National Testing Agency

Question Paper Name :	B Tech 27 Jul 2022 Shift 1
Subject Name :	B. Tech
Duration :	180
Total Marks :	300
Display Marks:	Yes

B. Tech

Group Number :	1
Group Maximum Duration :	0
Group Minimum Duration :	180
Show Attended Group? :	No
Edit Attended Group? :	No
Break time :	0
Group Marks :	300

Mathematics Section A

Section Number :	1
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	80
Maximum Instruction Time :	0
Sub-Section Number :	1
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 1 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let R_1 and R_2 be two relations defined on $\mathbb{R}$ by

$a\,R_1\,b \Leftrightarrow ab \geq 0$ and $a\,R_2\,b \Leftrightarrow a \geq b$

Then,

Options :

A. R_1 is an equivalence relation but not R_2

B. R_2 is an equivalence relation but not R_1

C. both R_1 and R_2 are equivalence relations

D. neither R_1 nor R_2 is an equivalence relation

Question Number : 2 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $f, g : \mathbb{N} - \{1\} \to \mathbb{N}$ be functions defined by

$$f(a) = \alpha$$

, where α is the maximum of the powers of those primes p such that p^{α} divides a, and

$$g(a) = a + 1$$

, for all $a \in \mathbb{N} - \{1\}$. Then, the function $f + g$ is

Options :

A. one-one but not onto

B. onto but not one-one

C. both one-one and onto

D. neither one-one nor onto

Question Number : 3 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let the minimum value v_0 of

$$v = |z|^2 + |z - 3|^2 + |z - 6i|^2, z \in \mathbb{C}$$

is attained at $z = z_0$. Then $\left|2z_0^2 - \bar{z}_0^3 + 3\right|^2 + v_0^2$ is equal to :

Options :

A. 1000

B. 1024

C. 1105

D. 1196

Question Number : 4 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let

$$A = \begin{pmatrix} 1 & 2 \\ -2 & -5 \end{pmatrix}$$

. Let $\alpha, \beta \in \mathbb{R}$ be such that

$$\alpha A^2 + \beta A = 2I$$

. Then $\alpha + \beta$ is equal to

Options :

A. -10

B. -6

C. 6

D. 10

Question Number : 5 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The remainder when $(2021)^{2022} + (2022)^{2021}$ is divided by 7 is

Options :

A. 0

B. 1

C. 2

D. 6

Question Number : 6 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Suppose $a_1, a_2, \ldots, a_n, \ldots$ be an arithmetic progression of natural numbers. If the ratio of the sum of first five terms to the sum of first nine terms of the progression is 5 : 17 and , $110 < a_{15} < 120$, then the sum of the first ten terms of the progression is equal to

Options :

A. 290

B. 380

C. 460

D. 510

Question Number : 7 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $f : \mathbb{R} \to \mathbb{R}$ be a function defined as

$$f(x) = a\sin\left(\frac{\pi[x]}{2}\right) + [2 - x], a \in \mathbb{R}$$

where $[t]$ is the greatest integer less than or equal to t. If

$$\lim_{x \to -1} f(x)$$

exists, then the value of

$$\int_0^4 f(x)dx$$

is equal to

Options :

A. -1

B. -2

C. 1

D. 2

Question Number : 8 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let

$$I = \int_{\pi/4}^{\pi/3} \left(\frac{8\sin x - \sin 2x}{x}\right)dx$$

. Then

Options :

A. $\frac{\pi}{2} < I < \frac{3\pi}{4}$

B. $\frac{\pi}{5} < I < \frac{5\pi}{12}$

C. $\frac{5\pi}{12} < I < \frac{\sqrt{2}}{3}\pi$

D. $\frac{3\pi}{4} < I < \pi$

Question Number : 9 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The area of the smaller region enclosed by the curves $y^2 = 8x + 4$ and

$$x^2 + y^2 + 4\sqrt{3}\ x - 4 = 0$$

is equal to

Options :

A. $\frac{1}{3}(2 - 12\sqrt{3}\ + 8\pi)$

B. $\frac{1}{3}(2 - 12\sqrt{3}\ + 6\pi)$

C. $\frac{1}{3}(4 - 12\sqrt{3}\ + 8\pi)$

D. $\frac{1}{3}(4 - 12\sqrt{3}\ + 6\pi)$

Question Number : 10 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let

$$y = y_1(x)$$

and

$$y = y_2(x)$$

be two distinct solutions of the differential equation

$$\frac{dy}{dx} = x + y$$

, with

$$y_1(0) = 0$$

and

$$y_2(0) = 1$$

respectively. Then, the number of points of intersection of

$$y = y_1(x)$$

and

$$y = y_2(x)$$

is

Options :

A. 0

B. 1

C. 2

D. 3

Question Number : 11 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let

$$\vec{a} = \alpha\hat{i} + \hat{j} + \beta\hat{k}$$

and

$$\vec{b} = 3\hat{i} - 5\hat{j} + 4\hat{k}$$

be two vectors, such that

$$\vec{a} \times \vec{b} = -\hat{i} + 9\hat{j} + 12\hat{k}$$

. Then the projection of $\vec{b} - 2\vec{a}$ on $\vec{b} + \vec{a}$ is equal to :

Options :

A. 2

B. $\frac{39}{5}$

C. 9

D. $\frac{46}{5}$

Question Number : 12 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let S be the sample space of all five digit numbers. It p is the probability that a randomly selected number from S, is a multiple of 7 but not divisible by 5 , then $9p$ is equal to :

Options :

A. 1.0146

B. 1.2085

C. 1.0285

D. 1.1521

Question Number : 13 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $A(1,1), B(-4,3), C(-2,-5)$ be vertices of a triangle ABC, P be a point on side BC, and Δ_1 and Δ_2 be the areas of triangles APB and ABC, respectively. If

$$\Delta_1 : \Delta_2 = 4 : 7$$

, then the area enclosed by the lines AP, AC and the x-axis is :

Options :

A. $\frac{1}{4}$

B. $\frac{3}{4}$

C. $\frac{1}{2}$

D. 1

Question Number : 14 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If the circle

$$x^2 + y^2 - 2gx + 6y - 19c = 0, g, c \in \mathbb{R}$$

passes through the point (6,1) and its centre lies on the line $x - 2cy = 8$, then the length of intercept made by the circle on x-axis is :

Options :

A. $\sqrt{11}$

B. 4

C. 3

D. $2\sqrt{23}$

Question Number : 15 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let a function $f : \mathbb{R} \to \mathbb{R}$ be defined as :

$$f(x) = \begin{cases} \int_0^x (5 - |t-3|)dt, & x > 4 \\ x^2 + bx & , x \leq 4 \end{cases}$$

where b $\in \mathbb{R}$. If f is continuous at $x = 4$, then which of the following statements is NOT true?

Options :

A. f is not differentiable at $x = 4$

B. $f'(3) + f'(5) = \frac{35}{4}$

C. f is increasing in

$$\left(-\infty, \frac{1}{8}\right) \cup (8, \infty)$$

D. f has a local minima at

$$x = \frac{1}{8}$$

Question Number : 16 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $P(a, b)$ be a point on the parabola $y^2 = 8x$ such that the tangent at P passes through the centre of the circle

$$x^2 + y^2 - 10x - 14y + 65 = 0$$

. Let A be the product of all possible values of a and B be the product of all possible values of b. Then the value of $A + B$ is equal to :

Options :

A. 0

B. 25

C. 40

D. 65

Question Number : 17 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $\vec{a} = 2\hat{i} - \hat{j} + 5\hat{k}$ and $\vec{b} = \alpha\hat{i} + \beta\hat{j} + 2\hat{k}$. If $((\vec{a} \times \vec{b}) \times \hat{i}) \cdot \hat{k} = \frac{23}{2}$, then $|\vec{b} \times 2\hat{j}|$ is equal to :

Options :

A. 4

B. 5

C. $\sqrt{21}$

D. $\sqrt{17}$

Question Number : 18 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let a vertical tower AB of height $2h$ stands on a horizontal ground. Let from a point P on the ground a man can see upto height h of the tower with an angle of elevation 2α. When from P, he moves a distance d in the direction of $\overrightarrow{AP}$, he can see the top B of the tower with an angle of elevation α. If

$$d = \sqrt{7}\ h$$

, then $\tan\alpha$ is equal to

Options :

A. $\sqrt{5} - 2$

B. $\sqrt{3} - 1$

C. $\sqrt{7} - 2$

D. $\sqrt{7} - \sqrt{3}$

Question Number : 19 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

$(p \wedge r) \Leftrightarrow (p \wedge (\sim q))$ is equivalent to $(\sim p)$ when r is

Options :

A. p

B. $\sim p$

C. q

D. $\sim q$

Question Number : 20 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If the plane P passes through the intersection of two mutually perpendicular planes $2x + ky - 5z = 1$ and

$$3kx - ky + z = 5, k < 3$$

and intercepts a unit length on positive x-axis, then the intercept made by the plane P on the y-axis is :

Options :

A. $\frac{1}{11}$

B. $\frac{5}{11}$

C. 6

D. 7

Mathematics Section B

Section Number :	2
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	10
Number of Questions to be attempted :	5
Section Marks :	20
Maximum Instruction Time :	0
Sub-Section Number :	1
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 21 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

For $k \in \mathbb{R}$, let the solutions of the equation

$$\cos\left(\sin^{-1}\left(x\cot\left(\tan^{-1}\left(\cos\left(\sin^{-1}x\right)\right)\right)\right)\right) = k, 0 < |x| < \frac{1}{\sqrt{2}}$$

be α and β, where the inverse trigonometric functions take only principal values. If the solutions of the equation $x^2 - bx - 5 = 0$ are

$$\frac{1}{\alpha^2} + \frac{1}{\beta^2}$$

and $\frac{\alpha}{\beta}$, then $\frac{b}{k^2}$ is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 22 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

The mean and variance of 10 observations were calculated as 15 and 15 respectively by a student who took by mistake 25 instead of 15 for one observation. Then, the correct standard deviation is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 23 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

An ellipse

$$E: \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

passes through the vertices of the hyperbola

$$H: \frac{x^2}{49} - \frac{y^2}{64} = -1$$

. Let the major and minor axes of the ellipse E coincide with the transverse and conjugate axes of the hyperbola H, respectively. Let the product of the eccentricities of E and H be $\frac{1}{2}$. If l is the length of the latus rectum of the ellipse E, then the value of $113l$ is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 24 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let

$$y = y(x)$$

be the solution curve of the differential equation

$$\sin\left(2x^2\right)\log_e\left(\tan x^2\right)dy + \left(4xy - 4\sqrt{2}\ x\sin\left(x^2 - \frac{\pi}{4}\right)\right)dx = 0$$

,

$$0 < x < \sqrt{\frac{\pi}{2}}$$

, which passes through the point

$$\left(\sqrt{\frac{\pi}{6}}, 1\right)$$

. Then

$$\left|y\left(\sqrt{\frac{\pi}{3}}\right)\right|$$

is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 25 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let

$$f(x) = 2x^2 - x - 1$$

and

$$\mathrm{S} = \{n \in \mathbb{Z} : |f(n)| \leq 800\}$$

. Then, the value of

$$\sum_{n \in S} f(n)$$

is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 26 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let S be the set containing all 3×3 matrices with entries from $\{-1,0,1\}$. The total number of matrices $A \in S$ such that the sum of all the diagonal elements of $A^{\mathrm{T}}A$ is 6 is _____.

Response Type : Numeric
Evaluation Required For SA : Yes

Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 27 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

If the length of the latus rectum of the ellipse

$$x^2 + 4y^2 + 2x + 8y - \lambda = 0$$

is 4 , and l is the length of its major axis, then $\lambda + l$ is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 28 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let

$$S = \left\{z \in \mathbb{C} : z^2 + \bar{z} = 0\right\}$$

. Then

$$\sum_{z \in S} (\mathrm{Re}(z) + \mathrm{Im}(z))$$

is equal to _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 29 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let the line

$$\frac{x-3}{7} = \frac{y-2}{-1} = \frac{z-3}{-4}$$

intersect the plane containing the lines

$$\frac{x-4}{1} = \frac{y+1}{-2} = \frac{z}{1}$$

and

$$4ax - y + 5z - 7a = 0 = 2x - 5y - z - 3, a \in \mathbb{R}$$

at the point $P(\alpha, \beta, \gamma)$. Then the value of $\alpha + \beta + \gamma$ equals _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 30 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Let M and N be the number of points on the curve $y^5 - 9xy + 2x = 0$, where the tangents to the curve are parallel to x-axis and y-axis, respectively. Then the value of $M + N$ equals _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Physics Section A

Section Number :	3
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	80
Maximum Instruction Time :	0
Sub-Section Number :	1
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 31 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A torque meter is calibrated to reference standards of mass, length and time each with 5% accuracy. After calibration, the measured torque with this torque meter will have net accuracy of :

Options :

A. 15%

B. 25%

C. 75%

D. 5%

Question Number : 32 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A bullet is shot vertically downwards with an initial velocity of 100 m/s from a certain height. Within 10 s, the bullet reaches the ground and instantaneously comes to rest due to the perfectly inelastic collision. The velocity-time curve for total time

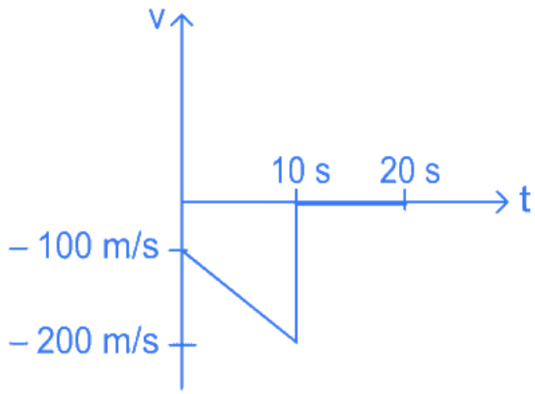
$$t = 20\ s$$

will be:

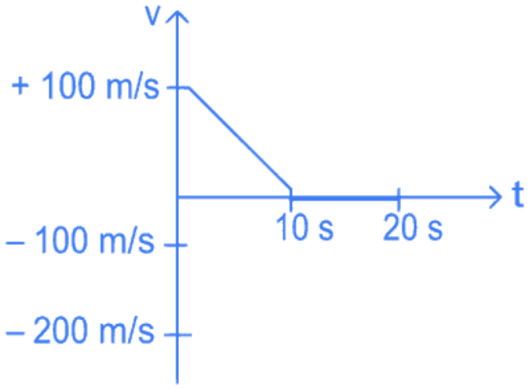
(Take $g = 10\ m/s^2$).

Options :

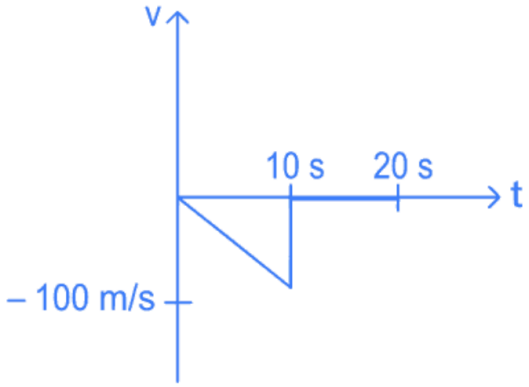
A.



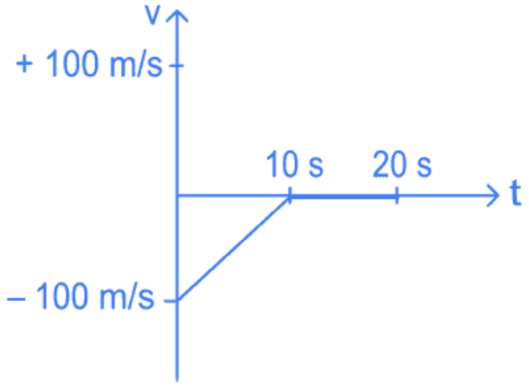
B.



C.



D.



Question Number : 33 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Sand is being dropped from a stationary dropper at a rate of 0.5 kgs^{-1} on a conveyor belt moving with a velocity of 5 ms^{-1}. The power needed to keep the belt moving with the same velocity will be :

Options :

A. 1.25 W

B. 2.5 W

C. 6.25 W

D. 12.5 W

Question Number : 34 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A bag is gently dropped on a conveyor belt moving at a speed of 2 m/s. The coefficient of friction between the conveyor belt and bag is 0.4. Initially, the bag slips on the belt before it stops due to friction. The distance travelled by the bag on the belt during slipping motion, is : [Take

$$g = 10\ m/s^{-2}$$

]

Options :

A. 2 m

B. 0.5 m

C. 3.2 m

D. 0.8 ms

Question Number : 35 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two cylindrical vessels of equal cross-sectional area 16 cm^2 contain water upto heights 100 cm and 150 cm respectively. The vessels are interconnected so that the water levels in them become equal. The work done by the force of gravity during the process, is [Take, density of water

$$= 10^3\ kg/m^3$$

and

$$g = 10\ ms^{-2}$$

] :

Options :

A. 0.25 J

B. 1 J

C. 8 J

D. 12 J

Question Number : 36 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two satellites A and B, having masses in the ratio 4 : 3, are revolving in circular orbits of radii 3r and 4r respectively around the earth. The ratio of total mechanical energy of A to B is :

Options :

A. 9 : 16

B. 16 : 9

C. 1 : 1

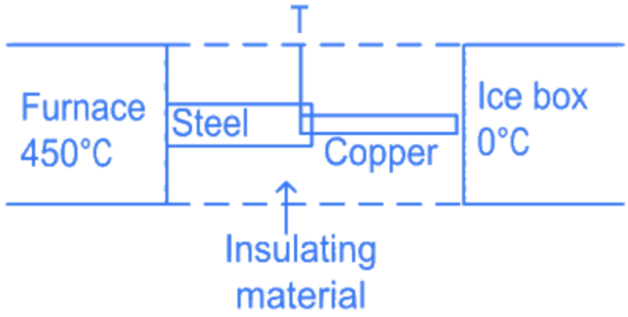
D. 4 : 3

Question Number : 37 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If K_1 and K_2 are the thermal conductivities, L_1 and L_2 are the lengths and A_1 and A_2 are the cross sectional areas of steel and copper rods respectively such that

$$\frac{K_2}{K_1} = 9, \frac{A_1}{A_2} = 2, \frac{L_1}{L_2} = 2$$

. Then, for the arrangement as shown in the figure, the value of temperature T of the steel - copper junction in the steady state will be:



Options :

A. 18°C

B. 14°C

C. 45°C

D. 150°C

Question Number : 38 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Read the following statements :

A. When small temperature difference between a liquid and its surrounding is doubled, the rate of loss of heat of the liquid becomes twice.

B. Two bodies *P* and *Q* having equal surface areas are maintained at temperature 10°C and 20°C. The thermal radiation emitted in a given time by P and Q are in the ratio 1 : 1.15.

C. A Carnot Engine working between 100 K and 400 K has an efficiency of 75%.

D. When small temperature difference between a liquid and its surrounding is quadrupled, the rate of loss of heat of the liquid becomes twice.

Choose the correct answer from the options given below :

Options :

A. A, B, C only

B. A, B only

C. A, C only

D. B, C, D only

Question Number : 39 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Same gas is filled in two vessels of the same volume at the same temperature. If the ratio of the number of molecules is 1 : 4, then

A. The r.m.s. velocity of gas molecules in two vessels will be the same.

B. The ratio of pressure in these vessels will be 1 : 4.

C. The ratio of pressure will be 1 : 1.

D. The r.m.s. velocity of gas molecules in two vessels will be in the ratio of 1 : 4.

Choose the correct answer from the options given below :

Options :

A. A and C only

B. B and D only

C. A and B only

D. C and D only

Question Number : 40 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two identical positive charges Q each are fixed at a distance of '2a' apart from each other. Another point charge q_0 with mass 'm' is placed at midpoint between two fixed charges. For a small displacement along the line joining the fixed charges, the charge q_0 executes SHM. The time period of oscillation of charge q_0 will be :

Options :

A. $\sqrt{\frac{4\pi^3\varepsilon_0 ma^3}{q_0 Q}}$

B. $\sqrt{\frac{q_0 Q}{4\pi^3\varepsilon_0 ma^3}}$

C. $\sqrt{\frac{2\pi^2\varepsilon_0 ma^3}{q_0 Q}}$

D. $\sqrt{\frac{8\pi^3\varepsilon_0 ma^3}{q_0 Q}}$

Question Number : 41 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two sources of equal emfs are connected in series. This combination is connected to an external resistance R. The internal resistances of the two sources are r_1 and r_2

$$(r_1 > r_2)$$

. If the potential difference across the source of internal resistance r_1 is zero, then the value of R will be :

Options :

A. $r_1 - r_2$

B. $\frac{r_1 r_2}{r_1 + r_2}$

C. $\frac{r_1 + r_2}{2}$

D. $r_2 - r_1$

Question Number : 42 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A direct current of 4 A and an alternating current of peak value 4 A flow through resistance of 3 Ω and 2 Ω respectively. The ratio of heat produced in the two resistances in same interval of time will be :

Options :

A. 3 : 2

B. 3 : 1

C. 3 : 4

D. 4 : 3

Question Number : 43 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A beam of light travelling along X-axis is described by the electric field

$$E_y = 900 \sin \omega(t - x/c)$$

. The ratio of electric force to magnetic force on a charge q moving along Y-axis with a speed of 3×10^7 ms^{-1} will be :

(Given speed of light

$$= 3 \times 10^8 \ ms^{-1}$$

)

Options :

A. 1 : 1

B. 1 : 10

C. 10 : 1

D. 1 : 2

Question Number : 44 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A microscope was initially placed in air (refractive index 1). It is then immersed in oil (refractive index 2). For a light whose wavelength in air is λ, calculate the change of microscope's resolving power due to oil and choose the correct option.

Options :

A. Resolving power will be $\frac{1}{4}$ in the oil than it was in the air.

B. Resolving power will be twice in the oil than it was in the air.

C. Resolving power will be four times in the oil than it was in the air.

D. Resolving power will be $\frac{1}{2}$ in the oil than it was in the air.

Question Number : 45 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

An electron (mass m) with an initial velocity

$$\vec{v} = v_0\hat{i}\,(v_0 > 0)$$

is moving in an electric field

$$\vec{E} = -E_0\hat{i}\,(E_0 > 0)$$

where E_0 is constant. If at

$$t = 0$$

de Broglie wavelength is

$$\lambda_0 = \frac{h}{mv_0}$$

, then its de Broglie wavelength after time t is given by

Options :

A. λ_0

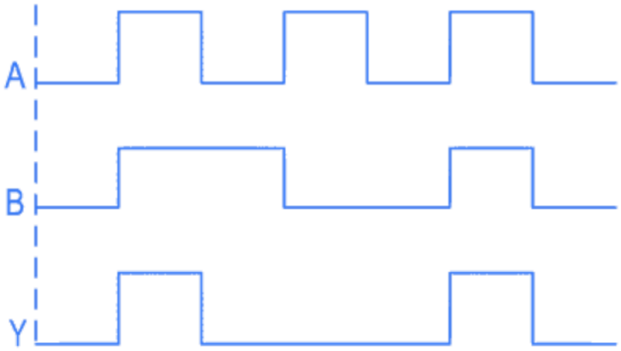
B. $\lambda_0\left(1 + \frac{eE_0t}{mv_0}\right)$

C. $\lambda_0 t$

D. $\frac{\lambda_0}{\left(1 + \frac{eE_0t}{mv_0}\right)}$

Question Number : 46 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A logic gate circuit has two inputs A and B and output Y. The voltage waveforms of A, B and Y are shown below.



The logic gate circuit is :

Options :

A. AND gate

B. OR gate

C. NOR gate

D. NAND gate

Question Number : 47 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two bar magnets oscillate in a horizontal plane in earth's magnetic field with time periods of 3 s and 4 s respectively. If their moments of inertia are in the ratio of 3 : 2, then the ratio of their magnetic moments will be:

Options :

A. 2 : 1

B. 8 : 3

C. 1 : 3

D. 27 : 16

Question Number : 48 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A magnet hung at 45° with magnetic meridian makes an angle of 60° with the horizontal. The actual value of the angle of dip is -

Options :

A. $\tan^{-1}\left(\sqrt{\frac{3}{2}}\right)$

B. $\tan^{-1}(\sqrt{6}\ )$

C. $\tan^{-1}\left(\sqrt{\frac{2}{3}}\right)$

D. $\tan^{-1}\left(\sqrt{\frac{1}{2}}\right)$

Question Number : 49 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

What is the half-life period of a radioactive material if its activity drops to $1/16^{th}$ of its initial value in 30 years?

Options :

A. 9.5 years

B. 8.5 years

C. 7.5 years

D. 10.5 years

Question Number : 50 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

At a particular station, the TV transmission tower has a height of 100 m. To triple its coverage range, height of the tower should be increased to

Options :

A. 200 m

B. 300 m

C. 600 m

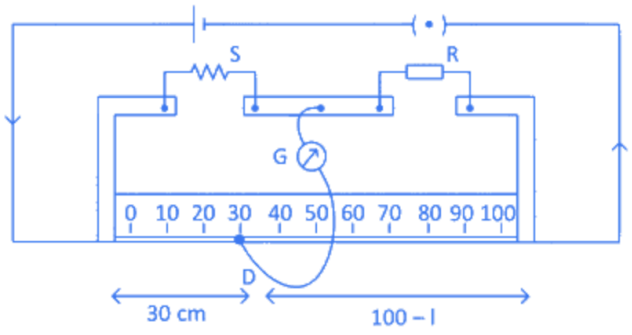
D. 900 m

Physics Section B

Section Number :	4
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	10
Number of Questions to be attempted :	5
Section Marks :	20
Maximum Instruction Time :	0
Sub-Section Number :	1
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 51 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

In a meter bridge experiment, for measuring unknown resistance 'S', the null point is obtained at a distance 30 cm from the left side as shown at point D. If R is 5.6 kΩ, then the value of unknown resistance 'S' will be _____ Ω.



Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes

Answers Type : Equal
Text Areas : PlainText

Question Number : 52 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

The one division of main scale of Vernier callipers reads 1 mm and 10 divisions of Vernier scale is equal to the 9 divisions on main scale. When the two jaws of the instrument touch each other, the zero of the Vernier lies to the right of zero of the main scale and its fourth division coincides with a main scale division. When a spherical bob is tightly placed between the two jaws, the zero of the Vernier scale lies in between 4.1 cm and 4.2 cm and 6^{th} Vernier division coincides scale division. The diameter of the bob will be _____ $\times 10^{-2}$ cm.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 53 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Two beams of light having intensities I and 4I interfere to produce a fringe pattern on a screen. The phase difference between the two beams are $\pi/2$ and $\pi/3$ at points A and B respectively. The difference between the resultant intensities at the two points is xI. The value of x will be _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 54 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

To light, a 50 W, 100 V lamp is connected, in series with a capacitor of capacitance

$$\frac{50}{\pi\sqrt{x}}\mu F$$

, with 200 V, 50 Hz AC source. The value of x will be _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 55 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A 1 m long copper wire carries a current of 1 A. If the cross section of the wire is 2.0 mm^2 and the resistivity of copper is 1.7×10^{-8} Ωm, the force experienced by moving electron in the wire is _____ $\times 10^{-23}$ N.

(charge on electorn

$$= 1.6 \times 10^{-19}\ C$$

)

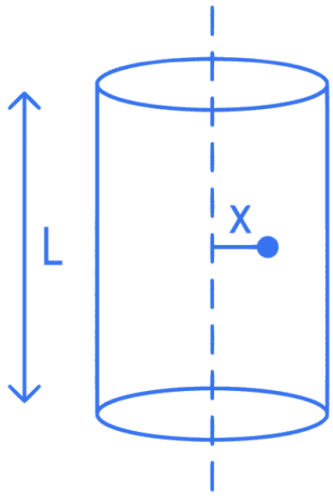
Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 56 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A long cylindrical volume contains a uniformly distributed charge of density $\rho\ \mathrm{Cm}^{-3}$. The electric field inside the cylindrical volume at a distance

$$x = \frac{2\varepsilon_0}{\rho}\mathrm{m}$$

from its axis is _____ Vm^{-1}.



Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 57 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A mass 0.9 kg, attached to a horizontal spring, executes SHM with an amplitude A_1. When this mass passes through its mean position, then a smaller mass of 124 g is placed over it and both masses move together with amplitude A_2. If the ratio $\frac{A_1}{A_2}$ is

$$\frac{\alpha}{\alpha - 1}$$

, then the value of α will be _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 58 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A square aluminum (shear modulus is $25 \times 10^9\ \mathrm{Nm}^{-2}$) slab of side 60 cm and thickness 15 cm is subjected to a shearing force (on its narrow face) of 18.0×10^4 N. The lower edge is riveted to the floor. The displacement of the upper edge is _____ μm.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 59 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A pulley of radius 1.5 m is rotated about its axis by a force

$$F = \left(12t - 3t^2\right)N$$

applied tangentially (while t is measured in seconds). If moment of inertia of the pulley about its axis of rotation is 4.5 kg m^2, the number of rotations made by the pulley before its direction of motion is reversed, will be $\frac{K}{\pi}$. The value of K is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 60 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A ball of mass m is thrown vertically upward. Another ball of mass 2 m is thrown at an angle θ with the vertical. Both the balls stay in air for the same period of time. The ratio of the heights attained by the two balls respectively is $\frac{1}{x}$. The value of x is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Chemistry Section A

Section Number :	5
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	20
Number of Questions to be attempted :	20
Section Marks :	80
Maximum Instruction Time :	0
Sub-Section Number :	1
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 61 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

250 g solution of D-glucose in water contains 10.8% of carbon by weight. The molality of the solution is nearest to

(Given: Atomic Weights are, H, 1 u; C, 12 u; O, 16 u)

Options :

A. 1.03

B. 2.06

C. 3.09

D. 5.40

Question Number : 62 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Given below are two statements.

Statement I:

O_2, Cu^{2+}

, and Fe^{3+} are weakly attracted by magnetic field and are magnetized in the same direction as magnetic field.

Statement II:

NaCl

and H_2O are weakly magnetized in opposite direction to magnetic field.

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

Options :

A. Both Statement I and Statement II are correct.

B. Both Statement I and Statement II are incorrect.

C. Statement I is correct but Statement II is incorrect.

D. Statement I is incorrect but Statement II is correct.

Question Number : 63 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

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

Assertion A: Energy of 2s orbital of hydrogen atom is greater than that of 2s orbital of lithium.

Reason R: Energies of the orbitals in the same subshell decrease with increase in the atomic number.

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

Options :

A. Both A and R are true and R is the 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.

Question Number : 64 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

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

Assertion A : Activated charcoal adsorbs SO_2 more efficiently than CH_4.

Reason R : Gases with lower critical temperatures are readily adsorbed by activated charcoal.

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

Options :

A. Both A and R are correct and R is the correct explanation of A.

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

C. A is correct but R is not correct.

D. A is not correct but R is correct.

Question Number : 65 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Boiling point of a 2% aqueous solution of a non-volatile solute A is equal to the boiling point of 8% aqueous solution of a non-volatile solute B. The relation between molecular weights of A and B is

Options :

A. $M_A = 4M_B$

B. $M_B = 4M_A$

C. $M_A = 8M_B$

D. $M_B = 8M_A$

Question Number : 66 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The incorrect statement is

Options :

A. The first ionization enthalpy of K is less than that of Na and Li.

B. Xe does not have the lowest first ionization enthalpy in its group.

C. The first ionization enthalpy of element with atomic number 37 is lower than that of the element with atomic number 38.

D. The first ionization enthalpy of Ga is higher than that of the d-block element with atomic number 30.

Question Number : 67 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Given below are two statements.

Statement I : Iron (III) catalyst, acidified $K_2Cr_2O_7$ and neutral $KMnO_4$ have the ability to oxidise I^- to I_2 independently.

Statement II : Manganate ion is paramagnetic in nature and involves $p\pi - p\pi$ bonding.

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

Options :

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.

Question Number : 68 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The total number of

$$Mn = O$$

bonds in Mn_2O_7 is _____.

Options :

A. 4

B. 5

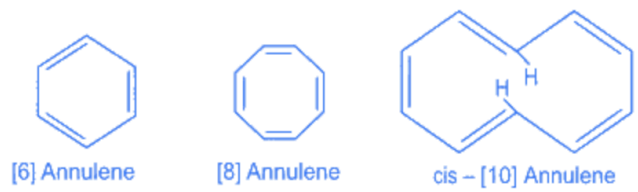
C. 6

D. 3

Question Number : 69 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

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

Assertion A: [6] Annulene, [8] Annulene and cis-[10] Annulene, are respectively aromatic, not-aromatic and aromatic.



[6] Annulene [8] Annulene cis – [10] Annulene

Reason R: Planarity is one of the requirements of aromatic systems.

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

Options :

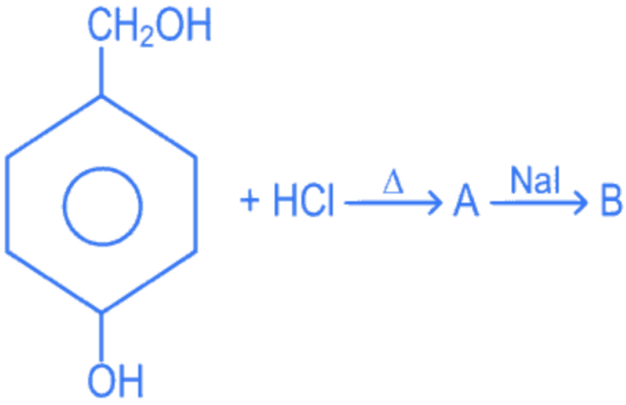
A. Both A and R are correct and R is the correct explanation of A.

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

C. A is correct but R is not correct.

D. A is not correct but R is correct.

Question Number : 70 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical



In the above reaction product B is :

Options :

A.



B.



C.



D.



Question Number : 71 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A sugar 'X' dehydrates very slowly under acidic condition to give furfural which on further reaction with resorcinol gives the coloured product after sometime. Sugar 'X' is

Options :

A. Aldopentose

B. Aldotetrose

C. Oxalic acid

D. Ketotetrose

Question Number : 72 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

In Carius method of estimation of halogen, 0.45 g of an organic compound gave 0.36 g of AgBr. Find out the percentage of bromine in the compound.

(Molar masses :

$$AgBr = 188\ g\ mol^{-1}; Br = 80\ g\ mol^{-1}$$

)

Options :

A. 34.04%

B. 40.04%

C. 36.03%

D. 38.04%

Question Number : 73 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Match List I with List II.

	List I		**List II**
(A)	Benzenesulphonyl chloride	(I)	Test for primary amines
(B)	Hoffmann bromamide reaction	(II)	Anti Saytzeff
(C)	Carbylamine reaction	(III)	Hinsberg reagent
(D)	Hoffmann orientation	(IV)	Known reaction of Isocyanates.

Choose the correct answer from the options given below:

Options :

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

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

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

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

Question Number : 74 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Which of the following methods are not used to refine any metal?

A. Liquation

B. Calcination

C. Electrolysis

D. Leaching

E. Distillation

Choose the correct answer from the options given below:

Options :

A. B and D only

B. A, B, D and E only

C. B, D and E only

D. A, C and E only

Question Number : 75 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Given below are two statements.

Statement I : Hydrogen peroxide can act as an oxidizing agent in both acidic and basic conditions.

Statement II : Density of hydrogen peroxide at 298 K is lower than that of D_2O.

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

Options :

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.

Question Number : 76 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Given below are two statements.

Statement I: The chlorides of Be and Al have Cl-bridged structure. Both are soluble in organic solvents and act as Lewis bases.

Statement II: Hydroxides of Be and Al dissolve in excess alkali to give beryllate and aluminate ions.

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

Options :

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.

Question Number : 77 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Which oxoacid of phosphorous has the highest number of oxygen atoms present in its chemical formula?

Options :

A. Pyrophosphorus acid

B. Hypophosphoric acid

C. Phosphoric acid

D. Pyrophosphoric acid

Question Number : 78 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Match List I with List II.

	List I **Pollutant**		**List II** **Disease/sickness**
(A)	Sulphate (>500 ppm)	(I)	Methemoglobinemia
(B)	Nitrate (>50 ppm)	(II)	Brown mottling of teeth
(C)	Lead (>50 ppb)	(III)	Laxative effect
(D)	Fluoride (>2 ppm)	(IV)	Kidney damage

Choose the correct answer from the options given below :

Options :

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

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

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

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

Question Number : 79 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Match List I with List II.

	List I **Polymers**		**List II** **Commercial names**
(A)	Phenol-formaldehyde resin	(I)	Glyptal
(B)	Copolymer of 1,3-butadiene and sterene	(II)	Novolac
(C)	Polyester of glycol and phthalic acid	(III)	Buna-S
(D)	Polyester of glycol and terephthalic acid	(IV)	Dacron

Choose the correct answer from the options given below:

Options :

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

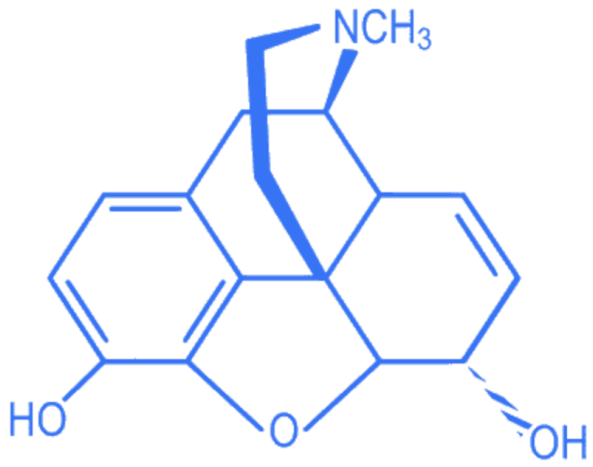
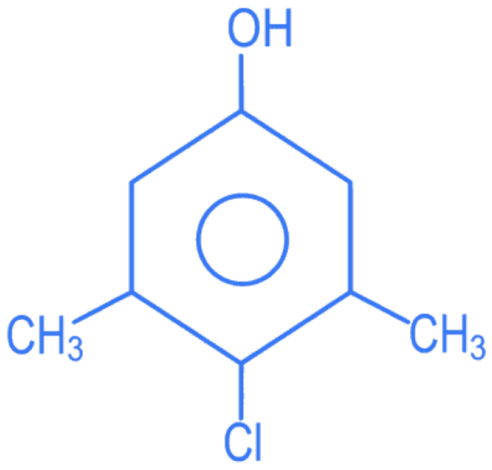
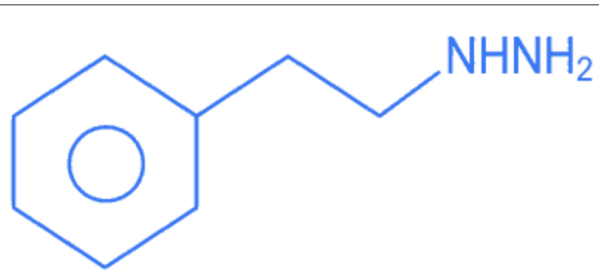
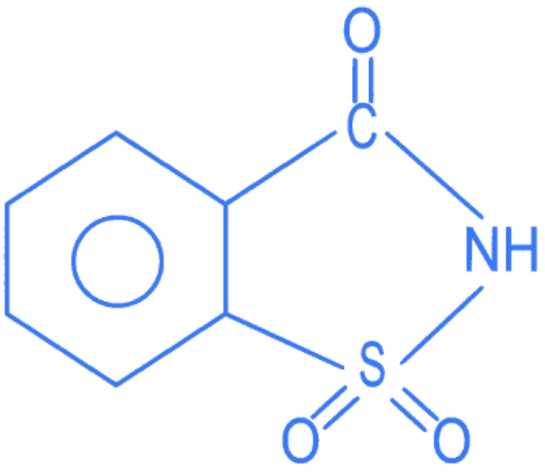
B. A-II, B-III, C-I, D-IV

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

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

Question Number : 80 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Match List I with List II.

	List I		**List II**
(A)		(I)	Anti-depressant
(B)		(II)	550 times sweeter than cane sugar.
(C)		(III)	Narcotic analgesic
(D)		(IV)	Antiseptic

Choose the correct answer from the options given below:

Options :

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

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

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

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

Chemistry Section B

Section Number :	6
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	10
Number of Questions to be attempted :	5
Section Marks :	20
Maximum Instruction Time :	0
Sub-Section Number :	1
Question Shuffling Allowed :	Yes
Is Section Default? :	No

Question Number : 81 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

20 mL of 0.02 M $K_2Cr_2O_7$ solution is used for the titration of 10 mL of Fe^{2+} solution in the acidic medium.

The molarity of Fe^{2+} solution is _____ $\times 10^{-2}$ M. (Nearest Integer)

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 82 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

$$2NO + 2H_2 \rightarrow N_2 + 2H_2O$$

The above reaction has been studied at 800°C. The related data are given in the table below

Reaction serial number	**Initial Pressure of** H_2/kPa	**Initial Pressure of** NO/kPa	**Initial rate** $\left(\frac{-dp}{dt}\right)/(kPa/s)$
1	65.6	40.0	0.135
2	65.6	20.1	0.033
3	38.6	65.6	0.214
4	19.2	65.6	0.106

The order of the reaction with respect to NO is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes

Answers Type : Equal
Text Areas : PlainText

Question Number : 83 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Amongst the following, the number of oxide(s) which are paramagnetic in nature is

$$Na_2O, KO_2, NO_2, N_2O, ClO_2, NO, SO_2, Cl_2O$$

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 84 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

The molar heat capacity for an ideal gas at constant pressure is 20.785 J K^{-1} mol^{-1}. The change in internal energy is 5000 J upon heating it from 300 K to 500 K. The number of moles of the gas at constant volume is _____. [Nearest integer] (Given:

$$R = 8.314 \text{ J } K^{-1} \text{ mol}^{-1}$$

)

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 85 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

According to MO theory, number of species/ions from the following having identical bond order is _____.

$$CN^-, NO^+, O_2, O_2^+, O_2^{2+}$$

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 86 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

At 310 K, the solubility of CaF_2 in water is 2.34×10^{-3} g/100 mL. The solubility product of CaF_2 is _____ $\times 10^{-8}(\text{ mol/L})^3$. (Give molar mass :

$$CaF_2 = 78 \text{ g mol}^{-1}$$

)

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 87 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

The conductivity of a solution of complex with formula $CoCl_3(NH_3)_4$ corresponds to 1 : 1 electrolyte, then the primary valency of central metal ion is _____.

Response Type : Numeric
Evaluation Required For SA : Yes

Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 88 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

In the titration of $KMnO_4$ and oxalic acid in acidic medium, the change in oxidation number of carbon at the end point is _____.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

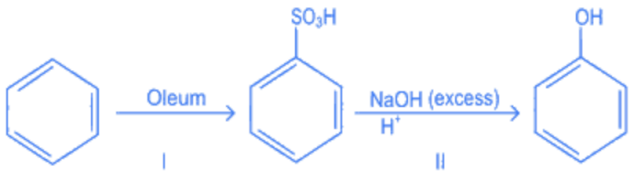
Question Number : 89 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

Optical activity of an enantiomeric mixture is +12.6° and the specific rotation of (+) isomer is +30°. The optical purity is _____%.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText

Question Number : 90 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

In the following reaction



The % yield for reaction I is 60% and that of reaction II is 50%. The overall yield of the complete reaction is _____ %. [nearest integer]

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText