Joint Entrance Examination (Main) - JEE(Main)

Paper Name	B.E/B.Tech.(Paper I)
Test Date	24-06-2022
Slot	SLOT - 2
Lang	English

Q:1
Topic Name: Mathematics-Section A

ItemCode:131

Question: 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

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

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

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

Question: 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 (α, x^*), (y^*, α) and $(x^*, -y^*)$ are collinear 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

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

A	30
B	32
C	36
D	40

Q:5
Topic Name: Mathematics-Section A

ItemCode:135

Question: Let $f(x)=\begin{cases}\dfrac{\sin(x-[x])}{x-[x]} & , x\in(-2,-1)\\ \max\{2x,3[|x|]\} & , |x|<1\\ 1 & , \text{otherwise}\end{cases}$ where $[t]$ denotes greatest integer $\le t$. 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

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

A	2π
B	0
C	π
D	$\dfrac{\pi}{2}$

Q:7

Topic Name: Mathematics-Section A

ItemCode:137

Question: $\lim\limits_{n\to\infty}\left(\dfrac{n^2}{(n^2+1)(n+1)}+\dfrac{n^2}{(n^2+4)(n+2)}+\dfrac{n^2}{(n^2+9)(n+3)}+\ldots+\dfrac{n^2}{(n^2+n^2)(n+n)}\right)$ is equal to

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

Q:8

Topic Name: Mathematics-Section A

ItemCode:138

Question: 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 $\left(\dfrac{4}{3},0\right)$

D	focus $\left(0,\frac{3}{4}\right)$

Q:9
Topic Name: Mathematics-Section A

ItemCode:139

Question: 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

Question: Let the area of the triangle with vertices $A(1, \alpha)$, $B(\alpha, 0)$ and $C(0, \alpha)$ be 4 sq. units. 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

Question: A random variable X has the following probability distribution:

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

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

A	$\frac{4}{7}$

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

Q:13
Topic Name: Mathematics-Section A

ItemCode:1313

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

A	8
B	5
C	6
D	7

Q:14
Topic Name: Mathematics-Section A

ItemCode:1314

Question: 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:

A	16
B	6
C	12
D	15

Q:15
Topic Name: Mathematics-Section A

ItemCode:1315

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

Question: Let $\hat{a}$ and $\hat{b}$ be two unit vectors such that $|(\hat{a}+\hat{b})+2(\hat{a}\times\hat{b})| = 2$. 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 $\frac{1}{2}$

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
Question: Consider the following statements:
A: Rishi is a judge.
B: Rishi is honest.
C: 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
Question: 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 $e \cdot y(e)$ 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
Question: 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 $f_{\lambda^*}(1) + f_{\lambda^*}(-1)$ is equal to :

A	36
B	48
C	64
D	72

Q:21
Topic Name: Mathematics-Section B

ItemCode:1321
Question: 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
Question: Let $S = \left\{\begin{pmatrix} -1 & a \\ 0 & b \end{pmatrix} : a, b \in \{1, 2, 3, \ldots 100\}\right\}$ 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
Question: 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
Question: The sum of all the elements of the set $\{\alpha \in \{1, 2, \ldots\ldots, 100\} : HCF(\alpha, 24) = 1\}$ is ___.

Q:25
Topic Name: Mathematics-Section B

ItemCode:1325
Question: The remainder on dividing $1 + 3 + 3^2 + 3^3 + \ldots. + 3^{2021}$ by 50 is __.

Q:26
Topic Name: Mathematics-Section B

ItemCode:1326
Question: 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
Question: 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
Question: 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

Question: 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 $12\left(e_H^2+e_E^2\right)$ is equal to __.

Q:30
Topic Name: Mathematics-Section B

ItemCode:1330

Question: 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

Question: 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

Question: 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

Question: 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 $g = 10 ms^{-2}$]

A	12 cm
B	10 cm
C	8 cm

D	5 cm

Q:35
Topic Name: Physics-Section A

ItemCode:1335
Question: 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

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
Question: 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 :

A	1:2
B	3:2
C	3:1
D	2:3

Q:37
Topic Name: Physics-Section A

ItemCode:1337
Question: 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?

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
Question: The soft-iron is a suitable material for making an electromagnet. This is because soft-iron has

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
Question: 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 :

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

Question: 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

Question: 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 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

Question: 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 ratio of time of ascent to the time of descent will be equal to : [Use g = $10ms^{-2}$].

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

Question: A fly wheel is accelerated uniformly from rest and rotates through 5 rad in the first 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

Q:44
Topic Name: Physics-Section A

ItemCode:1344

Question: 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 ? [Specific heat capacity of iron = 0.42 $Jg^{-1}\ ^{\circ}C^{-1}$]

A	$675^{\circ}C$
B	$1600^{\circ}C$
C	$16.07^{\circ}C$
D	$6.75^{\circ}C$

Q:45
Topic Name: Physics-Section A

ItemCode:1345

Question: 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)

A	10
B	20
C	30
D	40

Q:46
Topic Name: Physics-Section A

ItemCode:1346

Question: 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 :

A	$\frac{\rho q R^2}{4\varepsilon_o}$
B	$\frac{\rho q R^2}{2\varepsilon_o}$
C	$\frac{q\rho}{4\varepsilon_o R^2}$
D	$\frac{4\varepsilon_o R^2}{q\rho}$

Q:47
Topic Name: Physics-Section A

ItemCode:1347

Question: 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.

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

Question: 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 respectivly will be :

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

Q:49
Topic Name: Physics-Section A

ItemCode:1349

Question: 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

Question: 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

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

Q:52
Topic Name: Physics-Section B

ItemCode:1352

Question: 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

Question: A potentiometer wire of length 10 m and resistance 20 Ω is connected in series with a 25 V battery and an external resistance 30 Ω . 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
Topic Name: Physics-Section B

ItemCode:1354

Question: 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

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

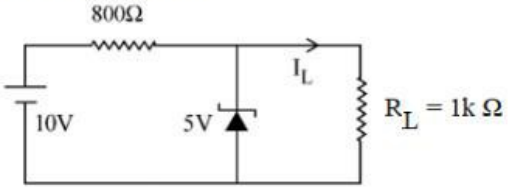
The amplitude of the particle at $x = \frac{4}{3}$ cm will be _____ cm.

Q:55
Topic Name: Physics-Section B

ItemCode:1355

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

(When R_L = 1k Ω)



Q:56
Topic Name: Physics-Section B

ItemCode:1356

Question: 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 _____.

Q:57
Topic Name: Physics-Section B

ItemCode:1357

Question: 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 glass slab is _____cm.

Q:58
Topic Name: Physics-Section B

ItemCode:1358

Question: A circular coil of 1000 turns each with area $1m^2$ is rotated about its vertical diameter at the rate of one revolution per second in a uniform horizontal magnetic field of 0.07T. The maximum voltage generation will be _____V.

Q:59
Topic Name: Physics-Section B

ItemCode:1359

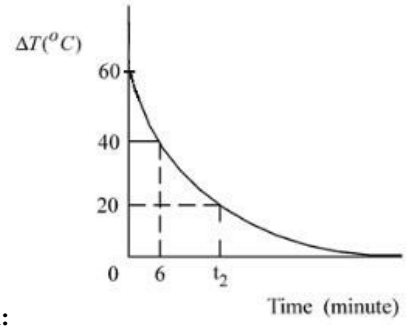
Question: A monoatomic gas performs a work of $\frac{Q}{4}$ where Q is the heat supplied to it. The molar heat capacity of the gas will be _____R during this transformation.

Where R is the gas constant.

Q:60
Topic Name: Physics-Section B

ItemCode:1360

Question: 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 _____.



Q:61

Topic Name: Chemistry-Section A

ItemCode:1361

Question: 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 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

Question: The energy of one mole of photons of radiation of wavelength 300 nm is (Given : $h = 6.63 \times 10^{-34}$ J s, $N_A = 6.02 \times 10^{23}$ mol^{-1}, $c = 3 \times 10^8$ 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	$C_2^{2-} < N_2^{2-} < O_2^{2-}$
B	$O_2^{2-} < N_2^{2-} < C_2^{2-}$
C	$C_2^{2-} < O_2^{2-} < N_2^{2-}$
D	$N_2^{2-} < C_2^{2-} < O_2^{2-}$

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)	$C_2H_6(g)$
$\frac{\Delta_c H^\ominus}{kJ\,mol^{-1}}$	−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

Question: 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)

A	1.12
B	2.43
C	3.32
D	33.31

Q:66
Topic Name: Chemistry-Section A

ItemCode:1366

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

A	Hg
B	Ag
C	Ga
D	Cs

Q:67
Topic Name: Chemistry-Section A

ItemCode:1367

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

A	$Cr_2O_3+2Al\rightarrow Al_2O_3+2Cr$
B	$2Al_2O_3+3C\rightarrow 4Al+3CO_2$
C	$FeO+CO\rightarrow Fe+CO_2$
D	$2[Au(CN)_2]^-_{(aq)}+Zn(s)\rightarrow 2Au(s)+[Zn(CN_4)]^{2-}$

Q:68
Topic Name: Chemistry-Section A

ItemCode:1368

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

A	NaOH
B	NaCl
C	Na metal
D	Na_2CO_3

Q:69
Topic Name: Chemistry-Section A

ItemCode:1369
Question: 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	$[Cr(H_2O)_6]^{3+}$
B	$[Mo(H_2O)_6]^{3+}$
C	$[Fe(H_2O)_6]^{3+}$
D	$[Os(H_2O)_6]^{3+}$

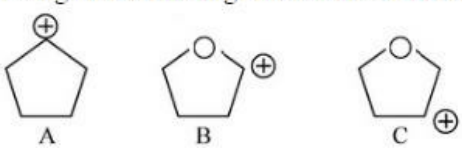
Q:72
Topic Name: Chemistry-Section A

ItemCode:1372
Question: Some gases are responsible for heating of atmosphere (green house effect). 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
Question: 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

Q:74

Topic Name: Chemistry-Section A

ItemCode: 1374

Question: 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 given below.

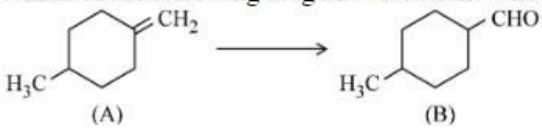
A	Both Statement I and Statement II are correct.
B	Both Statement I and Statement II are incorrect.
C	Statement I is correct but Statement II is incorrect.
D	Statement I is incorrect but Statement II is correct.

Q: 75

Topic Name: Chemistry-Section A

ItemCode: 1375

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



(A) (B)

A	PCC oxidation
B	Ozonolysis
C	BH_3, H_2O_2 / ^-OH followed by PCC oxidation
D	HBr, hydrolysis followed by oxidation by $K_2Cr_2O_7$.

Q: 76

Topic Name: Chemistry-Section A

ItemCode: 1376

Question: 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 compound 'C' is

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

Q: 77

Topic Name: Chemistry-Section A

ItemCode: 1377

Question: The conversion of propan-1-ol to n-butylamine involves the sequential addition of reagents. The correct sequential order of reagents is

A	(i) $SOCl_2$ (ii) KCN (iii) H_2/Ni, Na(Hg)/C_2H_5OH
B	(i) HCl (ii) H_2/Ni, Na(Hg)/C_2H_5OH
C	(i) $SOCl_2$ (ii) KCN (iii) CH_3NH_2
D	(i) HCl (ii) CH_3NH_2

Q: 78

Topic Name: Chemistry-Section A

ItemCode: 1378

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

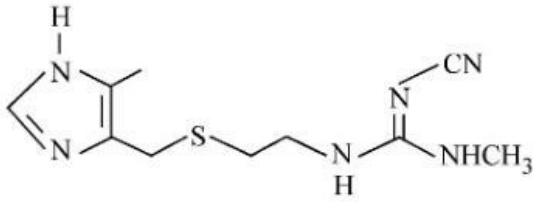
A	Nylon 6,6

B	Decron
C	Buna-N
D	Silicone

Q:79
Topic Name: Chemistry-Section A

ItemCode:1379

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



A	Ranitidine
B	Seldane
C	Cimetidine
D	Codeine

Q:80
Topic Name: Chemistry-Section A

ItemCode:1380

Question: In the flame test of a mixture of salts, a green flame with blue centre was observed. 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

Question: 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. (Given: The molar mass of hydrogen (H_2) gas is 2.0 g mol^{-1}.)

Q:82
Topic Name: Chemistry-Section B

ItemCode:1382

Question: A company dissolves 'x' amount of CO_2 at 298 K in 1 litre of water to prepare soda water. X = _____ $\times 10^{-3}$ 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.
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

Question: PCl_5 dissociates as
$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
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)
(Given: R = 0.082 L atm K^{-1} mol^{-1}; Assume ideal gas behaviour)

Q:84
Topic Name: Chemistry-Section B

ItemCode:1384
Question: 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 0.152×10^{-3} S cm^{-1}, then the cell constant of the conductivity cell is _____ $\times 10^{-3} cm^{-1}$.

Q:85
Topic Name: Chemistry-Section B

ItemCode:1385
Question: 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 adsorbed per gram of carbon is _____ g.

Q:86
Topic Name: Chemistry-Section B

ItemCode:1386
Question: (a) Baryte, (b) Galena, (c) Zinc blende and (d) Copper pyrites. How many of these minerals are sulphide based?

Q:87
Topic Name: Chemistry-Section B

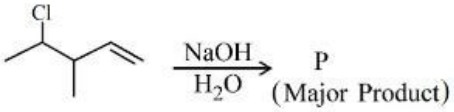
ItemCode:1387
Question: Manganese (VI) has ability to disproportionate in acidic solution. The difference in oxidation states of two ions it forms in acidic solution is _____.

Q:88
Topic Name: Chemistry-Section B

ItemCode:1388
Question: 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]
(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
Question:



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

Q:90
Topic Name: Chemistry-Section B

ItemCode:1390
Question: In alanylglycylleucylalanylvaline, the number of peptide linkages is _____.