Joint Entrance Examination (Main) - JEE(Main)

Paper Name	B.E/B.Tech.(Paper I)
Test Date	26-06-2022
Slot	SLOT - 2
Lang	English

Q:1
Topic Name: Mathematics-Section A

ItemCode:181

Question: Let $f:\mathbb{R}\to\mathbb{R}$ be defined as $f(x)=x-1$ and $g:\mathbb{R}-\{1,-1\}\to\mathbb{R}$ be defined as $g(x)=\frac{x^2}{x^2-1}$. Then the function fog is :

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

Q:2
Topic Name: Mathematics-Section A

ItemCode:182

Question: If the system of equations
$\alpha x+y+z=5,\ x+2y+3z=4,\ x+3y+5z=\beta$
has infinitely many solutions, then the ordered pair (α, β) is equal to :

A	$(1,-3)$
B	$(-1,3)$
C	$(1,3)$
D	$(-1,-3)$

Q:3
Topic Name: Mathematics-Section A

ItemCode:183

Question: If $A=\sum_{n=1}^{\infty}\frac{1}{\left(3+(-1)^n\right)^n}$ and $B=\sum_{n=1}^{\infty}\frac{(-1)^n}{\left(3+(-1)^n\right)^n}$, then $\frac{A}{B}$ is equal to :

A	$\frac{11}{9}$
B	1
C	$-\frac{11}{9}$
D	$-\frac{11}{3}$

Q:4
Topic Name: Mathematics-Section A

ItemCode:184

Question: $\lim_{x\to 0}\frac{\cos(\sin x)-\cos x}{x^4}$ is equal to :

A	$\frac{1}{3}$
B	$\frac{1}{4}$
C	$\frac{1}{6}$
D	$\frac{1}{12}$

Q:5
Topic Name: Mathematics-Section A

ItemCode:185

Question: Let $f(x) = \min\{1, 1 + x\sin x\}$, $0 \le x \le 2\pi$. If m is the number of points, where f is not differentiable and n is the number of points, where f is not continuous, then the ordered pair (m, n) is equal to

A	$(2, 0)$
B	$(1, 0)$
C	$(1, 1)$
D	$(2, 1)$

Q:6
Topic Name: Mathematics-Section A

ItemCode:186

Question: Cosider a cuboid of sides $2x$, $4x$ and $5x$ and a closed hemisphere of radius r. If the sum of their surface areas is a constant k, then the ratio $x : r$, for which the sum of their volumes is maximum, is :

A	2:5
B	19:45
C	3:8
D	19:15

Q:7
Topic Name: Mathematics-Section A

ItemCode:187

Question: The area of the region bounded by $y^2 = 8x$ and $y^2 = 16(3 - x)$ is equal to:

A	$\frac{32}{3}$
B	$\frac{40}{3}$
C	16
D	19

Q:8
Topic Name: Mathematics-Section A

ItemCode:188

Question: If $\int \frac{1}{x}\sqrt{\frac{1-x}{1+x}}\,dx = g(x) + c$, $g(1) = 0$, then $g\left(\frac{1}{2}\right)$ is equal to :

A	$\log_e\left(\frac{\sqrt{3}-1}{\sqrt{3}+1}\right)+\frac{\pi}{3}$
B	$\log_e\left(\frac{\sqrt{3}+1}{\sqrt{3}-1}\right)+\frac{\pi}{3}$
C	$\log_e\left(\frac{\sqrt{3}+1}{\sqrt{3}-1}\right)-\frac{\pi}{3}$
D	$\frac{1}{2}\log_e\left(\frac{\sqrt{3}-1}{\sqrt{3}+1}\right)-\frac{\pi}{6}$

Q:9
Topic Name: Mathematics-Section A

ItemCode:189

Question: If $y = y(x)$ is the solution of the differential equation $x\frac{dy}{dx} + 2y = xe^x$, $y(1) = 0$ then the local maximum value of the function $z(x) = x^2 y(x) - e^x, x \in \mathbb{R}$ is :

A	$1 - e$
B	0
C	$\frac{1}{2}$
D	$\frac{4}{e} - e$

Q:10
Topic Name: Mathematics-Section A

ItemCode:1810

Question: If the solution of the differential equation $\frac{dy}{dx} + e^x\left(x^2 - 2\right)y = \left(x^2 - 2x\right)\left(x^2 - 2\right)e^{2x}$ satisfies $y(0) = 0$, then the value of $y(2)$ is _____

A	-1
B	1
C	0
D	e

Q:11
Topic Name: Mathematics-Section A

ItemCode:1811

Question: If m is the slope of a common tangent to the curves $\frac{x^2}{16} + \frac{y^2}{9} = 1$ and $x^2 + y^2 = 12$, then $12\,m^2$ is equal to :

A	6
B	9
C	10
D	12

Q:12
Topic Name: Mathematics-Section A

ItemCode:1812

Question: The locus of the mid point of the line segment joining the point (4, 3) and the points on the ellipse $x^2 + 2y^2 = 4$ is an ellipse with eccentricity :

A	$\frac{\sqrt{3}}{2}$
B	$\frac{1}{2\sqrt{2}}$
C	$\frac{1}{\sqrt{2}}$
D	$\frac{1}{2}$

Q:13
Topic Name: Mathematics-Section A

ItemCode:1813

Question: The normal to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{9} = 1$ at the point $\left(8, 3\sqrt{3}\right)$ on it passes through the point :

A	$(15, -2\sqrt{3})$
B	$(9, 2\sqrt{3})$
C	$(-1, 9\sqrt{3})$
D	$(-1, 6\sqrt{3})$

Q:14
Topic Name: Mathematics-Section A

ItemCode:1814

Question: If the plane $2x + y - 5z = 0$ is rotated about its line of intersection with the plane $3x - y + 4z - 7 = 0$ by an angle of $\frac{\pi}{2}$, then the plane after the rotation passes through the point :

A	$(2, -2, 0)$
B	$(-2, 2, 0)$
C	$(1, 0, 2)$
D	$(-1, 0, -2)$

Q:15
Topic Name: Mathematics-Section A

ItemCode:1815

Question: If the lines $\vec{r} = \left(\hat{i} - \hat{j} + \hat{k}\right) + \lambda\left(3\hat{j} - \hat{k}\right)$ and $\vec{r} = \left(\alpha\hat{i} - \hat{j}\right) + \mu\left(2\hat{i} - 3\hat{k}\right)$ are co-planar, then the distance of the plane containing these two lines from the point $(\alpha, 0, 0)$ is:

A	$\frac{2}{9}$
B	$\frac{2}{11}$
C	$\frac{4}{11}$
D	2

Q:16
Topic Name: Mathematics-Section A

ItemCode:1816

Question: Let $\vec{a} = \hat{i} + \hat{j} + 2\hat{k}$, $\vec{b} = 2\hat{i} - 3\hat{j} + \hat{k}$ and $\vec{c} = \hat{i} - \hat{j} + \hat{k}$ be three given vectors. Let $\vec{v}$ be a vector in the plane of $\vec{a}$ and $\vec{b}$ whose projection on $\vec{c}$ is $\frac{2}{\sqrt{3}}$. If $\vec{v} \cdot \hat{j} = 7$, then $\vec{v} \cdot \left(\hat{i} + \hat{k}\right)$ is equal to :

A	6
B	7
C	8
D	9

Q:17
Topic Name: Mathematics-Section A

ItemCode:1817

Question: The mean and standard deviation of 50 observations are 15 and 2 respectively. It was found that one incorrect observation was taken such that the sum of correct and incorrect observations is 70. If the correct mean is 16, then the correct variance is equal to :

A	10
B	36
C	43
D	60

Q:18
Topic Name: Mathematics-Section A

ItemCode:1818
Question: $16 \sin(20°) \sin(40°) \sin(80°)$ is equal to :

A	$\sqrt{3}$
B	$2\sqrt{3}$
C	3
D	$4\sqrt{3}$

Q:19
Topic Name: Mathematics-Section A

ItemCode:1819
Question: If the inverse trignometric functions take principal values, then $\cos^{-1}\left(\frac{3}{10}\cos\left(\tan^{-1}\left(\frac{4}{3}\right)\right)+\frac{2}{5}\sin\left(\tan^{-1}\left(\frac{4}{3}\right)\right)\right)$ is equal to :

A	0
B	$\frac{\pi}{4}$
C	$\frac{\pi}{3}$
D	$\frac{\pi}{6}$

Q:20
Topic Name: Mathematics-Section A

ItemCode:1820
Question: Let $r \in \{p, q, \sim p, \sim q\}$ be such that the logical statement $r \vee (\sim p) \Rightarrow (p \wedge q) \vee r$ is a tautology. Then r is equal to :

A	p
B	q
C	$\sim p$
D	$\sim q$

Q:21
Topic Name: Mathematics-Section B

ItemCode:1821
Question: Let $f: \mathbb{R} \to \mathbb{R}$ satisfy $f(x+y) = 2^x f(y) + 4^y f(x), \forall x, y \in \mathbb{R}$. If $f(2) = 3$, then $14 \cdot \frac{f'(4)}{f'(2)}$ is equal to _____.

Q:22
Topic Name: Mathematics-Section B

ItemCode:1822
Question: Let p and q be two real numbers such that $p + q = 3$ and $p^4 + q^4 = 369$. Then $\left(\frac{1}{p}+\frac{1}{q}\right)^{-2}$ is equal to _____.

Q:23
Topic Name: Mathematics-Section B

ItemCode:1823

Question: If $z^2+z+1=0, z \in \mathbb{C}$, then $\left|\sum_{n=1}^{15}\left(z^n+(-1)^n\frac{1}{z^n}\right)^2\right|$ is equal to _____.

Q:24
Topic Name: Mathematics-Section B

ItemCode:1824

Question: Let $X=\begin{bmatrix}0&1&0\\0&0&1\\0&0&0\end{bmatrix}$, $Y=\alpha I+\beta X+\gamma X^2$ and $Z=\alpha^2 I-\alpha\beta X+(\beta^2-\alpha\gamma)X^2$, $\alpha, \beta, \gamma \in \mathbb{R}$. If $Y^{-1}=\begin{bmatrix}1/5&-2/5&1/5\\0&1/5&-2/5\\0&0&1/5\end{bmatrix}$, then $(\alpha-\beta+\gamma)^2$ is equal to _____.

Q:25
Topic Name: Mathematics-Section B

ItemCode:1825

Question: The total number of 3-digit numbers, whose greatest common divisor with 36 is 2, is _____.

Q:26
Topic Name: Mathematics-Section B

ItemCode:1826

Question: If $\left({}^{40}C_0\right)+\left({}^{41}C_1\right)+\left({}^{42}C_2\right)+....+\left({}^{60}C_{20}\right)=\frac{m}{n}\,{}^{60}C_{20}$ m and n are coprime, then $m+n$ is equal to _____.

Q:27
Topic Name: Mathematics-Section B

ItemCode:1827

Question: If $a_1\ (>0), a_2, a_3, a_4, a_5$ are in a G.P., $a_2+a_4=2a_3+1$ and $3a_2+a_3=2a_4$, then $a_2+a_4+2a_5$ is equal to _____.

Q:28
Topic Name: Mathematics-Section B

ItemCode:1828

Question: The integral $\frac{24}{\pi}\int_0^{\sqrt{2}}\frac{\left(2-x^2\right)dx}{\left(2+x^2\right)\sqrt{4+x^4}}$ is equal to _____.

Q:29
Topic Name: Mathematics-Section B

ItemCode:1829

Question: Let a line L_1 be tangent to the hyperbola $\frac{x^2}{16}-\frac{y^2}{4}=1$ and let L_2 be the line passing through the origin and perpendicular to L_1. If the locus of the point of intersection of L_1 and L_2 is $(x^2+y^2)^2=\alpha x^2+\beta y^2$, then $\alpha+\beta$ is equal to _____.

Q:30
Topic Name: Mathematics-Section B

ItemCode:1830

Question: If the probability that a randomly chosen 6-digit number formed by using digits 1 and 8 only is a multiple of 21 is p, then $96p$ is equal to _____.

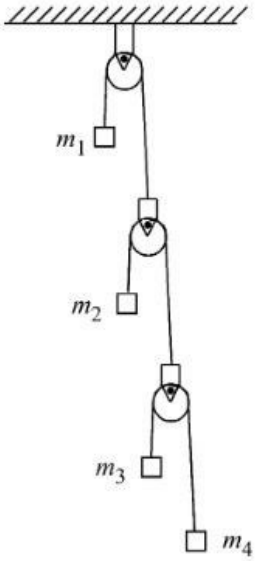
Q:31
Topic Name: Physics-Section A

ItemCode:1831
Question: The dimension of mutual inductance is :

A	$[ML^2 T^{-2} A^{-1}]$
B	$[ML^2 T^{-3} A^{-1}]$
C	$[ML^2 T^{-2} A^{-2}]$
D	$[ML^2 T^{-3} A^{-2}]$

Q:32
Topic Name: Physics-Section A

ItemCode:1832
In the arrangement shown in figure a_1, a_2, a_3 and a_4 are the accelerations of masses m_1, m_2, m_3 and m_4 respectively. Which of the following relation is true for this arrangement ?



Question:

A	$4a_1 + 2a_2 + a_3 + a_4 = 0$
B	$a_1 + 4a_2 + 3a_3 + a_4 = 0$
C	$a_1 + 4a_2 + 3a_3 + 2a_4 = 0$
D	$2a_1 + 2a_2 + 3a_3 + a_4 = 0$

Q:33
Topic Name: Physics-Section A

ItemCode:1833

Arrange the four graphs in descending order of total work done; where W_1, W_2, W_3 and W_4 are the work done corresponding to figure a, b, c and d respectively.

Figure-a

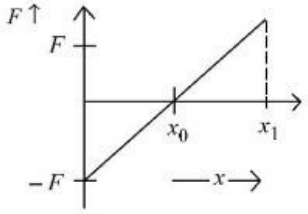


Figure-b

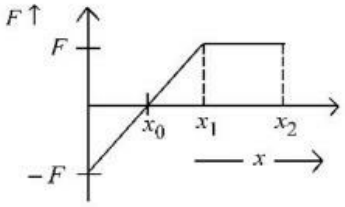


Figure-c

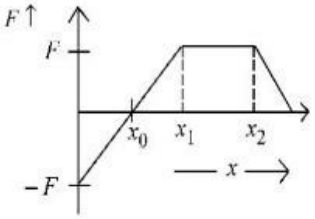
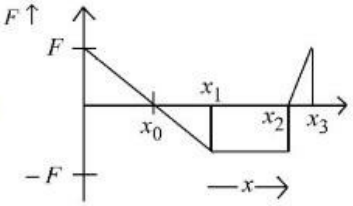


Figure-d



Question:

A	$W_3 > W_2 > W_1 > W_4$
B	$W_3 > W_2 > W_4 > W_1$
C	$W_2 > W_3 > W_4 > W_1$
D	$W_2 > W_3 > W_1 > W_4$

Q:34
Topic Name: Physics-Section A

ItemCode:1834

Question: A solid spherical ball is rolling on a frictionless horizontal plane surface about its axis of symmetry. The ratio of rotational kinetic energy of the ball to its total kinetic energy is -

A	$\frac{2}{5}$
B	$\frac{2}{7}$
C	$\frac{1}{5}$
D	$\frac{7}{10}$

Q:35
Topic Name: Physics-Section A

ItemCode:1835

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

Assertion A: If we move from poles to equator, the direction of acceleration due to gravity of earth always points towards the center of earth without any variation in its magnitude.
Reason R: At equator, the direction of acceleration due to the gravity is towards the center of earth.

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

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

Q:36
Topic Name: Physics-Section A

ItemCode:1836

Question: If p is the density and η is coefficient of viscosity of fluid which flows with a speed v in the pipe of diameter d, the correct formula for Reynolds number R_e is :

A	$R_e = \frac{\eta d}{\rho v}$
B	$R_e = \frac{\rho v}{\eta d}$
C	$R_e = \frac{\rho v d}{\eta}$
D	$R_e = \frac{\eta}{\rho v d}$

Q:37
Topic Name: Physics-Section A

ItemCode:1837

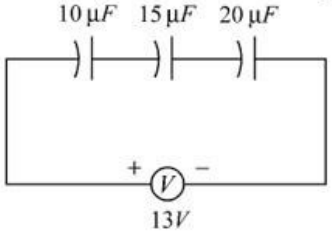
Question: A flask contains argon and oxygen in the ratio of 3:2 in mass and the mixture is kept at 27°C. The ratio of their average kinetic energy per molecule respectively will be :

A	3:2
B	9:4
C	2:3
D	1:1

Q:38
Topic Name: Physics-Section A

ItemCode:1838

Question: The charge on capacitor of capacitance 15μF in the figure given below is :

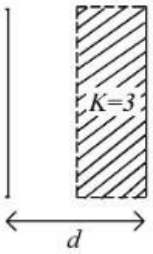


A	60μc
B	130μc
C	260μc
D	585μc

Q:39
Topic Name: Physics-Section A

ItemCode:1839

Question: A parallel plate capacitor with plate area A and plate separation d=2 m has a capacitance of 4 μF. The new capacitance of the system if half of the space between them is filled with a dielectric material of dielectric constant K=3 (as shown in figure) will be :



A	$2\mu F$
B	$32\mu F$
C	$6\mu F$
D	$8\mu F$

Q:40
Topic Name: Physics-Section A

ItemCode:1840

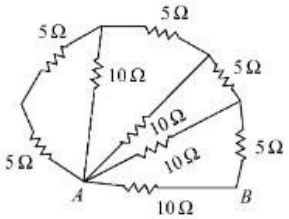
Question: Sixty four conducting drops each of radius 0.02 m and each carrying a charge of 5 μC are combined to form a bigger drop. The ratio of surface density of bigger drop to the smaller drop will be :

A	1:4
B	4:1
C	1:8
D	8:1

Q:41
Topic Name: Physics-Section A

ItemCode:1841

Question: The equivalent resistance between points A and B in the given network is :



A	65Ω
B	20Ω
C	5Ω
D	2Ω

Q:42
Topic Name: Physics-Section A

ItemCode:1842

Question: A bar magnet having a magnetic moment of 2.0×10^5 JT^{-1}, is placed along the direction of uniform magnetic field of magnitude $B=14 \times 10^{-5}$ T. The work done in rotating the magnet slowly through 60° from the direction of field is :

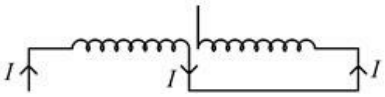
A	14 J
B	8.4 J

C	4 J
D	1.4 J

Q:43
Topic Name: Physics-Section A

ItemCode:1843

Question: Two coils of self inductance L_1 and L_2 are connected in series combination having mutual inductance of the coils as M. The equivalent self inductance of the combination will be :



A	$\frac{1}{L_1}+\frac{1}{L_2}+\frac{1}{M}$
B	$L_1 + L_2 + M$
C	$L_1 + L_2 + 2M$
D	$L_1 + L_2 - 2M$

Q:44
Topic Name: Physics-Section A

ItemCode:1844

Question: A metallic conductor of length 1m rotates in a vertical plane parallel to east-west direction about one of its end with angular velocity 5 $rad\ s^{-1}$. If the horizontal component of earth's magnetic field is $0.2 \times 10^{-4}\ T$, then emf induced between the two ends of the conductor is :

A	$5\mu V$
B	$50\mu V$
C	$5mV$
D	$50mV$

Q:45
Topic Name: Physics-Section A

ItemCode:1845

Question: Which is the correct ascending order of wavelengths ?

A	$\lambda_{visible} < \lambda_{X\text{-}ray} < \lambda_{gamma\text{-}ray} < \lambda_{microwave}$
B	$\lambda_{gamma\text{-}ray} < \lambda_{X\text{-}ray} < \lambda_{visible} < \lambda_{microwave}$
C	$\lambda_{X\text{-}ray} < \lambda_{gamma\text{-}ray} < \lambda_{visible} < \lambda_{microwave}$
D	$\lambda_{microwave} < \lambda_{visible} < \lambda_{gamma\text{-}ray} < \lambda_{X\text{-}ray}$

Q:46
Topic Name: Physics-Section A

ItemCode:1846

Question: For a specific wavelength 670 nm of light coming from a galaxy moving with velocity v, the observed wavelength is 670.7 nm. The value of v is :

A	$3 \times 10^8\ ms^{-1}$
B	$3 \times 10^{10}\ ms^{-1}$
C	$3.13 \times 10^5\ ms^{-1}$
D	$4.48 \times 10^5\ ms^{-1}$

Q:47
Topic Name: Physics-Section A

ItemCode: 1847

Question: A metal surface is illuminated by a radiation of wavelength 4500 Å. The ejected photo-electron enters a constant magnetic field of 2 mT making an angle of 90°with the magnetic field. If it starts revolving in a circular path of radius 2 mm, the work function of the metal is approximately :

A	1.36 eV
B	1.69 eV
C	2.78 eV
D	2.23 eV

Q:48
Topic Name: Physics-Section A

ItemCode: 1848

Question: A radioactive nucleus can decay by two different processes. Half-life for the first process is 3.0 hours while it is 4.5 hours for the second process. The effective half-life of the nucleus will be :

A	3.75 hours
B	0.56 hours
C	0.26 hours
D	1.80 hours

Q:49
Topic Name: Physics-Section A

ItemCode: 1849

Question: The positive feedback is required by an amplifier to act an oscillator. The feedback here means :

A	External input is necessary to sustain ac signal in output.
B	A portion of the output power is returned back to the input.
C	Feedback can be achieved by LR network.
D	The base-collector junction must be forward biased.

Q:50
Topic Name: Physics-Section A

ItemCode: 1850

Question: A sinusoidal wave $y(t) = 40\sin(10 \times 10^6\, \pi t)$ is amplitude modulated by another sinusoidal wave $x(t) = 20\sin(1000\pi t)$. The amplitude of minimum frequency component of modulated signal is :

A	0.5
B	0.25
C	20
D	10

Q:51
Topic Name: Physics-Section B

ItemCode: 1851

Question: A ball is projected vertically upward with an initial velocity of $50\ ms^{-1}$ at $t = 0s$. At $t = 2s$, another ball is projected vertically upward with same velocity. At $t =$ _____s, second ball will meet the first ball ($g = 10\ ms^{-2}$).

Q:52
Topic Name: Physics-Section B

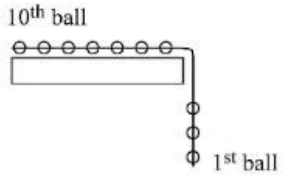
ItemCode:1852

Question: A batsman hits back a ball of mass 0.4 kg straight in the direction of the bowler without changing its initial speed of 15 ms^{-1}. The impulse imparted to the ball is _____ Ns.

Q:53
Topic Name: Physics-Section B

ItemCode:1853

Question: A system to 10 balls each of mass 2 kg are connected via massless and unstretchable string. The system is allowed to slip over the edge of a smooth table as shown in figure. Tension on the string between the 7^{th} and 8^{th} ball is _____N when 6^{th} ball just leaves the table.



Q:54
Topic Name: Physics-Section B

ItemCode:1854

Question: A geyser heats water flowing at a rate of 2.0 kg per minute from 30°C to 70°C. If geyser operates on a gas burner, the rate of combustion of fuel will be _____ $g\ min^{-1}$
[Heat of combustion = $8 \times 10^3\ Jg^{-1}$,
Specific heat of water = $4.2\ Jg^{-1}\ °C^{-1}$]

Q:55
Topic Name: Physics-Section B

ItemCode:1855

Question: A heat engine operates with the cold reservoir at temperature 324 K.
The minimum temperature of the hot reservoir, if the heat engine takes 300 J heat from the hot reservoir and delivers 180 J heat to the cold reservoir per cycle, is _____ K.

Q:56
Topic Name: Physics-Section B

ItemCode:1856

Question: A set of 20 tuning forks is arranged in a series of increasing frequencies. If each fork gives 4 beats with respect to the preceding fork and the frequency of the last fork is twice the frequency of the first, then the frequency of last fork is _____ Hz.

Q:57
Topic Name: Physics-Section B

ItemCode:1857

Question: Two 10 cm long, straight wires, each carrying a current of 5A are kept parallel to each other. If each wire experienced a force of $10^{-5}\ N$, then separation between the wires is _____ cm.

Q:58
Topic Name: Physics-Section B

ItemCode:1858

Question: A small bulb is placed at the bottom of a tank containing water to a depth of $\sqrt{7}\ m$. The refractive index of water is $\frac{4}{3}$. The area of the surface of water through which light from the bulb can emerge out is $x\pi\ m^2$. The value of x is _____.

Q:59
Topic Name: Physics-Section B

ItemCode:1859

A travelling microscope is used to determine the refractive index of a glass slab. If 40 divisions are there in 1 cm on main scale and 50 Vernier scale divisions are equal to 49 main scale divisions, then least count of the travelling microscope is

Question: _____ $\times 10^{-6}$ m.

Q:60
Topic Name: Physics-Section B

ItemCode:1860

The stopping potential for photoelectrons emitted from a surface illuminated by light of wavelength 6630 Å is 0.42 V. If the threshold frequency is $x \times 10^{13}$ $/s$, where x is _____ (nearest integer).

Question: (Given, speed light = 3×10^{8} m/s ,Planck's constant = 6.63×10^{-34} Js)

Q:61
Topic Name: Chemistry-Section A

ItemCode:1861

Question: The number of radial and angular nodes in 4d orbital are, respectively

A	1 and 2
B	3 and 2
C	1 and 0
D	2 and 1

Q:62
Topic Name: Chemistry-Section A

ItemCode:1862

Match **List I** with **List II**.

List I **Enzyme**	**List II** **Conversion of**
A. Invertase	I. Starch into maltose
B. Zymase	II. Maltose into glucose
C. Diastase	III. Glucose into ethanol
D. Maltase	IV. Cane sugar into glucose

Question: Choose the most appropriate answer from the options given below:

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

Q:63
Topic Name: Chemistry-Section A

ItemCode:1863

Question: Which of the following elements is considered as a metalloid?

A	Sc
B	Pb
C	Bi
D	Te

Q:64
Topic Name: Chemistry-Section A

ItemCode:1864
Question: The role of depressants in 'Froth Floation method' is to

A	selectively prevent one component of the ore from coming to the froth.
B	reduce the consumption of oil for froth formation.
C	stabilize the froth.
D	enhance non-wettability of the mineral particles.

Q:65
Topic Name: Chemistry-Section A

ItemCode:1865
Question: Boiling of hard water is helpful in removing the temporary hardness by converting calcium hydrogen carbonate and magnesium hydrogen carbonate to

A	$CaCO_3$ and $Mg(OH)_2$
B	$CaCO_3$ and $MgCO_3$
C	$Ca(OH)_2$ and $MgCO_3$
D	$Ca(OH)_2$ and $Mg(OH)_2$

Q:66
Topic Name: Chemistry-Section A

ItemCode:1866
Question: s-block element which **cannot** be qualitatively confirmed by the flame test is

A	Li
B	Na
C	Rb
D	Be

Q:67
Topic Name: Chemistry-Section A

ItemCode:1867
Question: The oxide which contains an odd electron at the nitrogen atom is

A	N_2O
B	NO_2
C	N_2O_3
D	N_2O_5

Q:68
Topic Name: Chemistry-Section A

ItemCode:1868
Question: Which one of the following is an example of disproportionation reaction ?

A	$3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$
B	$MnO_4^- + 4H^+ + 4e^- \rightarrow MnO_2 + 2H_2O$
C	$10I^- + 2MnO_4^- + 16H^+ \rightarrow 2Mn^{2+} + 8H_2O + 5I_2$
D	$8MnO_4^- + 3S_2O_3^{2-} + H_2O \rightarrow 8MnO_2 + 6SO_4^{2-} + 2OH^-$

Q:69
Topic Name: Chemistry-Section A

ItemCode:1869
Question: The most common oxidation state of Lanthanoid elements is +3. Which of the following is likely to deviate easily from +3 oxidation state?

A	Ce (At. No. 58)

B	La (At. No. 57)
C	Lu (At. No. 71)
D	Gd (At. No. 64)

Q:70
Topic Name: Chemistry-Section A

ItemCode:1870
Question: The measured BOD values for four different water samples (A-D) are as follows: A = 3 ppm; B=18 ppm; C=21 ppm; D=4 ppm. The water samples which can be called as highly polluted with organic wastes, are

A	A and B
B	A and D
C	B and C
D	B and D

Q:71
Topic Name: Chemistry-Section A

ItemCode:1871
Question: The correct order of nucleophilicity is

A	$F^- > OH^-$
B	$H_2\ddot{O} > OH^-$
C	$R\ddot{O}H > RO^-$
D	$NH_2^- > NH_3$

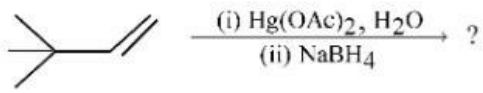
Q:72
Topic Name: Chemistry-Section A

ItemCode:1872
Question: Oxidation of toluene to benzaldehyde can be easily carried out with which of the following reagents?

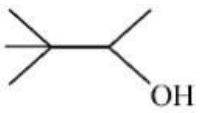
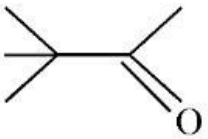
A	CrO_3/acetic acid, H_3O^+
B	CrO_3/acetic anhydride, H_3O^+
C	$KMnO_4$/HCl, H_3O^+
D	CO/HCl, anhydrous $AlCl_3$

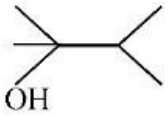
Q:73
Topic Name: Chemistry-Section A

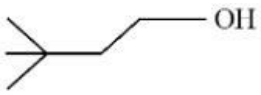
ItemCode:1873
Question: The major product in the following reaction



is

A	
B	

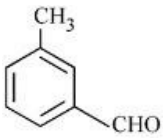
C 

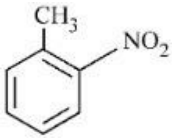
D 

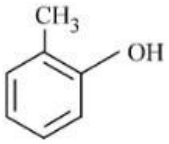
Q:74
Topic Name: Chemistry-Section A

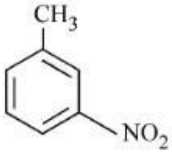
ItemCode:1874

Question: Halogenation of which one of the following will yield m-substituted product with respect to methyl group as a major product?

A 

B 

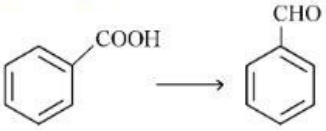
C 

D 

Q:75
Topic Name: Chemistry-Section A

ItemCode:1875

Question: The reagent, from the following, which converts benzoic acid to benzaldehyde in one step is



A $LiAlH_4$

B $KMnO_4$

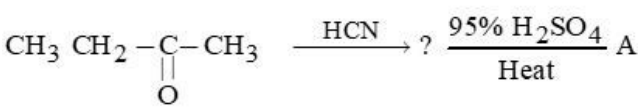
C MnO

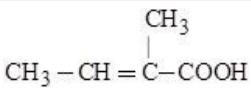
D $NaBH_4$

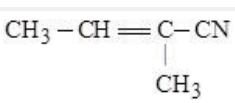
Q:76
Topic Name: Chemistry-Section A

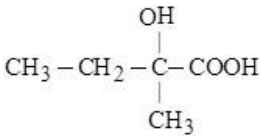
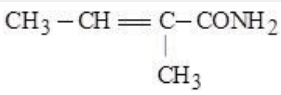
ItemCode:1876

Question: The final product 'A' in the following reaction sequence is



A 

B 

C	
D	

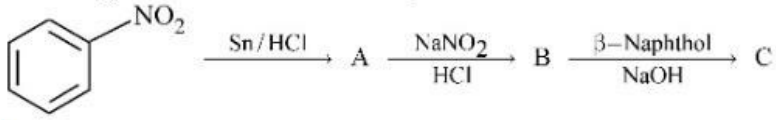
Q:77
Topic Name: Chemistry-Section A

ItemCode:1877
Question: Which statement is NOT correct for p-toluenesulphonyl chloride?

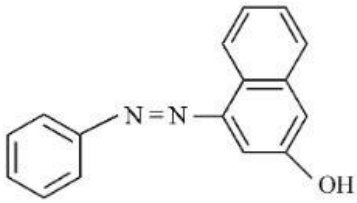
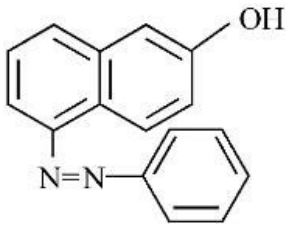
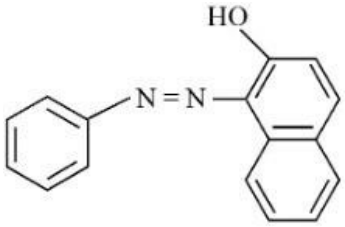
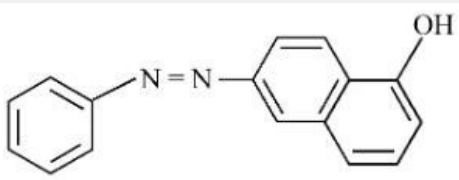
A	It is known as Hinsberg's reagent.
B	It is used to distinguish primary and secondary amines.
C	On treatment with secondary amine, it leads to a product, that is soluble in alkali.
D	It doesn't react with tertiary amines.

Q:78
Topic Name: Chemistry-Section A

ItemCode:1878
The final product 'C' in the following series of reactions

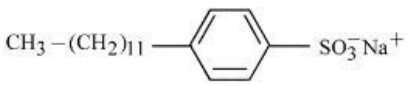


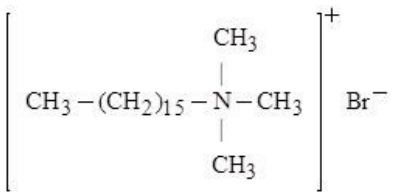
Question:is

A	
B	
C	
D	

Q:79
Topic Name: Chemistry-Section A

ItemCode:1879
Question: Which of the following is NOT an example of synthetic detergent?

A	

B	$CH_3-(CH_2)_{16}-COO^- Na^+$
C	
D	$CH_3(CH_2)_{16}COO(CH_2CH_2O)_nCH_2CH_2OH$

Q:80
Topic Name: Chemistry-Section A

ItemCode:1880
Question: Which one of the following is a water soluble vitamin, that is not excreted easily?

A	Vitamin B_2
B	Vitamin B_1
C	Vitamin B_6
D	Vitamin B_{12}

Q:81
Topic Name: Chemistry-Section B

ItemCode:1881
Question: CNG is an important transportation fuel. When 100 g CNG is mixed with 208 g oxygen in vehicles, it leads to the formation of CO_2 and H_2O and produces large quantity of heat during this combustion ,then the amount of carbon dioxide, produced in grams is ____. [nearest integer]

[Assume CNG to be methane]

Q:82
Topic Name: Chemistry-Section B

ItemCode:1882
Question: In a solid AB, A atoms are in ccp arrangement and B atoms occupy all the octahedral sites. If two atoms from the opposite faces are removed, then the resultant stoichiometry of the compound is A_xB_y. The value of x is ____. [nearest integer]

Q:83
Topic Name: Chemistry-Section B

ItemCode:1883
Question: Amongst SF_4, XeF_4, CF_4 and H_2O, the number of species with two lone pairs of electrons is ____.

Q:84
Topic Name: Chemistry-Section B

ItemCode:1884
Question: A fish swimming in water body when taken out from the water body is covered with a film of water of weight 36 g. When it is subjected to cooking at 100 °C, then the internal energy for vaporization in kJ mol^{-1} is _____. [nearest integer]

[Assume steam to be an ideal gas. Given $\Delta_{vap}H^{\ominus}$ for water at 373 K and 1 bar is 41.1 kJ mol^{-1} ; R = 8.31 J $K^{-1}mol^{-1}$]

Q:85
Topic Name: Chemistry-Section B

ItemCode:1885

Question: The osmotic pressure exerted by a solution prepared by dissolving 2.0 g of protein of molar mass 60 kg mol^{-1} in 200 mL of water at 27°C is _____ Pa.[integer value]
(use R = 0.083 L bar mol^{-1} K^{-1})

Q:86
Topic Name: Chemistry-Section B

ItemCode:1886

Question: 40% of HI undergoes decomposition to H_2 and I_2 at 300 K. $\Delta G^{\ominus}$ for this decompostion reaction at one atmopsphere pressure is _____ J mol^{-1}.[nearest integer]
(Use R = 8.31 J K^{-1} mol^{-1}; log 2 = 0.3010, ln 10 =2.3, log 3 = 0.477)

Q:87
Topic Name: Chemistry-Section B

ItemCode:1887

Question: $Cu(s) + Sn^{2+}(0.001M) \rightarrow Cu^{2+}(0.01M) + Sn(s)$
The Gibbs free energy change for the above reaction at 298 K is $x \times 10^{-1}$ kJ mol^{-1}.
The value of x is _____. [nearest integer]
$\left[\text{Given : } E^{\ominus}_{Cu^{2+}/Cu} = 0.34\,V\ ;\ E^{\ominus}_{Sn^{2+}/Sn} = -0.14\,V\ ;\ F = 96500\ C\ mol^{-1}\right]$

Q:88
Topic Name: Chemistry-Section B

ItemCode:1888

Question: Catalyst A reduces the activation energy for a reaction by 10 kJ mol^{-1} at 300 K.
The ratio of rate constants, $\frac{k_{T,\,Catalysed}}{k_{T,\,Uncatalysed}}$ is e^{x}. The value of x is ___. [nearest integer]
[Assume that the pre-exponential factor is same in both the cases.
Given R = 8.31 J $K^{-1}mol^{-1}$]

Q:89
Topic Name: Chemistry-Section B

ItemCode:1889

Question: Reaction of $[Co(H_2O)_6]^{2+}$ with excess ammonia and in the presence of oxygen results into a diamagnetic product. Number of electrons present in t_{2g}-orbitals of the product is _____.

Q:90
Topic Name: Chemistry-Section B

ItemCode:1890

Question: The moles of methane required to produce 81 g of water after complete combustion is _____ $\times 10^{-2}$ mol. [nearest integer]