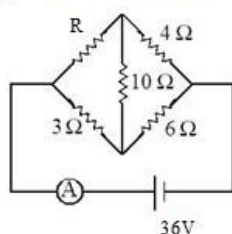
Question:

Q:53

Topic Name:Physics-Section B

ItemCode:1753

Current measured by the ammeter $\textcircled{A}$ in the reported circuit when no current flows through 10Ω resistance, will be _____ A.



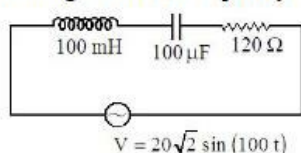
Question:

Q:54

Topic Name:Physics-Section B

ItemCode:1754

An AC source is connected to an inductance of 100 mH, a capacitance of $100 \mu\text{F}$ and a resistance of 120Ω as shown in figure. The time in which the resistance having a thermal capacity $2 \text{ J/}^\circ\text{C}$ will get heated by 16°C is _____ s.



$$V = 20\sqrt{2} \sin(100t)$$

Question:

Q:55

Topic Name:Physics-Section B

ItemCode:1755

The position vector of 1 kg object is $\vec{r} = (3\hat{i} - \hat{j}) \text{ m}$ and its velocity

$\vec{v} = (3\hat{j} + \hat{k}) \text{ ms}^{-1}$. The magnitude of its angular momentum is $\sqrt{x} \text{ Nm}$ where x is

Question:_____.

Q:56

Topic Name:Physics-Section B

ItemCode:1756

A man of 60 kg is running on the road and suddenly jumps into a stationary trolley car of mass 120 kg. Then, the trolley car starts moving with velocity 2 ms^{-1} . The

Question: velocity of the running man was _____ ms^{-1} , when he jumps into the car.

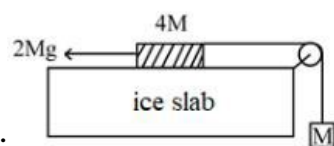
Q:57

Topic Name:Physics-Section B

ItemCode:1757

A hanging mass M is connected to a four times bigger mass by using a string-pulley arrangement, as shown in the figure. The bigger mass is placed on a horizontal ice-slab and being pulled by $2Mg$ force. In this situation, tension in the string is $\frac{x}{5}Mg$ for $x = \underline{\hspace{2cm}}$. Neglect mass of the string and friction of the block (bigger mass) with ice slab.

(Given $g = \text{acceleration due to gravity}$)



Question:

Q:58

Topic Name:Physics-Section B

ItemCode:1758

The total internal energy of two mole monoatomic ideal gas at temperature

Question: $T = 300 \text{ K}$ will be _____ J. (Given $R = 8.31 \text{ J/mol.K}$)

Q:59

Topic Name:Physics-Section B

ItemCode:1759

A singly ionized magnesium atom ($A=24$) ion is accelerated to kinetic energy 5 keV , and is projected perpendicularly into a magnetic field B of the

Question: magnitude 0.5 T . The radius of path formed will be _____ cm.

Q:60

Topic Name:Physics-Section B

ItemCode:1760

A telegraph line of length 100 km has a capacity of $0.01 \mu\text{F/km}$ and it carries an alternating current at 0.5 kilo cycle per second. If minimum impedance is required, then the value of the inductance that needs to be introduced in series is

Question: _____ mH. (if $\pi = \sqrt{10}$)

Q:61

Topic Name:Chemistry-Section A

ItemCode:1761

Question: The **incorrect** statement about the imperfections in solids is :

- A Schottky defect decreases the density of the substance.
- B Interstitial defect increases the density of the substance.
- C Frenkel defect does not alter the density of the substance.
- D Vacancy defect increases the density of the substance.

Q:62

Topic Name:Chemistry-Section A

ItemCode:1762

Question: The Zeta potential is related to which property of colloids ?

- A Colour
- B Tyndall effect

C Charge on the surface of colloidal particles

D Brownian movement

Q:63

Topic Name:Chemistry-Section A

ItemCode:1763

Element "E" belongs to the period 4 and group 16 of the periodic table. The valence shell electron configuration of the element, which is just above "E" in the

Question: group is

A $3s^2, 3p^4$

B $3d^{10}, 4s^2, 4p^4$

C $4d^{10}, 5s^2, 5p^4$

D $2s^2, 2p^4$

Q:64

Topic Name:Chemistry-Section A

ItemCode:1764

Given are two statements one is labelled as **Assertion A** and other is labelled as **Reason R**.

Assertion A :Magnesium can reduce Al_2O_3 at a temperature below $1350^\circ C$, while above $1350^\circ C$ aluminium can reduce MgO .

Reason R : The melting and boiling points of magnesium are lower than those of aluminium.

In light of the above statements, choose most appropriate answer from the options

Question: given below :

A Both **A** and **R** are correct, and **R** is correct explanation of **A**.

B Both **A** and **R** are correct, but **R** is NOT the correct explanation of **A**.

C **A** is correct **R** is not correct.

D **A** is not correct, **R** is correct.

Q:65

Topic Name:Chemistry-Section A

ItemCode:1765

Question: Dihydrogen reacts with CuO to give

A CuH_2

B Cu

C Cu_2O

D $Cu(OH)_2$

Q:66

Topic Name:Chemistry-Section A

ItemCode:1766

Question: Nitrogen gas is obtained by thermal decomposition of

A $Ba(NO_3)_2$

B $Ba(N_3)_2$

C $NaNO_2$

D $NaNO_3$

Q:67

Topic Name:Chemistry-Section A

ItemCode:1767

Given below are two statements :

Statement I :The pentavalent oxide of group-15 element, E_2O_5 , is less acidic than trivalent oxide, E_2O_3 , of the same element.

Statement II :The acidic character of trivalent oxide of group 15 elements, E_2O_3 , decreases down the group.

In light of the above statements, choose **most appropriate** answer from the

Question: options given below :

A Both Statement I and Statement II are true.

B Both Statement I and Statement II are false.

C Statement I true, but statement II is false.

D Statement I is false but statement II is true.

Q:68

Topic Name:Chemistry-Section A

ItemCode:1768

Question: Which one of the lanthanoids given below is the most stable in divalent form?

A Ce (Atomic Number 58)

B Sm (Atomic Number 62)

C Eu (Atomic Number 63)

D Yb (Atomic Number 70)

Q:69

Topic Name:Chemistry-Section A

ItemCode:1769

Given below are two statements :

Statement I : $[Ni(CN)_4]^{2-}$ is square planar and diamagnetic complex, with dsp^2 hybridization for Ni but $[Ni(CO)_4]$ is tetrahedral, paramagnetic and with sp^3 -hybridization for Ni.

Statement II : $[NiCl_4]^{2-}$ and $[Ni(CO)_4]$ both have same d-electron configuration, have same geometry and are paramagnetic.

In light the above statements, choose the **correct** answer form the options given

Question: below :

A Both Statement I and Statement II are true.

B Both Statement I and Statement II are false.

C Statement I is correct but statement II is false.

D Statement I is incorrect but statement II is true.

Q:70

Topic Name:Chemistry-Section A

ItemCode:1770

Question: Which amongst the following is **not** a pesticide ?

A DDT

B Organophosphates

C Dieldrin

D Sodium arsenite

Q:71

Topic Name:Chemistry-Section A

ItemCode:1771

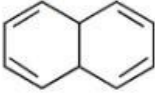
Which one of the following techniques is **not** used to spot components of a

Question: mixture separated on thin layer chromatographic plate ?

A	I ₂ (Solid)
B	U.V. Light
C	Visualisation agent as a component of mobile phase
D	Spraying of an appropriate reagent

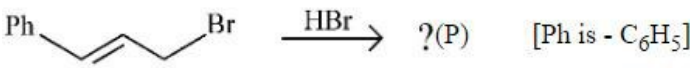
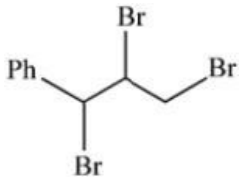
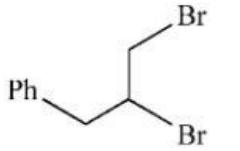
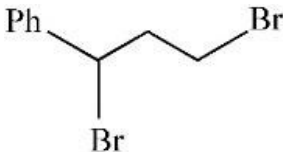
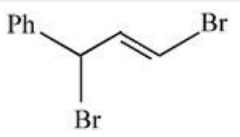
Q:72

Topic Name:Chemistry-Section A

ItemCode:1772 Which of the following structures are aromatic in nature ?  A  B  C  D	
Question:	
A	A, B, C and D
B	Only A and B
C	Only A and C
D	Only B, C and D

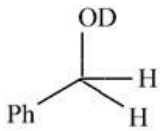
Q:73

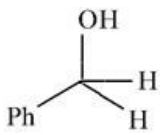
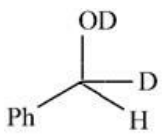
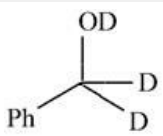
Topic Name:Chemistry-Section A

ItemCode:1773 The major product (P) in the reaction 	
Question:	is
A	
B	
C	
D	

Q:74

Topic Name:Chemistry-Section A

ItemCode:1774 The correct structure of product 'A' formed in the following reaction, $\text{PhCHO} + \text{Ph} \cdot \text{CHO} \xrightarrow[\text{in D}_2\text{O}]{\text{NaOD}} \text{A} + \text{Ph} - \overset{\text{O}}{\overset{\parallel}{\text{C}}} - \text{O}^- \quad (\text{Ph is} - \text{C}_6\text{H}_5)$	
Question:	is
A	

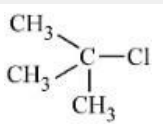
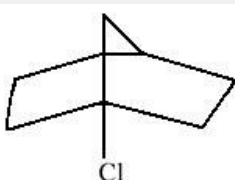
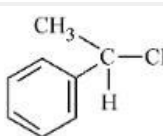
B	
C	
D	

Q:75

Topic Name:Chemistry-Section A

ItemCode:1775

Question: Which one of the following compounds is inactive towards S_N1 reaction ?

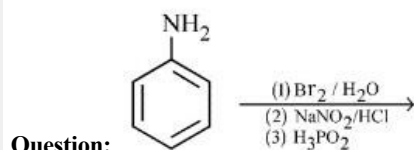
A	
B	
C	
D	

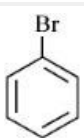
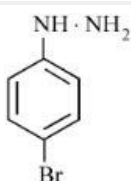
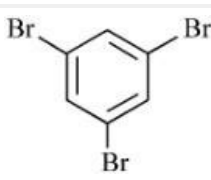
Q:76

Topic Name:Chemistry-Section A

ItemCode:1776

Identify the major product formed in the following sequence of reactions :



A	
B	
C	

D



Q:77

Topic Name:Chemistry-Section A

ItemCode:1777

A primary aliphatic amine on reaction with nitrous acid in cold (273 K) and there after raising temperature of reaction mixture to room temperature (298 K), gives

Question: a/an

- A nitrile
- B alcohol
- C diazonium salt
- D secondary amine

Q:78

Topic Name:Chemistry-Section A

ItemCode:1778

Question: Which one of the following is **NOT** a copolymer ?

- A Buna-S
- B Neoprene
- C PHBV
- D Butadiene-styrene

Q:79

Topic Name:Chemistry-Section A

ItemCode:1779

Question: Stability of α - Helix structure of proteins depends upon

- A dipolar interaction
- B H-bonding interaction
- C van der Waals forces
- D π -stacking interaction

Q:80

Topic Name:Chemistry-Section A

ItemCode:1780

The formula of the purple colour formed in Laissaigne's test for sulphur using sodium nitroprusside is

- A $\text{NaFe}[\text{Fe}(\text{CN})_6]$
- B $\text{Na}[\text{Cr}(\text{NH}_3)_2(\text{NCS})_4]$
- C $\text{Na}_2[\text{Fe}(\text{CN})_5(\text{NO})]$
- D $\text{Na}_4[\text{Fe}(\text{CN})_5(\text{NOS})]$

Q:81

Topic Name:Chemistry-Section B

ItemCode:1781

A 2.0 g sample containing MnO_2 is treated with HCl liberating Cl_2 . The Cl_2 gas is passed into a solution of KI and 60.0 mL of 0.1 M $\text{Na}_2\text{S}_2\text{O}_3$ is required to titrate the liberated iodine. The percentage of MnO_2 in the sample is _____. (Nearest integer)

[Atomic masses (in u) Mn = 55; Cl = 35.5; O = 16, I = 127, Na = 23, K = 39, S = 32]

Question:

Q:82

Topic Name:Chemistry-Section B

ItemCode:1782

If the work function of a metal is $6.63 \times 10^{-19} \text{J}$, the maximum wavelength of the photon required to remove a photoelectron from the metal is _____ nm. (Nearest integer)

Question: [Given : $h = 6.63 \times 10^{-34} \text{J s}$, and $c = 3 \times 10^8 \text{ m s}^{-1}$]

Q:83

Topic Name:Chemistry-Section B

ItemCode:1783

Question: The hybridization of P exhibited in PF_5 is $\text{sp}^x \text{d}^y$. The value of y is _____

Q:84

Topic Name:Chemistry-Section B

ItemCode:1784

4.0 L of an ideal gas is allowed to expand isothermally into vacuum until the total

Question: volume is 20 L. The amount of heat absorbed in this expansion is _____ L atm.

Q:85

Topic Name:Chemistry-Section B

ItemCode:1785

The vapour pressures of two volatile liquids A and B at 25°C are 50 Torr and 100 Torr, respectively. If the liquid mixture contains 0.3 mole fraction of A, then the mole fraction of liquid B in the vapour phase is $\frac{x}{17}$. The value of x is _____.

Question:

Q:86

Topic Name:Chemistry-Section B

ItemCode:1786

The solubility product of a sparingly soluble salt A_2X_3 is 1.1×10^{-23} . If specific conductance of the solution is $3 \times 10^{-5} \text{ S m}^{-1}$, the limiting molar conductivity of

Question: the solution is $x \times 10^{-3} \text{ S m}^2 \text{ mol}^{-1}$. The value of x is _____.

Q:87

Topic Name:Chemistry-Section B

ItemCode:1787

The quantity of electricity in Faraday needed to reduce 1 mol of $\text{Cr}_2\text{O}_7^{2-}$ to Cr^{3+} is

Question: _____

Q:88

Topic Name:Chemistry-Section B

ItemCode:1788

For a first order reaction $\text{A} \rightarrow \text{B}$, the rate constant, $k = 5.5 \times 10^{-14} \text{ s}^{-1}$. The time required for 67% completion of reaction is $x \times 10^{-1}$ times the half life of reaction. The value of x is _____ (Nearest integer)

Question: (Given : $\log 3 = 0.4771$)

Q:89

Topic Name:Chemistry-Section B

ItemCode:1789

Number of complexes which will exhibit synergic bonding amongst,

Question: $[\text{Cr}(\text{CO})_6]$, $[\text{Mn}(\text{CO})_5]$ and $[\text{Mn}_2(\text{CO})_{10}]$ is _____.

Q:90

Topic Name:Chemistry-Section B

ItemCode:1790

In the estimation of bromine, 0.5 g of an organic compound gave 0.40 g of silver bromide. The percentage of bromine in the given compound is _____ % (nearest integer)

Question: (Relative atomic masses of Ag and Br are 108u and 80u, respectively).