

Q:1

Topic Name:Mathematics-Section A

ItemCode:131

Let $x*y = x^2 + y^3$ and $(x*1)*1 = x*(1*1)$.

Then a value of $2\sin^{-1}\left(\frac{x^4+x^2-2}{x^4+x^2+2}\right)$ is

Question:

A

$\frac{\pi}{4}$

B

$\frac{\pi}{3}$

C

$\frac{\pi}{2}$

D

$\frac{\pi}{6}$

Q:2

Topic Name:Mathematics-Section A

ItemCode:132

The sum of all the real roots of the equation $(e^{2x}-4)(6e^{2x}-5e^x+1)=0$ is

Question:

A

$\log_e 3$

B

$-\log_e 3$

C

$\log_e 6$

D

$-\log_e 6$

Q:3

Topic Name:Mathematics-Section A

ItemCode:133

Let the system of linear equations

$x + y + \alpha z = 2$

$3x + y + z = 4$

$x + 2z = 1$

have a unique solution (x^*, y^*, z^*) . If $(\alpha, x^*), (y^*, \alpha)$ and $(x^*, -y^*)$ are collinear

Question:

points, then the sum of absolute values of all possible values of α is

A

4

B

3

C

2

D

1

Q:4

Topic Name:Mathematics-Section A

ItemCode:134

Let $x, y > 0$. If $x^3y^2 = 2^{15}$, then the least value of $3x + 2y$ is

Question:

A

30

B

32

C

36

D

40

Q:5

Topic Name:Mathematics-Section A

ItemCode:135

Let $f(x) = \begin{cases} \frac{\sin(x - [x])}{x - [x]} & , x \in (-2, -1) \\ \max\{2x, 3[|x|]\} & , |x| < 1 \\ 1 & , \text{otherwise} \end{cases}$

where $[t]$ denotes greatest integer $\leq t$. If m is the number of points where f is not continuous and n is the number of points where f is not differentiable, then the ordered pair (m, n) is:

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

Q:6
Topic Name:Mathematics-Section A

ItemCode:136

The value of the integral $\int_{-\pi/2}^{\pi/2} \frac{dx}{(1 + e^x)(\sin^6 x + \cos^6 x)}$ is equal to

- A 2π
- B 0
- C π
- D $\frac{\pi}{2}$

Q:7
Topic Name:Mathematics-Section A

ItemCode:137

$\lim_{n \rightarrow \infty} \left(\frac{n^2}{(n^2 + 1)(n + 1)} + \frac{n^2}{(n^2 + 4)(n + 2)} + \frac{n^2}{(n^2 + 9)(n + 3)} + \dots + \frac{n^2}{(n^2 + n^2)(n + n)} \right)$

is equal to

- A $\frac{\pi}{8} + \frac{1}{4} \log_e 2$
- B $\frac{\pi}{4} + \frac{1}{8} \log_e 2$
- C $\frac{\pi}{4} - \frac{1}{8} \log_e 2$
- D $\frac{\pi}{8} + \log_e \sqrt{2}$

Q:8
Topic Name:Mathematics-Section A

ItemCode:138

A particle is moving in the xy -plane along a curve C passing through the point $(3, 3)$. The tangent to the curve C at the point P meets the x -axis at Q . If the y -axis bisects the segment PQ , then C is a parabola with

- A length of latus rectum 3
- B length of latus rectum 6
- C focus $\left(\frac{4}{3}, 0\right)$

D	focus $\left(0, \frac{3}{4}\right)$
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Q:9
Topic Name:Mathematics-Section A

ItemCode:139	
Let the maximum area of the triangle that can be inscribed in the ellipse $\frac{x^2}{a^2} + \frac{y^2}{4} = 1, a > 2$, having one of its vertices at one end of the major axis of the ellipse and one of its sides parallel to the y-axis, be $6\sqrt{3}$. Then the eccentricity of the ellipse is:	
A	$\frac{\sqrt{3}}{2}$
B	$\frac{1}{2}$
C	$\frac{1}{\sqrt{2}}$
D	$\frac{\sqrt{3}}{4}$

Q:10
Topic Name:Mathematics-Section A

ItemCode:1310	
Let the area of the triangle with vertices $A(1, \alpha), B(\alpha, 0)$ and $C(0, \alpha)$ be 4 sq. units.	
Question: If the points $(\alpha, -\alpha), (-\alpha, \alpha)$ and (α^2, β) are collinear, then β is equal to	
A	64
B	−8
C	−64
D	512

Q:11
Topic Name:Mathematics-Section A

ItemCode:1311	
Question: The number of distinct real roots of the equation $x^7 - 7x - 2 = 0$ is	
A	5
B	7
C	1
D	3

Q:12
Topic Name:Mathematics-Section A

ItemCode:1312

A random variable X has the following probability distribution:

X	0	1	2	3	4
$P(X)$	k	$2k$	$4k$	$6k$	$8k$

Question: The value of $P(1 < X < 4 | X \leq 2)$ is equal to :

A $\frac{4}{7}$

ZOLLER

B	$\frac{2}{3}$
C	$\frac{3}{7}$
D	$\frac{4}{5}$

Q:13
Topic Name:Mathematics-Section A

ItemCode:1313

The number of solutions of the equation $\cos\left(x+\frac{\pi}{3}\right)\cos\left(\frac{\pi}{3}-x\right)=\frac{1}{4}\cos^2 2x,$

Question: $x \in [-3\pi, 3\pi]$ is:

A	8
B	5
C	6
D	7

Q:14
Topic Name:Mathematics-Section A

ItemCode:1314

If the shortest distance between the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{\lambda}$ and

$\frac{x-2}{1}=\frac{y-4}{4}=\frac{z-5}{5}$ is $\frac{1}{\sqrt{3}}$, then the sum of all possible values of λ is:

Question:

A	16
B	6
C	12
D	15

Q:15
Topic Name:Mathematics-Section A

ItemCode:1315

Let the points on the plane P be equidistant from the points $(-4, 2, 1)$ and $(2, -2, 3)$. Then the acute angle between the plane P and the plane

Question: $2x + y + 3z = 1$ is

A	$\frac{\pi}{6}$
B	$\frac{\pi}{4}$
C	$\frac{\pi}{3}$
D	$\frac{5\pi}{12}$

Q:16
Topic Name:Mathematics-Section A

ItemCode:1316

Let $\hat{a}$ and $\hat{b}$ be two unit vectors such that $|\left(\hat{a}+\hat{b}\right)+2\left(\hat{a}\times\hat{b}\right)|=2$. If $\theta \in (0, \pi)$ is the angle between $\hat{a}$ and $\hat{b}$, then among the statements:

(S1) : $2|\hat{a}\times\hat{b}|=|\hat{a}-\hat{b}|$

(S2) : The projection of $\hat{a}$ on $(\hat{a}+\hat{b})$ is $\frac{1}{2}$

Question:

A	Only (S1) is true.
B	Only (S2) is true.

C	Both (S1) and (S2) are true.
D	Both (S1) and (S2) are false.

Q:17
Topic Name:Mathematics-Section A

ItemCode:1317	
Question: If $y = \tan^{-1}\left(\sec x^3 - \tan x^3\right), \frac{\pi}{2} < x^3 < \frac{3\pi}{2}$, then	
A	$xy'' + 2y' = 0$
B	$x^2y'' - 6y + \frac{3\pi}{2} = 0$
C	$x^2y'' - 6y + 3\pi = 0$
D	$xy'' - 4y' = 0$

Q:18
Topic Name:Mathematics-Section A

ItemCode:1318	
Consider the following statements: <i>A</i>: Rishi is a judge. <i>B</i>: Rishi is honest. <i>C</i>: Rishi is not arrogant. The negation of the statement “if Rishi is a judge and he is not arrogant, then he is honest” is	
A	$B \rightarrow (A \vee C)$
B	$(\sim B) \wedge (A \wedge C)$
C	$B \rightarrow ((\sim A) \vee (\sim C))$
D	$B \rightarrow (A \wedge C)$

Q:19
Topic Name:Mathematics-Section A

ItemCode:1319	
The slope of normal at any point $(x, y), x > 0, y > 0$ on the curve $y = y(x)$ is given by $\frac{x^2}{xy - x^2y^2 - 1}$. If the curve passes through the point $(1, 1)$, then $e \cdot y(e)$	
Question: is equal to	
A	$\frac{1 - \tan(1)}{1 + \tan(1)}$
B	$\tan(1)$
C	1
D	$\frac{1 + \tan(1)}{1 - \tan(1)}$

Q:20
Topic Name:Mathematics-Section A

ItemCode:1320	
Let λ^* be the largest value of λ for which the function $f_\lambda(x) = 4\lambda x^3 - 36\lambda x^2 + 36x + 48$ is increasing for all $x \in \mathbb{R}$. Then	
Question: $f_{\lambda^*}(1) + f_{\lambda^*}(-1)$ is equal to :	
A	36
B	48
C	64
D	72

Q:21
Topic Name:Mathematics-Section B

ItemCode:1321

Let $S = \{z \in \mathbb{C} : |z - 3| \leq 1 \text{ and } z(4 + 3i) + \bar{z}(4 - 3i) \leq 24\}$. If $\alpha + i\beta$ is the point in S which is closest to $4i$, then $25(\alpha + \beta)$ is equal to ____.

Q:22
Topic Name:Mathematics-Section B

ItemCode:1322

Let $S = \left\{ \begin{pmatrix} -1 & a \\ 0 & b \end{pmatrix}; a, b \in \{1, 2, 3, \dots, 100\} \right\}$ and let $T_n = \{A \in S : A^{n(n+1)} = I\}$. Then the number of elements in $\bigcap_{n=1}^{100} T_n$ is ____.

Q:23
Topic Name:Mathematics-Section B

ItemCode:1323

The number of 7-digit numbers which are multiples of 11 and are formed using all the digits 1, 2, 3, 4, 5, 7 and 9 is ____.

Q:24
Topic Name:Mathematics-Section B

ItemCode:1324

The sum of all the elements of the set $\{a \in \{1, 2, \dots, 100\} : HCF(a, 24) = 1\}$ is ____.

Q:25
Topic Name:Mathematics-Section B

ItemCode:1325

The remainder on dividing $1 + 3 + 3^2 + 3^3 + \dots + 3^{2021}$ by 50 is ____.

Q:26
Topic Name:Mathematics-Section B

ItemCode:1326

The area (in sq. units) of the region enclosed between the parabola $y^2 = 2x$ and the line $x + y = 4$ is ____.

Q:27
Topic Name:Mathematics-Section B

ItemCode:1327

Let a circle $C : (x - h)^2 + (y - k)^2 = r^2$, $k > 0$, touch the x -axis at $(1, 0)$. If the line $x + y = 0$ intersects the circle C at P and Q such that the length of the chord PQ is 2, then the value of $h + k + r$ is equal to ____.

Q:28
Topic Name:Mathematics-Section B

ItemCode:1328

In an examination, there are 10 true-false type questions. Out of 10, a student can guess the answer of 4 questions correctly with probability $\frac{3}{4}$ and the remaining 6 questions correctly with probability $\frac{1}{4}$. If the probability that the student guesses the answers of exactly 8 questions correctly out of 10 is $\frac{27k}{4^{10}}$, then k is equal to ____.

Q:29
Topic Name:Mathematics-Section B

ItemCode:1329

Let the hyperbola $H : \frac{x^2}{a^2} - y^2 = 1$ and the ellipse $E : 3x^2 + 4y^2 = 12$ be such that the length of latus rectum of H is equal to the length of latus rectum of E . If e_H and e_E are the eccentricities of H and E respectively, then the value of $12(e_H^2 + e_E^2)$ is

Question: equal to ____.

Q:30
Topic Name:Mathematics-Section B

ItemCode:1330

Let P_1 be a parabola with vertex $(3, 2)$ and focus $(4, 4)$ and P_2 be its mirror image with respect to the line $x + 2y = 6$. Then the directrix of P_2 is $x + 2y =$ ____.

Q:31
Topic Name:Physics-Section A

ItemCode:1331

Question:Identify the pair of physical quantities that have same dimensions :

- A velocity gradient and decay constant
- B wien's constant and Stefan constant
- C angular frequency and angular momentum
- D wave number and Avogadro number

Q:32
Topic Name:Physics-Section A

ItemCode:1332

The distance between Sun and Earth is R . The duration of year if the distance between Sun and Earth becomes $3R$ will be :

- A $\sqrt{3}$ years
- B 3 years
- C 9 years
- D $3\sqrt{3}$ years

Q:33
Topic Name:Physics-Section A

ItemCode:1333

A stone of mass m , tied to a string is being whirled in a vertical circle with a uniform speed. The tension in the string is

- A the same throughout the motion.
- B minimum at the highest position of the circular path.
- C minimum at the lowest position of the circular path.
- D minimum when the rope is in the horizontal position.

Q:34
Topic Name:Physics-Section A

ItemCode:1334

Two identical charged particles each having a mass 10 g and charge $2.0 \times 10^{-7} C$ are placed on a horizontal table with a separation of L between them such that they stay in limited equilibrium. If the coefficient of friction between each particle and the table is 0.25, find the value of L . [Use $g = 10ms^{-2}$]

- A 12 cm
- B 10 cm
- C 8 cm

D	5 cm
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Q:35
Topic Name:Physics-Section A

ItemCode:1335	
A Carnot engine takes 5000 kcal of heat from a reservoir at 727°C and gives heat to a sink at 127°C. The work done by the engine is	
Question:	
A	$3 \times 10^6 J$
B	Zero
C	$12.6 \times 10^6 J$
D	$8.4 \times 10^6 J$

Q:36
Topic Name:Physics-Section A

ItemCode:1336	
Two massless springs with spring constants 2 k and 9 k, carry 50 g and 100 g masses at their free ends. These two masses oscillate vertically such that their maximum velocities are equal. Then, the ratio of their respective amplitudes will be :	
Question:	
A	1:2
B	3:2
C	3:1
D	2:3

Q:37
Topic Name:Physics-Section A

ItemCode:1337	
What will be the most suitable combination of three resistors A=2Ω, B=4Ω, C=6Ω so that $\left(\frac{22}{3}\right)\Omega$ is equivalent resistance of combination?	
Question:	
A	Parallel combination of A and C connected in series with B.
B	Parallel combination of A and B connected in series with C.
C	Series combination of A and C connected in parallel with B.
D	Series combination of B and C connected in parallel with A.

Q:38
Topic Name:Physics-Section A

ItemCode:1338	
The soft-iron is a suitable material for making an electromagnet. This is because soft-iron has	
Question:	
A	low coercivity and high retentivity.
B	low coercivity and low permeability.
C	high permeability and low retentivity.
D	high permeability and high retentivity.

Q:39
Topic Name:Physics-Section A

ItemCode:1339	
A proton, a deuteron and an α-particle with same kinetic energy enter into a uniform magnetic field at right angle to magnetic field. The ratio of the radii of their respective circular paths is :	
Question:	
A	$1:\sqrt{2}:\sqrt{2}$
B	$1:1:\sqrt{2}$

C	$\sqrt{2}:1:1$
D	$1:\sqrt{2}:1$

Q:40
Topic Name:Physics-Section A

ItemCode:1340	
Given below are two statements :	
Statement-I: The reactance of an ac circuit is zero. It is possible that the circuit contains a capacitor and an inductor.	
Statement-II: In ac circuit, the average power delivered by the source never becomes zero.	
In the light of the above statements, choose the correct answer from the options given below	
A	Both Statement I and Statement II are true.
B	Both Statement I and Statement II are false.
C	Statement I is true but Statement II is false.
D	Statement I is false but Statement II is true.

Q:41
Topic Name:Physics-Section A

ItemCode:1341	
Potential energy as a function of r is given by $U = \frac{A}{r^{10}} - \frac{B}{r^5}$, where r is the interatomic distance, A and B are positive constants. The equilibrium distance	
Question: between the two atoms will be :	
A	$\left(\frac{A}{B}\right)^{\frac{1}{5}}$
B	$\left(\frac{B}{A}\right)^{\frac{1}{5}}$
C	$\left(\frac{2A}{B}\right)^{\frac{1}{5}}$
D	$\left(\frac{B}{2A}\right)^{\frac{1}{5}}$

Q:42
Topic Name:Physics-Section A

ItemCode:1342	
An object of mass 5 kg is thrown vertically upwards from the ground. The air resistance produces a constant retarding force of 10 N throughout the motion. The	
Question: ratio of time of ascent to the time of descent will be equal to : [Use $g = 10\text{ms}^{-2}$].	
A	1:1
B	$\sqrt{2}:\sqrt{3}$
C	$\sqrt{3}:\sqrt{2}$
D	2:3

Q:43
Topic Name:Physics-Section A

ItemCode:1343	
A fly wheel is accelerated uniformly from rest and rotates through 5 rad in the first	
Question: second. The angle rotated by the fly wheel in the next second, will be :	
A	7.5 rad
B	15 rad
C	20 rad

D	30 rad
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Q:44
Topic Name:Physics-Section A

ItemCode:1344	
A 100 g of iron nail is hit by a 1.5 kg hammer striking at a velocity of 60 ms^{-1} . What will be the rise in the temperature of the nail if one fourth of energy of the hammer goes into heating the nail ?	
Question:[Specific heat capacity of iron = $0.42\text{ Jg}^{-1}\text{ }^{\circ}\text{C}^{-1}$]	
A	675°C
B	1600°C
C	16.07°C
D	6.75°C

Q:45
Topic Name:Physics-Section A

ItemCode:1345	
If the charge on a capacitor is increased by 2 C, the energy stored in it increases by 44%. The original charge on the capacitor is (in C)	
Question:	
A	10
B	20
C	30
D	40

Q:46
Topic Name:Physics-Section A

ItemCode:1346	
A long cylindrical volume contains a uniformly distributed charge of density ρ . The radius of cylindrical volume is R . A charge particle (q) revolves around the cylinder in a circular path. The kinetic energy of the particle is :	
Question:	
A	$\frac{\rho q R^2}{4\epsilon_o}$
B	$\frac{\rho q R^2}{2\epsilon_o}$
C	$\frac{q\rho}{4\epsilon_o R^2}$
D	$\frac{4\epsilon_o R^2}{q\rho}$

Q:47
Topic Name:Physics-Section A

ItemCode:1347	
An electric bulb is rated as 200 W. What will be the peak magnetic field at 4 m distance produced by the radiations coming from this bulb? Consider this bulb as a point source with 3.5% efficiency.	
Question:	
A	$1.19 \times 10^{-8}T$
B	$1.71 \times 10^{-8}T$
C	$0.84 \times 10^{-8}T$
D	$3.36 \times 10^{-8}T$

Q:48
Topic Name:Physics-Section A

ItemCode:1348

The light of two different frequencies whose photons have energies 3.8 eV and 1.4 eV respectively, illuminate a metallic surface whose work function is 0.6 eV successively. The ratio of maximum speeds of emitted electrons for the two frequencies respectively will be :

- A 1 : 1
- B 2 : 1
- C 4 : 1
- D 1 : 4

Q:49
Topic Name:Physics-Section A

ItemCode:1349

Two light beams of intensities in the ratio of 9 : 4 are allowed to interfere. The ratio of the intensity of maxima and minima will be :

- A 2 : 3
- B 16 : 81
- C 25 : 169
- D 25 : 1

Q:50
Topic Name:Physics-Section A

ItemCode:1350

In Bohr's atomic model of hydrogen, let K, P and E are the kinetic energy, potential energy and total energy of the electron respectively. Choose the correct option when the electron undergoes transitions to a higher level :

- A All K, P and E increase.
- B K decreases, P and E increase.
- C P decreases, K and E increase.
- D K increases, P and E decrease.

Q:51
Topic Name:Physics-Section B

ItemCode:1351

A body is projected from the ground at an angle of 45° with the horizontal. Its velocity after 2 s is 20 ms^{-1} . The maximum height reached by the body during its motion is _____ m. (use $g = 10\text{ ms}^{-2}$)

Q:52
Topic Name:Physics-Section B

ItemCode:1352

An antenna is placed in a dielectric medium of dielectric constant 6.25. If the maximum size of that antenna is 5.0 mm , it can radiate a signal of minimum frequency of _____ GHz.
(Given $\mu_r = 1$ for dielectric medium)

Q:53
Topic Name:Physics-Section B

ItemCode:1353

A potentiometer wire of length 10 m and resistance $20\ \Omega$ is connected in series with a 25 V battery and an external resistance $30\ \Omega$. A cell of emf E in secondary circuit is balanced by 250 cm long potentiometer wire. The value of E (in volt) is $\frac{x}{10}$. The value of x is _____.

Q:54

ItemCode:1354

Two travelling waves of equal amplitudes and equal frequencies move in opposite directions along a string. They interfere to produce a stationary wave whose equation is given by

$$y = (10 \cos \pi x \sin \frac{2\pi t}{T}) \text{ cm}$$

Question: The amplitude of the particle at $x = \frac{4}{3}$ cm will be _____ cm.

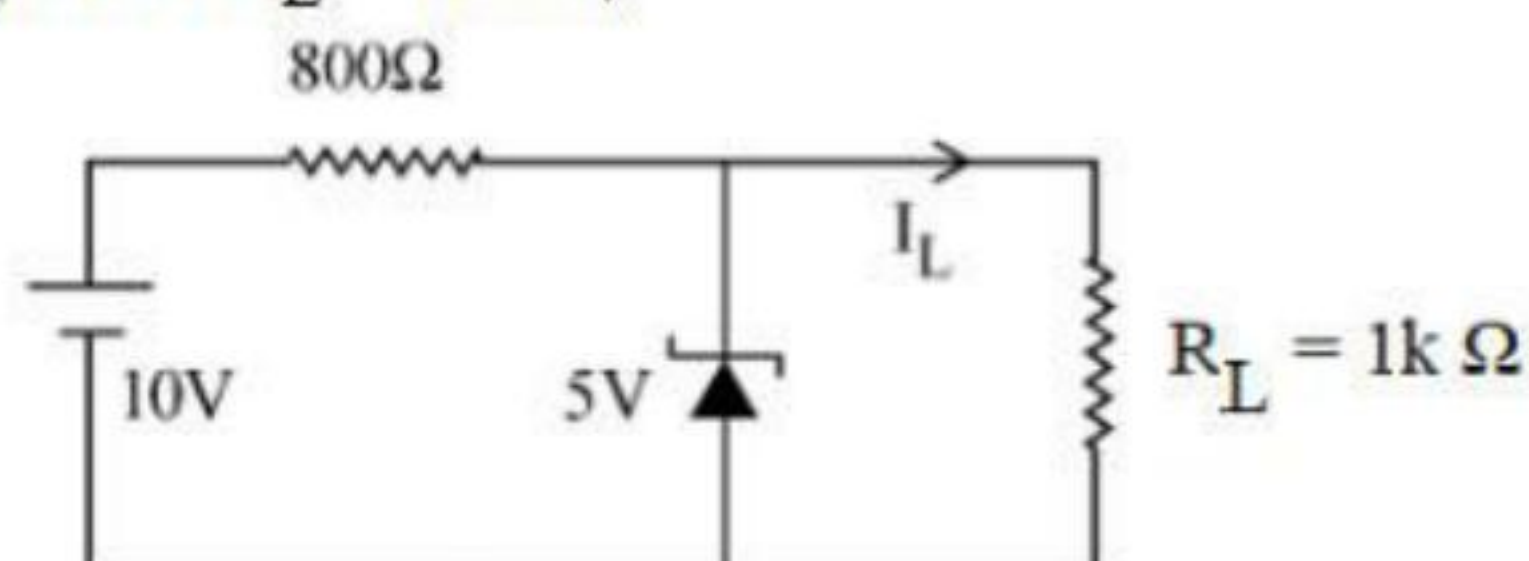
Q:55

Topic Name:Physics-Section B

ItemCode:1355

In the given circuit, the value of current I_L will be _____ mA.

(When $R_L = 1 \text{ k } \Omega$)



Question:

Q:56

Topic Name:Physics-Section B

ItemCode:1356

A sample contains 10^{-2} kg each of two substances A and B with half lives 4 s and 8 s respectively. The ratio of their atomic weights is 1 : 2. The ratio of the amounts

of A and B after 16 s is $\frac{x}{100}$. The value of x is _____.

Question:

Q:57

Topic Name:Physics-Section B

ItemCode:1357

A ray of light is incident at an angle of incidence 60° on the glass slab of refractive index $\sqrt{3}$. After refraction, the light ray emerges out from other parallel faces and lateral shift between incident ray and emergent ray is $4\sqrt{3}$ cm. The thickness of the

Question: glass slab is _____ cm.

Q:58

Topic Name:Physics-Section B

ItemCode:1358

A circular coil of 1000 turns each with area 1 m^2 is rotated about its vertical diameter at the rate of one revolution per second in a uniform horizontal magnetic

Question: field of 0.07T. The maximum voltage generation will be _____ V.

Q:59

Topic Name:Physics-Section B

ItemCode:1359

A monoatomic gas performs a work of $\frac{Q}{4}$ where Q is the heat supplied to it. The molar heat capacity of the gas will be _____ R during this transformation.

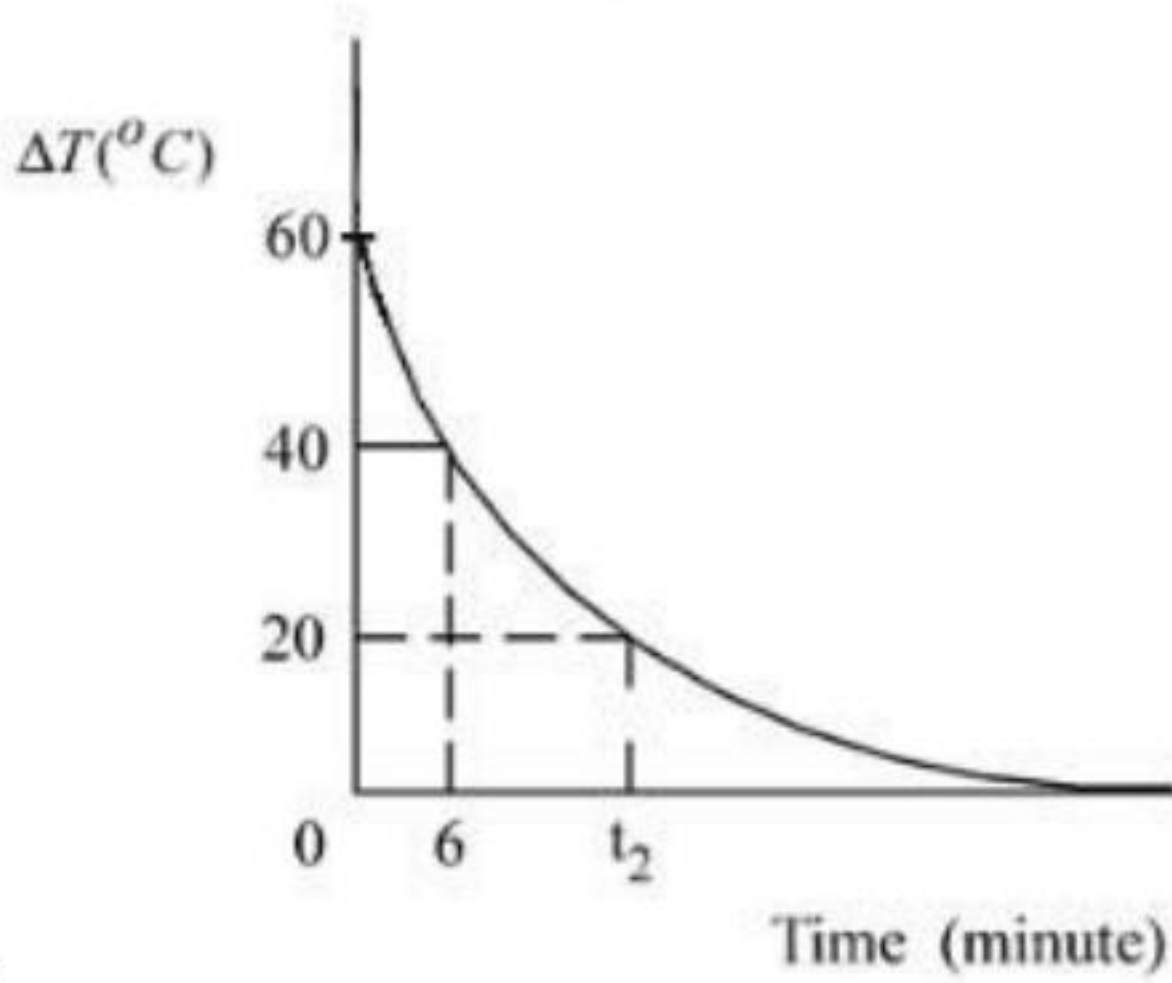
Question: Where R is the gas constant.

Q:60

Topic Name:Physics-Section B

ItemCode:1360

In an experiment to verify Newton’s law of cooling, a graph is plotted between, the temperature difference (ΔT) of the water and surroundings and time as shown in figure. The initial temperature of water is taken as 80°C . The value of t_2 as mentioned in the graph will be _____.



Question:

Q:61
Topic Name:Chemistry-Section A

ItemCode:1361

120 g of an organic compound that contains only carbon and hydrogen gives 330 g of CO_2 and 270 g of water on complete combustion. The percentage of carbon and

Question:hydrogen, respectively are

- A 25 and 75
- B 40 and 60
- C 60 and 40
- D 75 and 25

Q:62
Topic Name:Chemistry-Section A

ItemCode:1362

The energy of one mole of photons of radiation of wavelength 300 nm is

Question:(Given : $h = 6.63 \times 10^{-34} \text{ J s}$, $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$, $c = 3 \times 10^8 \text{ m s}^{-1}$)

- A 235 kJ mol^{-1}
- B 325 kJ mol^{-1}
- C 399 kJ mol^{-1}
- D 435 kJ mol^{-1}

Q:63
Topic Name:Chemistry-Section A

ItemCode:1363

Question:The correct order of bond orders of C_2^{2-} , N_2^{2-} and O_2^{2-} is, respectively

- A $\text{C}_2^{2-} < \text{N}_2^{2-} < \text{O}_2^{2-}$
- B $\text{O}_2^{2-} < \text{N}_2^{2-} < \text{C}_2^{2-}$
- C $\text{C}_2^{2-} < \text{O}_2^{2-} < \text{N}_2^{2-}$
- D $\text{N}_2^{2-} < \text{C}_2^{2-} < \text{O}_2^{2-}$

Q:64
Topic Name:Chemistry-Section A

ItemCode:1364

At 25°C and 1 atm pressure, the enthalpies of combustion are as given below:

Substance	H ₂	C (graphite)	C ₂ H ₆ (g)
$\Delta_c H^\ominus$ kJ mol ⁻¹	-286.0	-394.0	-1560.0

Question: The enthalpy of formation of ethane is

- A +54.0 kJ mol⁻¹
- B -68.0 kJ mol⁻¹
- C -86.0 kJ mol⁻¹
- D +97.0 kJ mol⁻¹

Q:65
Topic Name:Chemistry-Section A

ItemCode:1365

For a first order reaction, the time required for completion of 90% reaction is ‘x’ times the half life of the reaction. The value of ‘x’ is

(Given: ln 10 = 2.303 and log 2 = 0.3010)

- Question:
- A 1.12
 - B 2.43
 - C 3.32
 - D 33.31

Q:66
Topic Name:Chemistry-Section A

ItemCode:1366

Metals generally melt at very high temperature. Amongst the following, the metal with the highest melting point will be

Question:

- A Hg
- B Ag
- C Ga
- D Cs

Q:67
Topic Name:Chemistry-Section A

ItemCode:1367

Which of the following chemical reactions represents Hall-Heroult Process?

Question:

- A $\text{Cr}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Cr}$
- B $2\text{Al}_2\text{O}_3 + 3\text{C} \rightarrow 4\text{Al} + 3\text{CO}_2$
- C $\text{FeO} + \text{CO} \rightarrow \text{Fe} + \text{CO}_2$
- D $2[\text{Au}(\text{CN})_2]^-_{(\text{aq})} + \text{Zn}(\text{s}) \rightarrow 2\text{Au}(\text{s}) + [\text{Zn}(\text{CN}_4)]^{2-}$

Q:68
Topic Name:Chemistry-Section A

ItemCode:1368

In the industrial production of which of the following, molecular hydrogen is obtained as a byproduct ?

Question:

- A NaOH
- B NaCl
- C Na metal
- D Na₂CO₃

Q:69
Topic Name:Chemistry-Section A

ItemCode:1369
Which one of the following compounds is used as a chemical in certain type of fire extinguishers?

- A Baking soda
- B Soda ash
- C Washing soda
- D Caustic Soda

Q:70
Topic Name:Chemistry-Section A

ItemCode:1370
Question: PCl_5 is well known, but NCl_5 is not. Because,

- A nitrogen is less reactive than phosphorous.
- B nitrogen doesn't have d-orbitals in its valence shell.
- C catenation tendency is weaker in nitrogen than phosphorous.
- D size of phosphorous is larger than nitrogen.

Q:71
Topic Name:Chemistry-Section A

ItemCode:1371
Question: Transition metal complex with highest value of crystal field splitting (Δ_0) will be

- A $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$
- B $[\text{Mo}(\text{H}_2\text{O})_6]^{3+}$
- C $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
- D $[\text{Os}(\text{H}_2\text{O})_6]^{3+}$

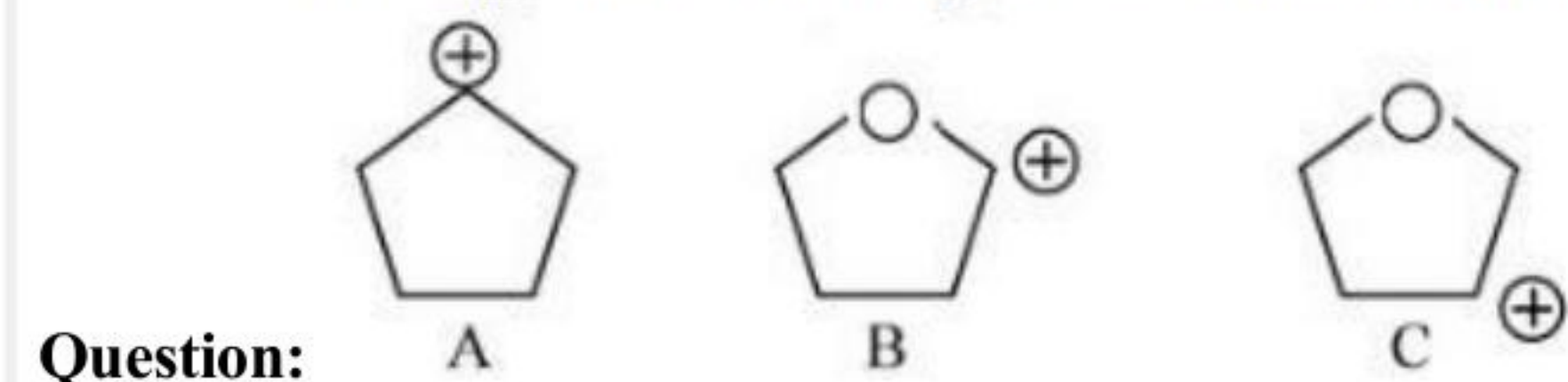
Q:72
Topic Name:Chemistry-Section A

ItemCode:1372
Some gases are responsible for heating of atmosphere (green house effect).
Question: Identify from the following the gaseous species which does not cause it.

- A CH_4
- B O_3
- C H_2O
- D N_2

Q:73
Topic Name:Chemistry-Section A

ItemCode:1373
Arrange the following carbocations in decreasing order of stability.



- A $A > C > B$
- B $A > B > C$
- C $C > B > A$
- D $C > A > B$

ItemCode:1374

Given below are two statements.

Statement I: The presence of weaker π -bonds make alkenes less stable than alkanes.

Statement II: The strength of the double bond is greater than that of carbon-carbon single bond.

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

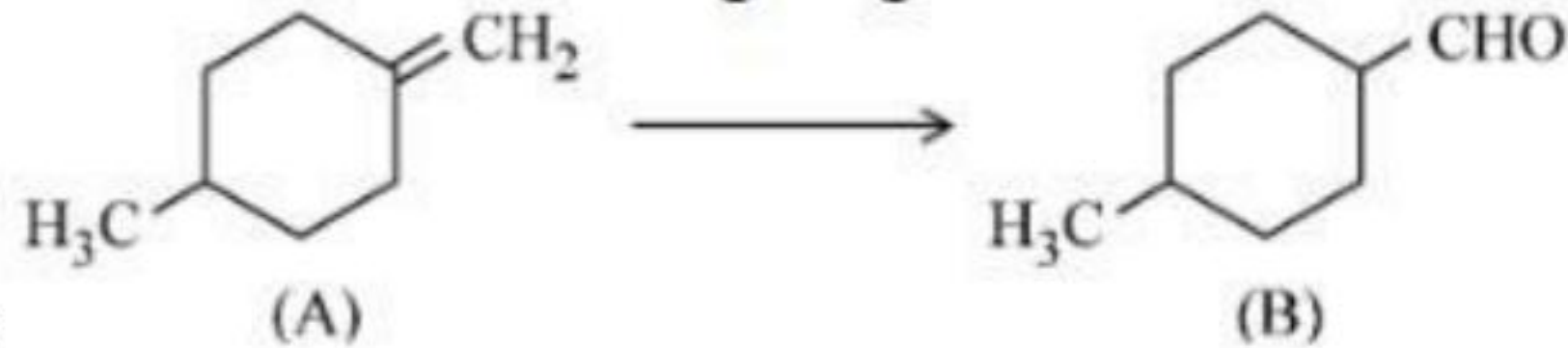
Question: given below.

- 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.

Q:75

ItemCode:1375

Which of the following reagents / reactions will convert 'A' to 'B'?



Question:

- A PCC oxidation
- B Ozonolysis
- C BH_3 , H_2O_2 / $^- \text{OH}$ followed by PCC oxidation
- D HBr, hydrolysis followed by oxidation by $\text{K}_2\text{Cr}_2\text{O}_7$.

Q:76

ItemCode:1376

Hex-4-ene-2-ol on treatment with PCC gives 'A'. 'A' on reaction with sodium hypoiodite gives 'B', which on further heating with soda lime gives 'C'. The

Question: compound 'C' is

- A 2-pentene
- B propanaldehyde
- C 2-butene
- D 4-methylpent-2-ene

Q:77

ItemCode:1377

The conversion of propan-1-ol to n-butylamine involves the sequential addition of

Question: reagents. The correct sequential order of reagents is

- A (i) SOCl_2 (ii) KCN (iii) H_2/Ni , $\text{Na}(\text{Hg})/\text{C}_2\text{H}_5\text{OH}$
- B (i) HCl (ii) H_2/Ni , $\text{Na}(\text{Hg})/\text{C}_2\text{H}_5\text{OH}$
- C (i) SOCl_2 (ii) KCN (iii) CH_3NH_2
- D (i) HCl (ii) CH_3NH_2

Q:78

ItemCode:1378

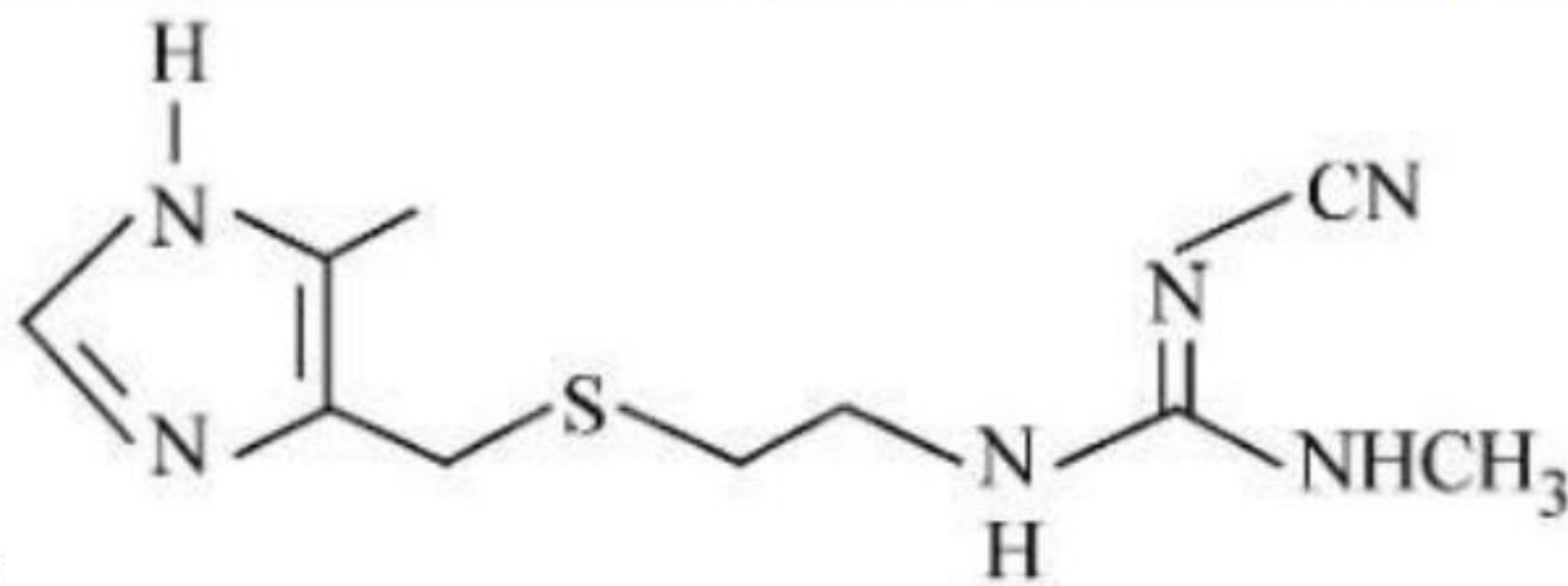
Question: Which of the following is **not** an example of a condensation polymer?

- A Nylon 6,6

B	Decron
C	Buna-N
D	Silicone

Q:79
 Topic Name:Chemistry-Section A

ItemCode:1379
 The structure shown below is of which well-known drug molecule ?



- Question:
- A Ranitidine
 - B Seldane
 - C Cimetidine
 - D Codeine

Q:80
 Topic Name:Chemistry-Section A

ItemCode:1380
 In the flame test of a mixture of salts, a green flame with blue centre was observed.
 Question: Which one of the following cations may be present?

- A Cu^{2+}
- B Sr^{2+}
- C Ba^{2+}
- D Ca^{2+}

Q:81
 Topic Name:Chemistry-Section B

ItemCode:1381
 At 300 K, a sample of 3.0 g of gas A occupies the same volume as 0.2 g of hydrogen at 200 K at the same pressure. The molar mass of gas A is _____ g mol^{-1} . (nearest integer) Assume that the behaviour of gases as ideal.
 Question: (Given: The molar mass of hydrogen (H_2) gas is 2.0 g mol^{-1} .)

Q:82
 Topic Name:Chemistry-Section B

ItemCode:1382
 A company dissolves 'x' amount of CO_2 at 298 K in 1 litre of water to prepare soda water. $X = \text{_____} \times 10^{-3}$ g. (nearest integer)
 (Given: partial pressure of CO_2 at 298 K = 0.835 bar.
 Henry's law constant for CO_2 at 298K = 1.67 kbar.
 Question: Atomic mass of H, C and O is 1, 12, and 6 g mol^{-1} , respectively)

Q:83
 Topic Name:Chemistry-Section B

ItemCode:1383
 PCl_5 dissociates as
 $\text{PCl}_5(\text{g}) \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$
 5 moles of PCl_5 are placed in a 200 litre vessel which contains 2 moles of N_2 and is maintained at 600 K. The equilibrium pressure is 2.46 atm. The equilibrium constant K_p for the dissociation of PCl_5 is _____ $\times 10^{-3}$. (nearest integer)
 Question: (Given: $R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$; Assume ideal gas behaviour)

Q:84

Topic Name:Chemistry-Section B

ItemCode:1384

The resistance of a conductivity cell containing 0.01 M KCl solution at 298 K is 1750 Ω . If the conductivity of 0.01M KCl solution at 298 K is $0.152 \times 10^{-3} \text{ S cm}^{-1}$, then the cell constant of the conductivity cell is

Question: _____ $\times 10^{-3} \text{ cm}^{-1}$.

Q:85

Topic Name:Chemistry-Section B

ItemCode:1385

When 200 mL of 0.2 M acetic acid is shaken with 0.6 g of wood charcoal, the final concentration of acetic acid after adsorption is 0.1 M. The mass of acetic acid

Question: adsorbed per gram of carbon is _____ g.

Q:86

Topic Name:Chemistry-Section B

ItemCode:1386

(a) Baryte, (b) Galena, (c) Zinc blende and (d) Copper pyrites. How many of these

Question: minerals are sulphide based?

Q:87

Topic Name:Chemistry-Section B

ItemCode:1387

Manganese (VI) has ability to disproportionate in acidic solution. The difference in

Question: oxidation states of two ions it forms in acidic solution is _____.

Q:88

Topic Name:Chemistry-Section B

ItemCode:1388

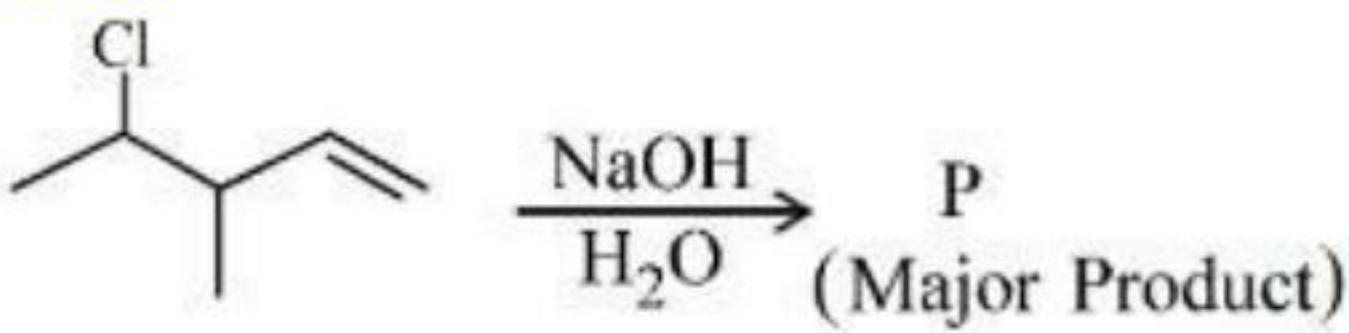
0.2 g of an organic compound was subjected to estimation of nitrogen by Dumas method in which volume of N_2 evolved (at STP) was found to be 22.400 mL. The percentage of nitrogen in the compound is _____. [nearest integer]

Question: (Given: Molar mass of N_2 is 28 g mol^{-1} , Molar volume of N_2 at STP : 22.4L)

Q:89

Topic Name:Chemistry-Section B

ItemCode:1389



Consider the above reaction. The number of π electrons present in the product 'P'

Question: is _____.

Q:90

Topic Name:Chemistry-Section B

ItemCode:1390

Question: In alanylglycylleucylalanylvaline, the number of peptide linkages is _____.