

National Testing Agency

Question Paper Name :	B Tech 28th Jan 2026 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 Id : 444792677 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If $g(x) = 3x^2 + 2x - 3$, $f(0) = -3$ and $4g(f(x)) = 3x^2 - 32x + 72$, then $f(g(2))$ is equal to:

Options :

4447922300. $\frac{25}{6}$

4447922301. $-\frac{7}{2}$

4447922302. $\frac{7}{2}$

4447922303. $-\frac{25}{6}$

Question Number : 2 Question Id : 444792686 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $y = x$ be the equation of a chord of the circle C_1 (in the closed half-plane $x \geq 0$) of diameter 10 passing through the origin. Let C_2 be another circle described on the given chord as its diameter. If the equation of the chord of the circle C_2 , which passes through the point $(2, 3)$ and is farthest from the center of C_2 , is $x + ay + b = 0$, then $a - b$ is equal to

Options :

4447922336. -6

4447922337. -2

4447922338. 6

4447922339. 10

Question Number : 3 Question Id : 444792676 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $S = \{x^3 + ax^2 + bx + c : a, b, c \in \mathbb{N} \text{ and } a, b, c \leq 20\}$ be a set of polynomials.

Then the number of polynomials in S , which are divisible by $x^2 + 2$, is

Options :

4447922296. 6

4447922297. 10

4447922298. 20

4447922299. 120

Question Number : 4 Question Id : 444792683 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The mean and variance of 10 observations are 9 and 34.2, respectively. If 8 of these observations are 2, 3, 5, 10, 11, 13, 15, 21, then the mean deviation about the median of all the 10 observations is

Options :

4447922324. 7

4447922325. 6

4447922326. 5

4447922327. 4

Question Number : 5 Question Id : 444792694 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $y = y(x)$ be the solution of the differential equation

$$x \frac{dy}{dx} - \sin 2y = x^3 \left(2 - x^3 \right) \cos^2 y, \quad x \neq 0.$$

If $y(2) = 0$, then $\tan(y(1))$ is equal to

Options :

4447922368. $-\frac{7}{4}$

4447922369. $-\frac{3}{4}$

4447922370. $\frac{7}{4}$

4447922371. $\frac{3}{4}$

Question Number : 6 Question Id : 444792682 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A bag contains 10 balls out of which k are red and $(10 - k)$ are black, where $0 \leq k \leq 10$. If three balls are drawn at random without replacement and all of them are found to be black, then the probability that the bag contains 1 red and 9 black balls is:

Options :

4447922320. $\frac{7}{11}$

4447922321. $\frac{14}{55}$

4447922322. $\frac{7}{55}$

4447922323. $\frac{7}{110}$

Question Number : 7 Question Id : 444792681 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The common difference of the A.P.: $a_1, a_2, \dots, a_m$ is 13 more than the common difference of the A.P.: $b_1, b_2, \dots, b_n$. If $b_{31} = -277$, $b_{43} = -385$ and $a_{78} = 327$, then a_1 is equal to

Options :

4447922316. 16

4447922317. 19

4447922318. 21

4447922319. 24

Question Number : 8 Question Id : 444792690 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The value of $\sum_{k=1}^{\infty} (-1)^{k+1} \left(\frac{k(k+1)}{k!} \right)$ is

Options :

4447922352. $e/2$

4447922353. $2/e$

4447922354. $1/e$

4447922355. $\sqrt{e}$

Question Number : 9 Question Id : 444792688 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If the distances of the point $(1, 2, a)$ from the line $\frac{x-1}{1} = \frac{y}{2} = \frac{z-1}{2}$ along the lines $L_1 : \frac{x-1}{3} = \frac{y-2}{4} = \frac{z-a}{b}$ and $L_2 : \frac{x-1}{1} = \frac{y-2}{4} = \frac{z-a}{c}$ are equal, then $a + b + c$ is equal to

Options :

4447922344. 7

4447922345. 6

4447922346. 5

4447922347. 4

Question Number : 10 Question Id : 444792689 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

For three unit vectors $\vec{a}, \vec{b}, \vec{c}$ satisfying

$$|\vec{a} - \vec{b}|^2 + |\vec{b} - \vec{c}|^2 + |\vec{c} - \vec{a}|^2 = 9 \text{ and } |2\vec{a} + k\vec{b} + k\vec{c}| = 3,$$

the positive value of k is

Options :

4447922348. 3

4447922349. 4

4447922350. 5

4447922351. 6

Question Number : 11 Question Id : 444792693 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The value of

$$\lim_{x \rightarrow 0} \frac{\log_e \left(\sec(ex) \cdot \sec(e^2x) \cdot \dots \cdot \sec(e^{10}x) \right)}{e^2 - e^{2 \cos x}}$$

is equal to

Options :

4447922364. $\frac{(e^{20} - 1)}{2(e^2 - 1)}$

4447922365. $\frac{(e^{20} - 1)}{2e^2(e^2 - 1)}$

$$\frac{(e^{10} - 1)}{2(e^2 - 1)}$$

4447922366.

$$\frac{(e^{10} - 1)}{2e^2(e^2 - 1)}$$

4447922367.

Question Number : 12 Question Id : 444792679 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let z be a complex number such that $|z - 6| = 5$ and $|z + 2 - 6i| = 5$. Then the value of $z^3 + 3z^2 - 15z + 141$ is equal to

Options :

4447922308. 37

4447922309. 42

4447922310. 50

4447922311. 61

Question Number : 13 Question Id : 444792687 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If $\frac{\tan(A - B)}{\tan A} + \frac{\sin^2 C}{\sin^2 A} = 1$, $A, B, C \in \left(0, \frac{\pi}{2}\right)$, then

Options :

4447922340. $\tan A, \tan B, \tan C$ are in G.P.

4447922341. $\tan A, \tan B, \tan C$ are in A.P.

4447922342. $\tan A, \tan C, \tan B$ are in G.P.

4447922343. $\tan A, \tan C, \tan B$ are in A.P.

Question Number : 14 Question Id : 444792692 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 region $R = \{(x, y) : xy \leq 8, 1 \leq y \leq x^2, x \geq 0\}$ is

Options :

$$\frac{2}{3}(20 \log_e(2) + 9)$$

4447922360.

$$\frac{2}{3}(24 \log_e(2) - 7)$$

4447922361.

$$\frac{1}{3}(49 \log_e(2) - 15)$$

4447922362.

$$\frac{1}{3}(40 \log_e(2) + 27)$$

4447922363.

Question Number : 15 Question Id : 444792678 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If α, β , where $\alpha < \beta$, are the roots of the equation $\lambda x^2 - (\lambda + 3)x + 3 = 0$ such that $\frac{1}{\alpha} - \frac{1}{\beta} = \frac{1}{3}$, then the sum of all possible values of λ is

Options :

4447922304. 2

4447922305. 4

4447922306. 6

4447922307. 8

Question Number : 16 Question Id : 444792684 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let $S = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$. Let x be the number of 9-digit numbers formed using the digits of the set S such that only one digit is repeated and it is repeated exactly twice. Let y be the number of 9-digit numbers formed using the digits of the set S such that only two digits are repeated and each of these is repeated exactly twice. Then,

Options :

4447922328. $21x = 4y$

4447922329. $45x = 7y$

4447922330. $56x = 9y$

4447922331. $29x = 5y$

Question Number : 17 Question Id : 444792680 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let A, B and C be three 2×2 matrices with real entries such that $B = (I + A)^{-1}$ and

$A + C = I$. If $BC = \begin{bmatrix} 1 & -5 \\ -1 & 2 \end{bmatrix}$ and $CB \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 12 \\ -6 \end{bmatrix}$, then $x_1 + x_2$ is

Options :

4447922312. 0

4447922313. 2

4447922314. -2

4447922315. 4

Question Number : 18 Question Id : 444792685 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let ABC be an equilateral triangle with orthocenter at the origin and the side BC on the line $x + 2\sqrt{2}y = 4$. If the co-ordinates of the vertex A are (α, β) , then the greatest integer less than or equal to $|\alpha + \sqrt{2}\beta|$ is

Options :

4447922332. 2

4447922333. 3

4447922334. 4

4447922335. 5

Question Number : 19 Question Id : 444792695 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

If $\int \left(\frac{1 - 5 \cos^2 x}{\sin^5 x \cos^2 x} \right) dx = f(x) + C$, where C is the constant of integration, then

$f\left(\frac{\pi}{6}\right) - f\left(\frac{\pi}{4}\right)$ is equal to

Options :

4447922372. $\frac{1}{\sqrt{3}}(26 + \sqrt{3})$

4447922373. $\frac{4}{\sqrt{3}}(8 - \sqrt{6})$

4447922374. $\frac{2}{\sqrt{3}}(4 + \sqrt{6})$

4447922375. $\frac{1}{\sqrt{3}}(26 - \sqrt{3})$

Question Number : 20 Question Id : 444792691 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Let f be a polynomial function such that $f(x^2 + 1) = x^4 + 5x^2 + 2$, for all $x \in \mathbb{R}$.

Then $\int_0^3 f(x) dx$ is equal to

Options :

4447922356. $\frac{27}{2}$

4447922357. $\frac{33}{2}$

4447922358. $\frac{41}{3}$

4447922359. $\frac{5}{3}$

Mathematics Section B

Section Number :

2

Section type :

Online

Mandatory or Optional :

Mandatory

Number of Questions :

5

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 Id : 444792696 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript
 In a G.P., if the product of the first three terms is 27 and the set of all possible values for the sum of its first three terms is $\mathbb{R} - (a, b)$, then $a^2 + b^2$ 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 Id : 444792697 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript
 If $k = \tan\left(\frac{\pi}{4} + \frac{1}{2}\cos^{-1}\left(\frac{2}{3}\right)\right) + \tan\left(\frac{1}{2}\sin^{-1}\left(\frac{2}{3}\right)\right)$, then the number of solutions of the equation $\sin^{-1}(kx - 1) = \sin^{-1}x - \cos^{-1}x$ is _____

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

Question Number : 23 Question Id : 444792700 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript
 For some $\theta \in \left(0, \frac{\pi}{2}\right)$, let the eccentricity and the length of the latus rectum of the hyperbola $x^2 - y^2 \sec^2\theta = 8$ be e_1 and l_1 , respectively, and let the eccentricity and the length of the latus rectum of the ellipse $x^2 \sec^2\theta + y^2 = 6$ be e_2 and l_2 , respectively. If $e_1^2 = e_2^2(\sec^2\theta + 1)$, then $\left(\frac{l_1 l_2}{e_1 e_2}\right) \tan^2\theta$ 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 Id : 444792699 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript
 The value of $\sum_{r=1}^{20} \left(\left| \sqrt{\pi \left(\int_0^r x |\sin \pi x| dx \right)} \right| \right)$ is _____

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

Question Number : 25 Question Id : 444792698 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript
 Let PQR be a triangle such that $\overrightarrow{PQ} = -2\hat{i} - \hat{j} + 2\hat{k}$ and $\overrightarrow{PR} = a\hat{i} + b\hat{j} - 4\hat{k}$, $a, b \in \mathbb{Z}$. Let S be the point on QR, which is equidistant from the lines PQ and PR. If $|\overrightarrow{PR}| = 9$ and $\overrightarrow{PS} = \hat{i} - 7\hat{j} + 2\hat{k}$, then the value of $3a - 4b$ is _____

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 : 26 Question Id : 444792713 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The electric current in the circuit is given as $i = i_0(t/T)$. The r.m.s current for the period $t = 0$ to $t = T$ is _____.

Options :

4447922429. i_0

4447922430. $\frac{i_0}{\sqrt{2}}$

4447922431. $\frac{i_0}{\sqrt{3}}$

4447922432. $\frac{i_0}{\sqrt{6}}$

Question Number : 27 Question Id : 444792718 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The magnitudes of power of a biconvex lens (refractive index 1.5) and that of a plano-concave lens (refractive index = 1.7) are same. If the curvature of plano-concave lens exactly matches with the curvature of back surface of the biconvex lens, then ratio of radius of curvature of front and back surface of the biconvex lens is _____.

Options :

4447922449. 5 : 2

4447922450. 5 : 12

4447922451. 2 : 5

4447922452. 12 : 5

Question Number : 28 Question Id : 444792719 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

An atom ${}^8_3\text{X}$ is bombarded by shower of fundamental particles and in 10 s this atom absorbed 10 electrons, 10 protons and 9 neutrons. The percentage growth in the surface area of the nucleons is recorded by:

Options :

4447922453. 150 %

4447922454. 900%

4447922455. 225%

4447922456. 250%

Question Number : 29 Question Id : 444792717 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: A plane wave after passing through prism remains as plane wave but passing through small pin hole may become spherical wave.

Statement II: The curvature of a spherical wave emerging from a slit will increase for increasing slit width.

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

Options :

4447922445. Both Statement I and Statement II are true

4447922446. Both Statement I and Statement II are false

4447922447. Statement I is true but Statement II is false

4447922448. Statement I is false but Statement II is true

Question Number : 30 Question Id : 444792701 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

When both jaws of vernier callipers touch each other, zero mark of the vernier scale is right to zero mark of main scale, 4th mark on vernier scale coincides with certain mark on the main scale. While measuring the length of a cylinder, observer observes 15 divisions on main scale and 5th division of vernier scale coincides with a main scale division. Measured length of cylinder is _____ mm.
(Least count of Vernier calliper = 0.1 mm)

Options :

4447922381. 15.9

4447922382. 15.5

4447922383. 15.1

4447922384. 15.4

Question Number : 31 Question Id : 444792702 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

In the potentiometer, when the cell in the secondary circuit is shunted with $4\ \Omega$ resistance, the balance is obtained at the length 120 cm of wire. Now when the same cell is shunted with $12\ \Omega$ resistance, the balance is shifted to a length of 180 cm. The internal resistance of cell is _____ Ω

Options :

4447922385. 3

4447922386. 4

4447922387. 6

4447922388. 12

Question Number : 32 Question Id : 444792705 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Water drops fall from a tap on the floor, 5 m below, at regular intervals of time, the first drop strikes the floor when the sixth drop begins to fall. The height at which the fourth drop will be from ground, at the instant when the first drop strikes the ground is _____ m.

($g = 10 \text{ m/s}^2$)

Options :

4447922397. 4.0

4447922398. 2.5

4447922399. 4.2

4447922400. 3.8

Question Number : 33 Question Id : 444792716 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The electric field of an electromagnetic wave travelling through a medium is given

by $\vec{E}(x,t) = 25 \sin(2.0 \times 10^{15} t - 10^7 x) \hat{n}$

then the refractive index of the medium is _____.

(All given measurement are in SI units)

Options :

4447922441. 1.5

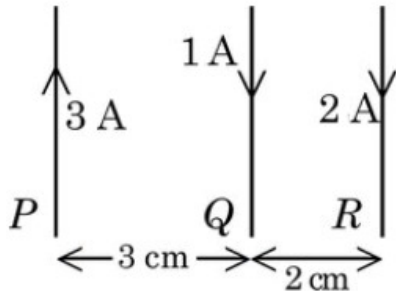
4447922442. 1.2

4447922443. 2

4447922444. 1.7

Question Number : 34 Question Id : 444792714 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Three long straight wires carrying current are arranged mutually parallel as shown in the figure. The force experienced by 15 cm length of wire Q is _____.



$$(\mu_0 = 4\pi \times 10^{-7} \text{ T.m/A})$$

Options :

4447922433. 6×10^{-7} N towards R

4447922434. 6×10^{-7} N towards P

4447922435. 6×10^{-6} N towards P

4447922436. 6×10^{-6} N towards R

Question Number : 35 Question Id : 444792707 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two wires A and B made of different materials of lengths 6.0 cm and 5.4 cm, respectively and area of cross sections $3.0 \times 10^{-5} \text{ m}^2$ and $4.5 \times 10^{-5} \text{ m}^2$, respectively are stretched by the same magnitude under a given load. The ratio of the Young's modulus of A to that of B is $x : 3$. The value of x is _____.

Options :

4447922405. 1

4447922406. 2

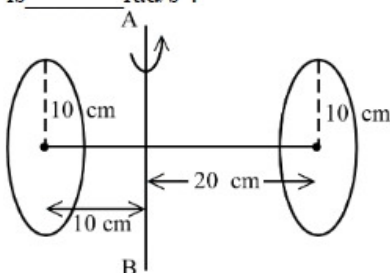
4447922407. 4

4447922408. 5

Question Number : 36 Question Id : 444792706 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two circular discs of radius each 10 cm are joined at their centres by a rod of length 30 cm and mass 600 gm as shown in figure.

If the mass of each disc is 600 gm and applied torque between two discs is $43 \times 10^5 \text{ dyne.cm}$, the angular acceleration of the discs about the given axis AB is _____ rad/s^2 .



Options :

4447922401. 27

4447922402. 22

4447922403. 11

4447922404. 100

Question Number : 37 Question Id : 444792712 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

For the two cells having same EMF E and internal resistance r , the current passing through the external resistor $6\ \Omega$ is same when both the cells are connected either in parallel or in series. The value of internal resistance r is _____ Ω .

Options :

4447922425. 3

4447922426. 4

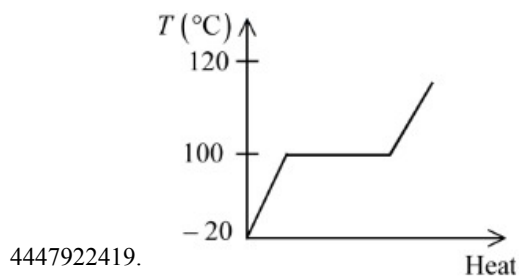
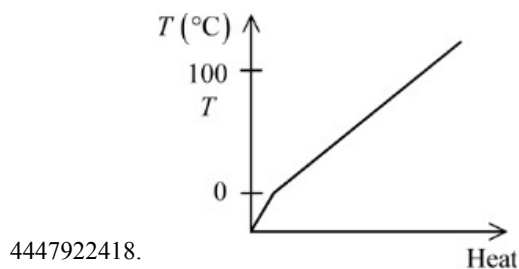
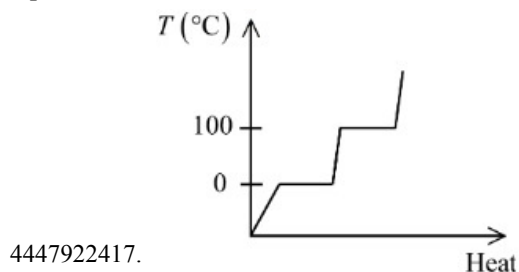
4447922427. 6

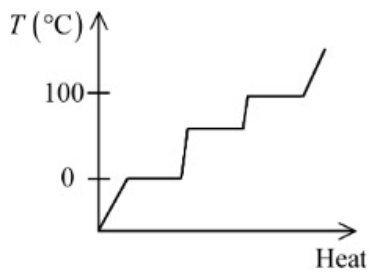
4447922428. 9

Question Number : 38 Question Id : 444792710 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 best represents the temperature versus heat supplied graph for water, in the range of $-20\ ^\circ\text{C}$ to $120\ ^\circ\text{C}$?

Options :



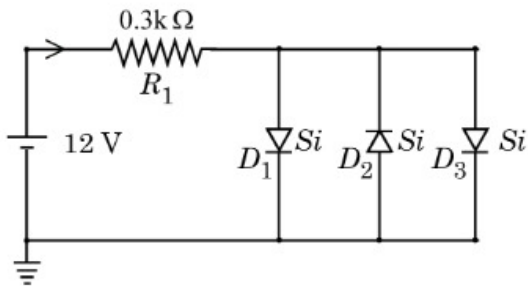


4447922420.

Question Number : 39 Question Id : 444792720 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Assuming in forward bias condition there is a voltage drop of 0.7 V across a silicon diode, the current through diode D_1 in the circuit is _____ mA.

(Assume all diodes in the given circuit are identical)



Options :

4447922457. 17.6

4447922458. 20.15

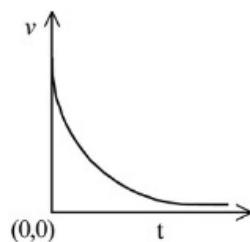
4447922459. 11.7

4447922460. 18.8

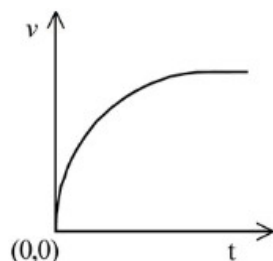
Question Number : 40 Question Id : 444792703 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A particle of mass m falls from rest through a resistive medium having resistive force, $F = -kv$, where v is the velocity of the particle and k is a constant. Which of the following graphs represents velocity (v) versus time (t)?

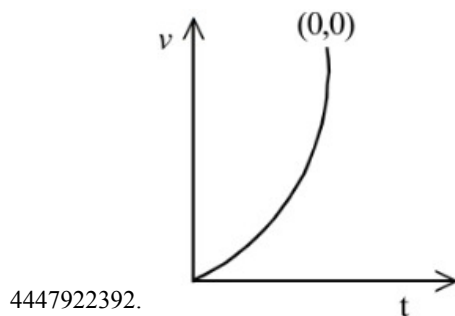
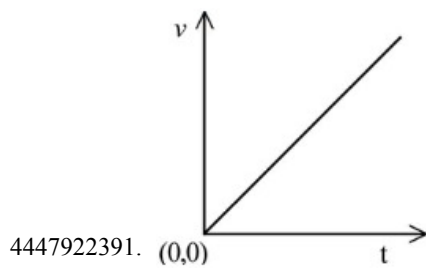
Options :



4447922389. (0,0)

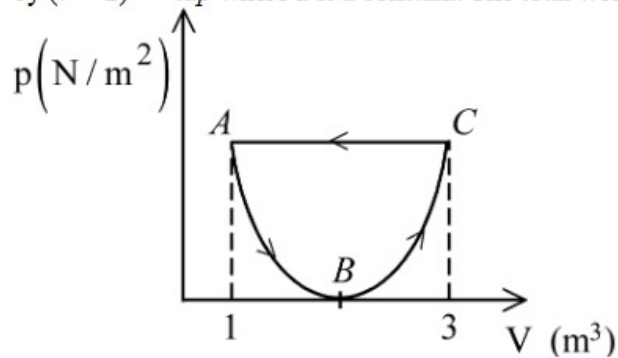


4447922390. (0,0)



Question Number : 41 Question Id : 444792709 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

In the following p - V diagram the equation of state along the curved path is given by $(V-2)^2 = 4ap$ where a is a constant. The total work done in the closed path is



Options :

4447922413. $-\frac{1}{a}$

4447922414. $-\frac{1}{3a}$

4447922415. $+\frac{1}{3a}$

4447922416. $\frac{1}{2a}$

Question Number : 42 Question Id : 444792711 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The magnetic field at the centre of a current carrying circular loop of radius R is $16 \mu\text{T}$. The magnetic field at a distance $x = \sqrt{3}R$ on its axis from the centre is _____ μT .

Options :

4447922421. 2

4447922422. $2\sqrt{2}$

4447922423. 4

4447922424. 8

Question Number : 43 Question Id : 444792704 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

A block of mass 5 kg is moving on an inclined plane which makes an angle of 30° with the horizontal. Friction coefficient between the block and inclined plane surface is $\frac{\sqrt{3}}{2}$. The force to be applied on the block so that the block will move down without acceleration is _____ N.
($g = 10 \text{ m/s}^2$).

Options :

4447922393. 12.5

4447922394. 7.5

4447922395. 25

4447922396. 15

Question Number : 44 Question Id : 444792708 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

10 kg of ice at -10°C is added to 100 kg of water to lower its temperature from 25°C . Consider no heat exchange to surroundings. The decrement to the temperature of water is _____ $^\circ\text{C}$.
(specific heat of ice = $2100 \text{ J/Kg.}^\circ\text{C}$, specific heat of water = $4200 \text{ J/Kg.}^\circ\text{C}$, latent heat of fusion of ice = $3.36 \times 10^5 \text{ J/Kg}$)

Options :

4447922409. 11.6

4447922410. 15

4447922411. 6.67

4447922412. 10

Question Number : 45 Question Id : 444792715 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Two point charges of 1 nC and 2 nC are placed at the two corners of equilateral triangle of side 3 cm. The work done in bringing a charge of 3 nC from infinity to the third corner of the triangle is _____ μJ .

$$\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N.m}^2/\text{C}^2$$

Options :

4447922437. 3.3

4447922438. 5.4

4447922439. 27

4447922440. 2.7

Physics Section B

Section Number :	4
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	5
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 : 46 Question Id : 444792721 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A convex lens of refractive index 1.5 and focal length $f = 18$ cm is immersed in water. The difference in focal lengths of the given lens when it is in water and in air is $\alpha \times f$. The value of α is _____.

(refractive index of water = $4/3$)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 47 Question Id : 444792724 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

A solid sphere of radius 10 cm is rotating about an axis which is at a distance 15 cm from its centre. The radius of gyration about this axis is $\sqrt{n}$ cm. The value of n is

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 48 Question Id : 444792725 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

The displacement of a particle, executing simple harmonic motion with time period T , is expressed as $x(t) = A \sin \omega t$, where A is the amplitude. The maximum value of potential energy of this oscillator is found at $t = T/2\beta$. The value of β is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

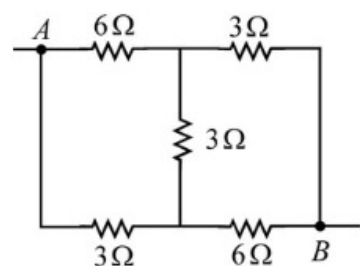
Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 49 Question Id : 444792722 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript

The equivalent resistance between the points A and B in the following circuit is $\frac{x}{5} \Omega$. The value of x is _____.



Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal
Text Areas : PlainText

Question Number : 50 Question Id : 444792723 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript
The ratio of de Broglie wavelength of a deuteron with kinetic energy E to that of an alpha particle with kinetic energy $2E$, is $n : 1$. The value of n is ____.
(Assume mass of proton = mass of neutron) :

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 : 51 Question Id : 444792745 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: Griss-Ilosvay test is used for the detection of nitrite ion, which involves the use of sulphanilic acid and α -naphthylamine reagent.

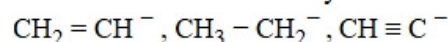
Statement II: In the above test, sulphanilic acid is diazotized by the acidified nitrite ion, which on further coupling with α -naphthylamine forms an azo-dye.

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

Options :

4447922542. Both Statement I and Statement II are true
4447922543. Both Statement I and Statement II are false
4447922544. Statement I is true but Statement II is false
4447922545. Statement I is false but Statement II is true

Question Number : 52 Question Id : 444792738 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical
CORRECT order of stability for the following is



Options :

4447922514. $\text{CH}_2 = \text{CH}^- > \text{CH} \equiv \text{C}^- > \text{CH}_3 - \text{CH}_2^-$
4447922515. $\text{CH}_3 - \text{CH}_2^- > \text{CH}_2 = \text{CH}^- > \text{CH} \equiv \text{C}^-$
4447922516. $\text{CH} \equiv \text{C}^- > \text{CH}_3 - \text{CH}_2^- > \text{CH}_2 = \text{CH}^-$

4447922517. $\text{CH} \equiv \text{C}^- > \text{CH}_2 = \text{CH}^- > \text{CH}_3 - \text{CH}_2^-$

Question Number : 53 Question Id : 444792736 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 number of pairs, from the following, in which both the ions are coloured in aqueous solution is 3.

$[\text{Sc}^{3+}, \text{Ti}^{3+}]$, $[\text{Mn}^{2+}, \text{Cr}^{2+}]$, $[\text{Cu}^{2+}, \text{Zn}^{2+}]$ and $[\text{Ni}^{2+}, \text{Ti}^{4+}]$

Statement II: Th^{4+} is the strongest reducing agent among Th^{4+} , Ce^{4+} , Gd^{3+} and Eu^{2+} .

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

Options :

4447922506. Both Statement I and Statement II are true

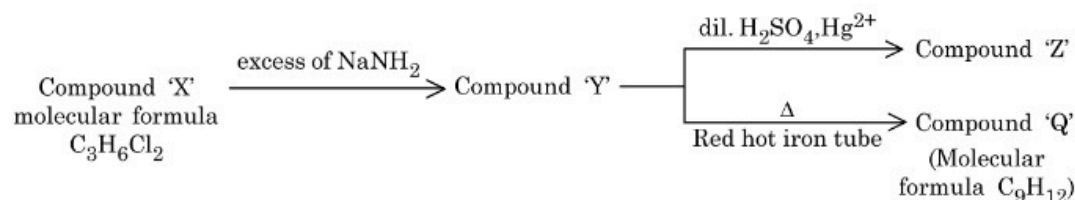
4447922507. Both Statement I and Statement II are false

4447922508. Statement I is true but Statement II is false

4447922509. Statement I is false but Statement II is true

Question Number : 54 Question Id : 444792740 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 for the following reaction sequence.



Statement I: Compound 'Z' will give yellow precipitate with NaOI.

Statement II: Compound 'Q' has two different types of 'H' atoms (aromatic : aliphatic) in the ratio 1:3.

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

Options :

4447922522. Both Statement I and Statement II are true

4447922523. Both Statement I and Statement II are false

4447922524. Statement I is true but Statement II is false

4447922525. Statement I is false but Statement II is true

Question Number : 55 Question Id : 444792728 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 number of species among BF_4^- , SiF_4 , XeF_4 and SF_4 , that have unequal E-F bond lengths is two. Here, E is the central atom.

Statement II: Among O_2^- , O_2^{2-} , F_2 and O_2^+ , O_2^- has the highest bond order.

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

Options :

4447922474. Both Statement I and Statement II are true

4447922475. Both Statement I and Statement II are false

4447922476. Statement I is true but Statement II is false

4447922477. Statement I is false but Statement II is true

Question Number : 56 Question Id : 444792729 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

20.0 dm³ of an ideal gas 'X' at 600 K and 0.5 MPa undergoes isothermal reversible expansion until pressure of the gas is 0.2 MPa. Which of the following option is correct?

(Given: $\log 2 = 0.3010$ and $\log 5 = 0.6989$)

Options :

4447922478. $w = -3.9 \text{ kJ}$, $\Delta U = 0$, $\Delta H = 0$; $q = 3.9 \text{ kJ}$

4447922479. $w = 9.1 \text{ J}$, $\Delta U = 9.1 \text{ J}$, $\Delta H = 0$; $q = 0$

4447922480. $w = -9.1 \text{ kJ}$, $\Delta U = 0$, $\Delta H = 0$, $q = 9.1 \text{ kJ}$

4447922481. $w = +4.1 \text{ kJ}$, $\Delta U = 0$, $\Delta H = 0$; $q = -4.1 \text{ kJ}$

Question Number : 57 Question Id : 444792731 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Consider a weak base 'B' of $\text{pK}_b = 5.699$. 'x' mL of 0.02 M HCl and 'y' mL of 0.02

M weak base 'B' are mixed to make 100 mL of a buffer of pH 9 at 25 °C. The values of 'x' and 'y' respectively are:

[Given: $\log 2 = 0.3010$, $\log 3 = 0.4771$, $\log 5 = 0.699$]

Options :

4447922486.

x	y
42.7	57.3

4447922487.

x	y
11.1	88.9

4447922488.

x	y
85.7	14.3

4447922489.

x	y
14.3	85.7

Question Number : 58 Question Id : 444792734 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Regarding the hydrides of group 15 elements EH_3 (E = N, P, As, Sb), select the correct statement from the following:

- A. The stability of hydrides decreases down the group.
- B. The basicity of hydrides decreases down the group.
- C. The reducing character increases down the group.
- D. The boiling point increases down the group.

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

Options :

4447922498. A, B, C & D

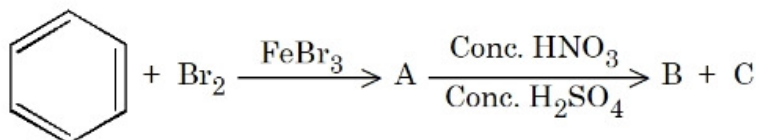
4447922499. B & C only

4447922500. A & D only

4447922501. A, B & C only

Question Number : 59 Question Id : 444792737 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Method used for separation of mixture of products (B and C) obtained in the following reaction is



Options :

4447922510. sublimation

4447922511. steam distillation

4447922512. fractional distillation

4447922513. simple distillation

Question Number : 60 Question Id : 444792733 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

In period 4 of the periodic table, the elements with highest and lowest atomic radii are respectively.

Options :

4447922494. Na & Cl

4447922495. K & Br

4447922496. Rb & Br

4447922497. K & Se

Question Number : 61 Question Id : 444792730 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

At T(K), 2 moles of liquid A and 3 moles of liquid B are mixed. The vapour pressure of ideal solution formed is 320 mm Hg. At this stage, one mole of A and one mole of B are added to the solution. The vapour pressure is now measured as 328.6 mm Hg. The vapour pressure (in mm Hg) of A and B are respectively:

Options :

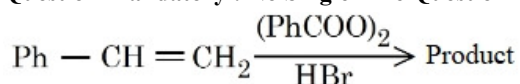
4447922482. 400, 300

4447922483. 500, 200

4447922484. 600, 400

4447922485. 300, 200

Question Number : 62 Question Id : 444792739 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical



Consider the above reaction

- A. The reaction proceeds through a more stable radical intermediate.
- B. The role of peroxide is to generate $\text{H}^\bullet$ (Hydrogen radical).
- C. During this reaction, benzene is formed as a byproduct.
- D. 1-Bromo-2-phenylethane is formed as the minor product.
- E. The same reaction in absence of peroxide proceeds via carbocation intermediate.

Identify the correct statements. Choose the *correct* answer from the options given below:

Options :

4447922518. A & E Only

4447922519. A, B & D Only

4447922520. A, C & E Only

4447922521. C, D & E Only

Question Number : 63 Question Id : 444792727 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The wave numbers of three spectral lines of H atom are considered. Identify the set of spectral lines belonging to Balmer series.

(R = Rydberg constant)

Options :

4447922470. $\frac{5R}{36}$, $\frac{8R}{9}$, $\frac{15R}{16}$

4447922471. $\frac{3R}{4}$, $\frac{3R}{16}$, $\frac{7R}{144}$

4447922472. $\frac{5R}{36}$, $\frac{3R}{16}$, $\frac{21R}{100}$

4447922473. $\frac{7R}{144}, \frac{3R}{16}, \frac{16R}{255}$

Question Number : 64 Question Id : 444792732 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

An organic compound undergoes first order decomposition. The time taken for decomposition to $\left(\frac{1}{8}\right)^{\text{th}}$ and $\left(\frac{1}{10}\right)^{\text{th}}$ of its initial concentration are $t_{1/8}$ and $t_{1/10}$ respectively.

What is the value of $\frac{t_{1/8}}{t_{1/10}} \times 10$?

(log 2= 0.3)

Options :

4447922490. 3

4447922491. 9

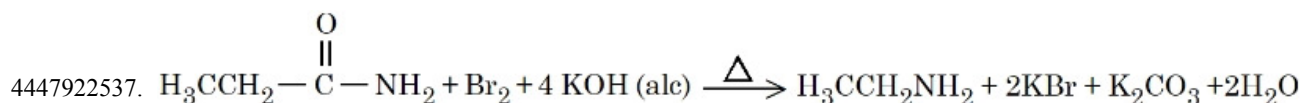
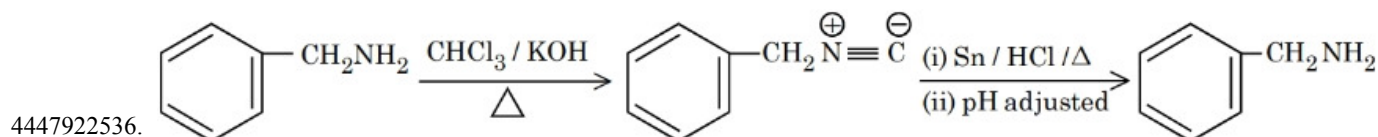
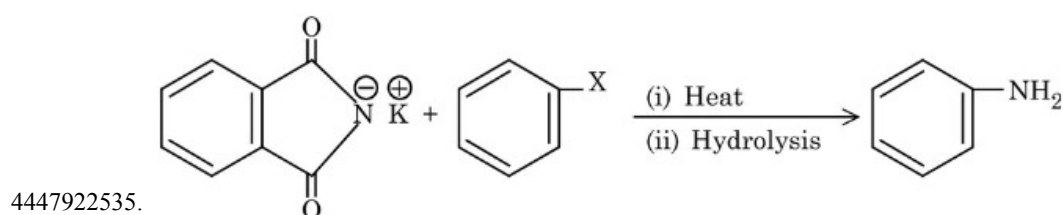
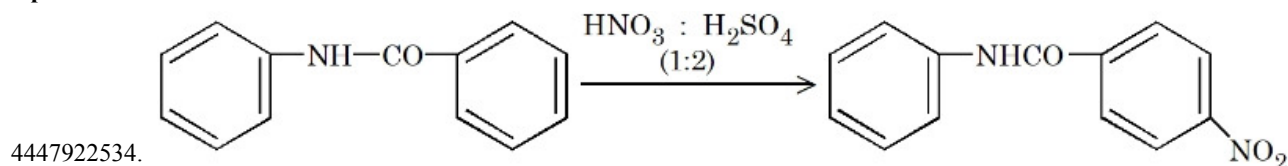
4447922492. 30

4447922493. 0.9

Question Number : 65 Question Id : 444792743 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

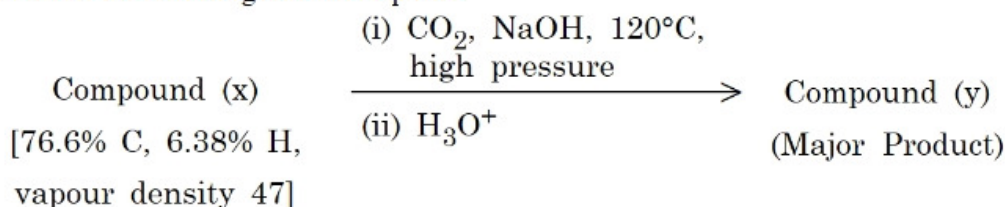
Consider the following reactions giving major product. Identify the correct reaction.

Options :



Question Number : 66 Question Id : 444792741 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

Consider the following reaction sequence



Compound (y) develops characteristic colour with neutral FeCl_3 solution.

Identify the **INCORRECT** statement from the following for the above sequence.

Options :

4447922526. Both compounds x and y will dissolve in NaOH.

4447922527. Compound y will dissolve in NaHCO_3 and evolve a gas.

4447922528. Both compounds x and y will burn with sooty flame.

4447922529. Compound x is more acidic than compound y.

Question Number : 67 Question Id : 444792726 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

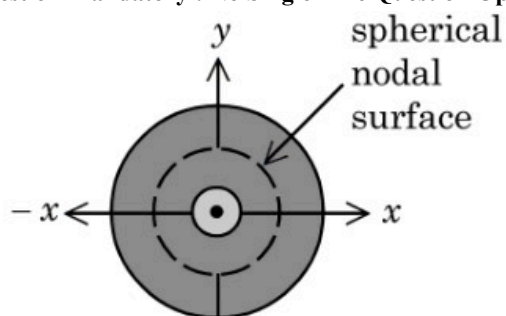


Figure 1. electron probability density for 2s orbital

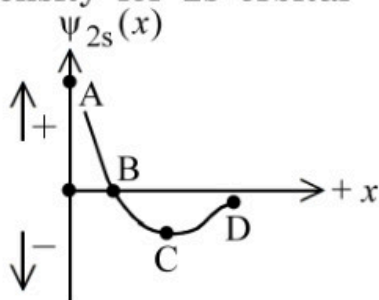


Figure 2. wave function for 2s orbital

Which of the following point in Figure 2 most accurately represents the nodal surface as shown in Figure 1?

Options :

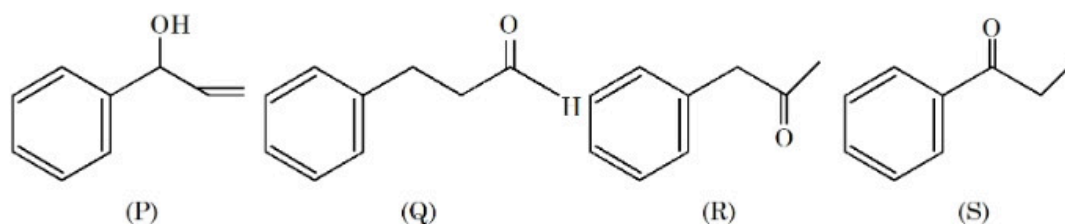
4447922466. A

4447922467. B

4447922468. C

4447922469. D

Question Number : 68 Question Id : 444792742 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 the four isomeric compounds (P, Q, R, S)



Identify **correct** statements from below.

- A. Q, R and S will give precipitate with 2, 4 – DNP.
- B. P and Q will give positive Bayer's test.
- C. Q and R will give sooty flame.
- D. R and S will give yellow precipitate with $I_2 / NaOH$.
- E. Q alone will deposit silver with Tollen's reagent

Choose the correct option.

Options :

4447922530. C and E only

4447922531. A, C and E only

4447922532. A, B, D and E only

4447922533. A and E only

Question Number : 69 Question Id : 444792735 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

The correct statement among the following is:

Options :

4447922502. $Ni(CO)_4$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $[NiCl_4]^{2-}$ is paramagnetic.

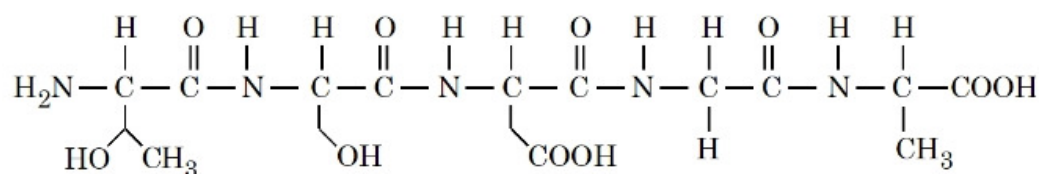
4447922503. $Ni(CO)_4$ and $[NiCl_4]^{2-}$ are diamagnetic and $[Ni(CN)_4]^{2-}$ is paramagnetic.

4447922504. $[Ni(CN)_4]^{2-}$ and $[NiCl_4]^{2-}$ are diamagnetic and $Ni(CO)_4$ is paramagnetic.

4447922505. $Ni(CO)_4$ is diamagnetic and $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ are paramagnetic.

Question Number : 70 Question Id : 444792744 Question Type : MCQ Option Shuffling : Yes Display Question Number : Yes Is Question Mandatory : No Single Line Question Option : No Option Orientation : Vertical

In the given pentapeptide, find out an essential amino acid (Y) and the sequence present in the pentapeptide:



Choose the correct answer from the options given below:

Options :

	(Y)	(Sequence)
4447922538.	Threonine	Thr-Ser-Asp-Gly-Ala

	(Y)	(Sequence)
4447922539.	Serine	Thr-Ser-Asp-Ala-Gly

	(Y)	(Sequence)
4447922540.	Serine	Ser-Asp-Thr-Ala-Gly

	(Y)	(Sequence)
4447922541.	Threonine	Ser-Thr-Asp-Gly-Ala

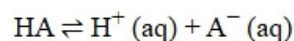
Chemistry Section B

Section Number :	6
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	5
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 : 71 Question Id : 444792748 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript
500 mL of 1.2 M KI solution is mixed with 500 mL of 0.2 M KMnO_4 solution in basic medium. The liberated iodine was titrated with standard 0.1 M $\text{Na}_2\text{S}_2\text{O}_3$ solution in the presence of starch indicator till the blue color disappeared. The volume (in L) of $\text{Na}_2\text{S}_2\text{O}_3$ consumed is _____. (Nearest integer)

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

Question Number : 72 Question Id : 444792750 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript
Consider the dissociation equilibrium of the following weak acid



If the pK_a of the acid is 4, then the pH of 10 mM HA solution is _____. (Nearest integer)

[Given: The degree of dissociation can be neglected with respect to unity]

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

Question Number : 73 Question Id : 444792746 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript
X is the number of geometrical isomers exhibited by $[\text{Pt}(\text{NH}_3)(\text{H}_2\text{O})\text{BrCl}]$.

Y is the number of optically inactive isomer(s) exhibited by $[\text{CrCl}_2(\text{ox})_2]^{3-}$

Z is the number of geometrical isomers exhibited by $[\text{Co}(\text{NH}_3)_3(\text{NO}_2)_3]$.

The value of $X + Y + Z$ is _____.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 74 Question Id : 444792747 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript
0.53 g of an organic compound (x) when heated with excess of nitric acid (concentrated) and then with silver nitrate gave 0.75 g of silver bromide precipitate. 1.0 g of (x) gave 1.32 g of CO_2 gas on combustion. The percentage of hydrogen in the compound (x) is ____%. [Nearest Integer]

[Given: Molar mass in g mol^{-1} H : 1, C : 12, Br : 80, Ag : 108, O : 16 ;
Compound (x) : $\text{C}_x\text{H}_y\text{Br}_z$]

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Question Number : 75 Question Id : 444792749 Question Type : SA Display Question Number : Yes Keyboard Layout : Inscript
Consider the following redox reaction taking place in acidic medium



If the Nernst equation for the above balanced reaction is

$$E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{RT}{nF} \ln Q,$$

then the value of n is _____. (Nearest integer)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText