Question ID:101061
Topic Name: Mathematics-Section A
Question:

Let $f(x) = \frac{x-1}{x+1}, x \in \mathbf{R} - \{0, -1, 1\}$. If $f^{n+1}(x) = f(f^{n}(x))$ for all $n \in \mathbf{N}$, then $f^{6}(6) + f^{7}(7)$ is equal to :

A $\frac{7}{6}$

B $-\frac{3}{2}$

C $\frac{7}{12}$

D $-\frac{11}{12}$

Answer Given By Candidate:**Not Attempted**

Question ID:101062
Topic Name: Mathematics-Section A

Let $A = \left\{ z \in \mathbf{C} : \left| \frac{z+1}{z-1} \right| < 1 \right\}$

and $B = \left\{ z \in \mathbf{C} : \arg\left(\frac{z-1}{z+1} \right) = \frac{2\pi}{3} \right\}$.

Question: Then $A \cap B$ is :

A a portion of a circle centred at $\left(0, -\frac{1}{\sqrt{3}}\right)$ that lies in the second and third quadrants only

B a portion of a circle centred at $\left(0, -\frac{1}{\sqrt{3}}\right)$ that lies in the second quadrant only

C an empty set

D

a portion of a circle of radius $\frac{2}{\sqrt{3}}$ that lies in the third quadrant only

Answer Given By Candidate:**Not Attempted**

Question ID:101063
Topic Name: Mathematics-Section A

Question: Let A be a 3×3 invertible matrix. If $|\text{adj}(24A)|=|\text{adj}(3\ \text{adj}(2A))|$, then $|A|^2$ is equal to :

A 6^6

B 2^{12}

C 2^6

D 1

Answer Given By Candidate:**Not Attempted**

Question ID:101064
Topic Name: Mathematics-Section A

Question: The ordered pair (a, b), for which the system of linear equations

$3x-2y+z=b$

$5x-8y+9z=3$

$2x+y+az=-1$

has no solution, is :

A $\left(3,\frac{1}{3}\right)$

B $\left(-3,\frac{1}{3}\right)$

C $\left(-3,-\frac{1}{3}\right)$

D $\left(3,-\frac{1}{3}\right)$

Answer Given By Candidate:**Not Attempted**

Question ID:101065
Topic Name: Mathematics-Section A

Question: The remainder when $(2021)^{2023}$ is divided by 7 is :

A 1

B 2

C 5

D 6

Answer Given By Candidate:**Not Attempted**

Question ID:101066
Topic Name: Mathematics-Section A
Question: $\lim\limits_{x\to\frac{1}{\sqrt{2}}} \dfrac{\sin(\cos^{-1}x)-x}{1-\tan(\cos^{-1}x)}$ is equal to :

A $\sqrt{2}$

B $-\sqrt{2}$

C $\dfrac{1}{\sqrt{2}}$

D $-\dfrac{1}{\sqrt{2}}$

Answer Given By Candidate:**Not Attempted**

Question ID:101067
Topic Name: Mathematics-Section A
Question:

Let $f, g : \mathbf{R} \to \mathbf{R}$ be two real valued functions defined as $f(x) = \begin{cases} -|x+3| & , \ x<0 \\ e^x & , \ x \geq 0 \end{cases}$ and

$g(x) = \begin{cases} x^2 + k_1 x & , \ x<0 \\ 4x + k_2 & , \ x \geq 0 \end{cases}$, where k_1 and k_2 are real constants. If (gof) is differentiable at $x=0$, then $(gof)(-4) + (gof)(4)$ is equal to :

A $4(e^4+1)$

B $2(2e^4+1)$

C $4e^4$

D $2(2e^4-1)$

Answer Given By Candidate:**Not Attempted**

Question ID:101068
Topic Name: Mathematics-Section A

Question:

The sum of the absolute minimum and the absolute maximum values of the function $f(x)=|3x-x^2+2|-x$ in the interval $[-1, 2]$ is :

A $\frac{\sqrt{17}+3}{2}$

B $\frac{\sqrt{17}+5}{2}$

C 5

D $\frac{9-\sqrt{17}}{2}$

Answer Given By Candidate:**Not Attempted**

Question ID:101069
Topic Name: Mathematics-Section A
Question:

Let S be the set of all the natural numbers, for which the line $\frac{x}{a}+\frac{y}{b}=2$ is a tangent to the curve $\left(\frac{x}{a}\right)^n+\left(\frac{y}{b}\right)^n=2$ at the point (a, b), $ab \neq 0$. Then :

A $S=\phi$

B $n(S)=1$

C $S=\{2k : k \in \mathbf{N}\}$

D $S=\mathbf{N}$

Answer Given By Candidate:**Not Attempted**

Question ID:101070
Topic Name: Mathematics-Section A
Question:

The area bounded by the curve $y=|x^2-9|$ and the line $y=3$ is :

A $4(2\sqrt{3}+\sqrt{6}-4)$

B $4(4\sqrt{3}+\sqrt{6}-4)$

C $8(4\sqrt{3}+3\sqrt{6}-9)$

D $8(4\sqrt{3}+\sqrt{6}-9)$

Answer Given By Candidate:**Not Attempted**

Question ID:101071
Topic Name: Mathematics-Section A
Question:

Let R be the point (3, 7) and let P and Q be two points on the line $x+y=5$ such that PQR is an equilateral triangle. Then the area of ΔPQR is :

A $\frac{25}{4\sqrt{3}}$

B $\frac{25\sqrt{3}}{2}$

C $\frac{25}{\sqrt{3}}$

D $\frac{25}{2\sqrt{3}}$

Answer Given By Candidate:**Not Attempted**

Question ID:101072
Topic Name: Mathematics-Section A
Question:

Let C be a circle passing through the points A(2, -1) and B(3, 4). The line segment AB is not a diameter of C. If r is the radius of C and its centre lies on the circle $(x-5)^2 + (y-1)^2 = \frac{13}{2}$, then r^2 is equal to :

A 32

B $\frac{65}{2}$

C $\frac{61}{2}$

D 30

Answer Given By Candidate:**D**

Question ID:101073
Topic Name: Mathematics-Section A
Question:

Let the normal at the point P on the parabola $y^2=6x$ pass through the point (5, -8). If the tangent at P to the parabola intersects its directrix at the point Q, then the ordinate of the point Q is :

A -3

B $-\frac{9}{4}$

C $-\frac{5}{2}$

D -2

Answer Given By Candidate:**Not Attempted**

Question ID:101074
Topic Name: Mathematics-Section A
Question:

If the two lines $l_1 : \frac{x-2}{3} = \frac{y+1}{-2}, z = 2$ and $l_2 : \frac{x-1}{1} = \frac{2y+3}{\alpha} = \frac{z+5}{2}$ are perpendicular, then an angle between the lines l_2 and $l_3 : \frac{1-x}{3} = \frac{2y-1}{-4} = \frac{z}{4}$ is :

A $\cos^{-1}\left(\frac{29}{4}\right)$

B $\sec^{-1}\left(\frac{29}{4}\right)$

C $\cos^{-1}\left(\frac{2}{29}\right)$

D $\cos^{-1}\left(\frac{2}{\sqrt{29}}\right)$

Answer Given By Candidate:**Not Attempted**

Question ID:101075
Topic Name: Mathematics-Section A
Question:

Let the plane $2x+3y+z+20=0$ be rotated through a right angle about its line of intersection with the plane $x-3y+5z=8$. If the mirror image of the point $\left(2, -\frac{1}{2}, 2\right)$ in the rotated plane is B(a, b, c), then :

A $\frac{a}{8} = \frac{b}{5} = \frac{c}{-4}$

B $\frac{a}{4} = \frac{b}{5} = \frac{c}{-2}$

C

$$\frac{a}{8} = \frac{b}{-5} = \frac{c}{4}$$

D

$$\frac{a}{4} = \frac{b}{5} = \frac{c}{2}$$

Answer Given By Candidate:**Not Attempted**

Question ID:101076
Topic Name: Mathematics-Section A

Question: If $\vec{a} \cdot \vec{b} = 1$, $\vec{b} \cdot \vec{c} = 2$ and $\vec{c} \cdot \vec{a} = 3$, then the value of $\left[\vec{a} \times (\vec{b} \times \vec{c}), \vec{b} \times (\vec{c} \times \vec{a}), \vec{c} \times (\vec{b} \times \vec{a})\right]$ is :

A 0

B $-6\vec{a} \cdot (\vec{b} \times \vec{c})$

C $12\vec{c} \cdot (\vec{a} \times \vec{b})$

D $-12\vec{b} \cdot (\vec{c} \times \vec{a})$

Answer Given By Candidate:**Not Attempted**

Question ID:101077
Topic Name: Mathematics-Section A
Question:

Let a biased coin be tossed 5 times. If the probability of getting 4 heads is equal to the probability of getting 5 heads, then the probability of getting atmost two heads is :

A $\frac{275}{6^5}$

B $\frac{36}{5^4}$

C $\frac{181}{5^5}$

D $\frac{46}{6^4}$

Answer Given By Candidate:**Not Attempted**

Question ID:101078
Topic Name: Mathematics-Section A

Question:

The mean of the numbers a, b, 8, 5, 10 is 6 and their variance is 6.8. If M is the mean deviation of the numbers about the mean, then 25 M is equal to :

A 60

B 55

C 50

D 45

Answer Given By Candidate:**Not Attempted**

Question ID:101079
Topic Name: Mathematics-Section A
Question:

Let $f(x) = 2\cos^{-1}x + 4\cot^{-1}x - 3x^2 - 2x + 10,\ x \in [-1, 1]$. If [a, b] is the range of the function f, then $4a - b$ is equal to :

A 11

B $11 - \pi$

C $11 + \pi$

D $15 - \pi$

Answer Given By Candidate:**Not Attempted**

Question ID:101080
Topic Name: Mathematics-Section A
Question:

Let $\Delta, \nabla \in \{\wedge, \vee\}$ be such that $p \nabla q \Rightarrow ((p \Delta q) \nabla r)$ is a tautology. Then $(p \nabla q) \Delta r$ is logically equivalent to :

A $(p \Delta r) \vee q$

B $(p \Delta r) \wedge q$

C $(p \wedge r) \Delta q$

D $(p \nabla r) \wedge q$

Answer Given By Candidate:**D**

Question ID:101081
Topic Name: Mathematics-Section B
Question:

The sum of the cubes of all the roots of the equation $x^4 - 3x^3 - 2x^2 + 3x + 1 = 0$ is _____.

Answer Given By Candidate:**Not Attempted**

Question ID:101082

Topic Name: Mathematics-Section B

There are ten boys $B_1, B_2, \ldots, B_{10}$ and five girls $G_1, G_2, \ldots, G_5$ in a class. Then the number of ways of forming a group consisting of three boys and three girls, if both B_1 and B_2 together should not be the members of a group, is _____.

Question:

Answer Given By Candidate:**Not Attempted**

Question ID:101083
Topic Name: Mathematics-Section B
Question:

Let the common tangents to the curves $4(x^2+y^2)=9$ and $y^2=4x$ intersect at the point Q. Let an ellipse, centered at the origin O, has lengths of semi-minor and semi-major axes equal to OQ and 6, respectively. If e and l respectively denote the eccentricity and the length of the latus rectum of this ellipse, then $\frac{l}{e^2}$ is equal to _____.

Answer Given By Candidate:**Not Attempted**

Question ID:101084
Topic Name: Mathematics-Section B

Let $f(x)=\max\{|x+1|, |x+2|, ..., |x+5|\}$. Then $\int_{-6}^{0} f(x)\,dx$ is equal to _____.

Question:

Answer Given By Candidate:**Not Attempted**

Question ID:101085
Topic Name: Mathematics-Section B
Question:

Let the solution curve $y=y(x)$ of the differential equation $(4+x^2)dy-2x(x^2+3y+4)dx=0$ pass through the origin. Then $y(2)$ is equal to _____.

Answer Given By Candidate:**Not Attempted**

Question ID:101086
Topic Name: Mathematics-Section B
Question:

If $\sin^2(10°)\sin(20°)\sin(40°)\sin(50°)\sin(70°)=\alpha-\frac{1}{16}\sin(10°)$, then $16+\alpha^{-1}$ is equal to _____.

Answer Given By Candidate:**Not Attempted**

Question ID:101087
Topic Name: Mathematics-Section B
Question:

Let $A=\{n \in \mathbf{N} : \text{H.C.F.}(n, 45)=1\}$ and

Let $B=\{2k : k \in \{1, 2, ..., 100\}\}$. Then the sum of all the elements of $A \cap B$ is _____.

Answer Given By Candidate:**Not Attempted**

Question ID:101088
Topic Name: Mathematics-Section B

The value of the integral $\frac{48}{\pi^4}\int_0^{\pi}\left(\frac{3\pi x^2}{2}-x^3\right)\frac{\sin x}{1+\cos^2 x}\,dx$ is equal to _____.

Question:

Answer Given By Candidate:**Not Attempted**

Question ID:101089
Topic Name: Mathematics-Section B
Question:

Let $A=\sum_{i=1}^{10}\sum_{j=1}^{10}\min\{i,j\}$ and $B=\sum_{i=1}^{10}\sum_{j=1}^{10}\max\{i,j\}$. Then A + B is equal to _____.

Answer Given By Candidate:**Not Attempted**

Question ID:101090
Topic Name: Mathematics-Section B

Let $S=(0,2\pi)-\left\{\frac{\pi}{2},\frac{3\pi}{4},\frac{3\pi}{2},\frac{7\pi}{4}\right\}$. Let $y=y(x)$, $x\in S$, be the solution curve of the differential equation $\frac{dy}{dx}=\frac{1}{1+\sin 2x}$, $y\left(\frac{\pi}{4}\right)=\frac{1}{2}$. If the sum of abscissas of all the points of intersection of the curve $y=y(x)$ with the curve $y=\sqrt{2}\sin x$ is $\frac{k\pi}{12}$, then k is equal to

Question: _____.

Answer Given By Candidate:**Not Attempted**

Question ID:101001
Topic Name: Physics-Section A
Question:

An expression for a dimensionless quantity P is given by $P=\frac{\alpha}{\beta}\log_e\left(\frac{kt}{\beta x}\right)$; where α and β are constants, x is distance; k is Boltzmann constant and t is the temperature. Then the dimensions of α will be :

A $[M^0 L^{-1} T^0]$

B $[M L^0 T^{-2}]$

C $[M L T^{-2}]$

D $[M L^2 T^{-2}]$

Answer Given By Candidate:**C**

Question ID:101002
Topic Name: Physics-Section A
Question:

A person is standing in an elevator. In which situation, he experiences weight loss ?

A When the elevator moves upward with constant acceleration

B When the elevator moves downward with constant acceleration

C When the elevator moves upward with uniform velocity

D When the elevator moves downward with uniform velocity

Answer Given By Candidate:**B**

Question ID:101003
Topic Name: Physics-Section A
Question:

An object is thrown vertically upwards. At its maximum height, which of the following quantity becomes zero ?

A Momentum

B Potential Energy

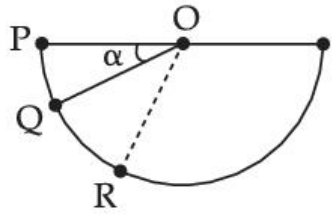
C Acceleration

D Force

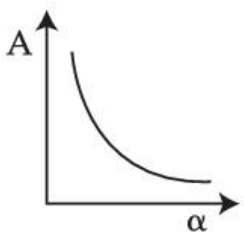
Answer Given By Candidate:**A**

Question ID:101004
Topic Name: Physics-Section A
Question:

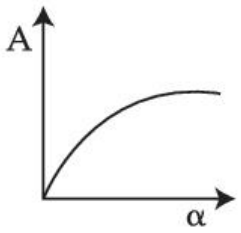
A ball is released from rest from point P of a smooth semi-spherical vessel as shown in figure. The ratio of the centripetal force and normal reaction on the ball at point Q is A while angular position of point Q is α with respect to point P. Which of the following graphs represent the correct relation between A and α when ball goes from Q to R ?



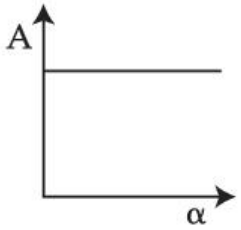
A



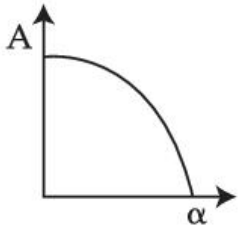
B



C



D



Answer Given By Candidate:**A**

Question ID:101005
Topic Name: Physics-Section A
Question:

A thin circular ring of mass M and radius R is rotating with a constant angular velocity 2 $rads^{-1}$ in a horizontal plane about an axis vertical to its plane and passing through the center of the ring. If two objects each of mass m be attached gently to the opposite ends of a diameter of ring, the ring will then rotate with an angular velocity (in $rads^{-1}$).

A $\frac{M}{(M+m)}$

B $\frac{(M+2m)}{2M}$

C $\frac{2M}{(M+2m)}$

D $\frac{2(M+2m)}{M}$

Answer Given By Candidate:**Not Attempted**

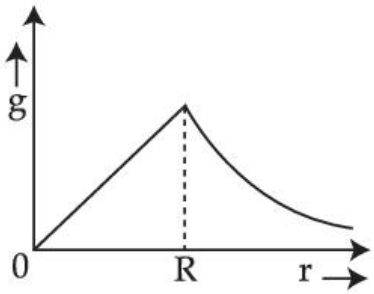
Question ID:101006
Topic Name: Physics-Section A

Question:

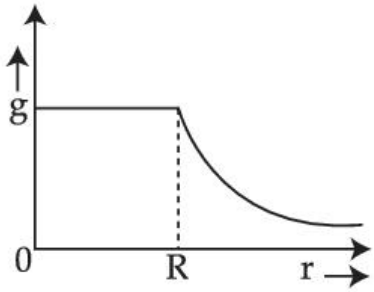
The variation of acceleration due to gravity (g) with distance (r) from the center of the earth is correctly represented by :

(Given R = radius of earth)

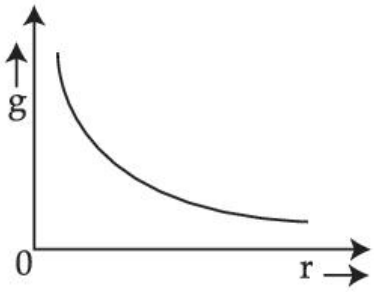
A



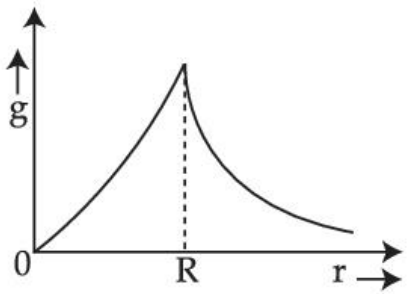
B



C



D



Answer Given By Candidate: **A**

Question ID: 101007
Topic Name: Physics-Section A
Question:

The efficiency of a Carnot's engine, working between steam point and ice point, will be :

A 26.81%

B 37.81%

C 47.81%

D 57.81%

Answer Given By Candidate:**Not Attempted**

Question ID:101008
Topic Name: Physics-Section A
Question:

Time period of a simple pendulum in a stationary lift is 'T'. If the lift accelerates with $\frac{g}{6}$ vertically upwards then the time period will be :
(Where g=acceleration due to gravity)

A $\sqrt{\frac{6}{5}}\,T$

B $\sqrt{\frac{5}{6}}\,T$

C $\sqrt{\frac{6}{7}}\,T$

D $\sqrt{\frac{7}{6}}\,T$

Answer Given By Candidate:**C**

Question ID:101009
Topic Name: Physics-Section A
Question:

A thermally insulated vessel contains an ideal gas of molecular mass M and ratio of specific heats 1.4. Vessel is moving with speed v and is suddenly brought to rest. Assuming no heat is lost to the surrounding and vessel temperature of the gas increases by :
(R=universal gas constant)

A $\frac{Mv^2}{7R}$

B $\frac{M\,v^2}{5\,R}$

C $2\,\frac{M\,v^2}{7\,R}$

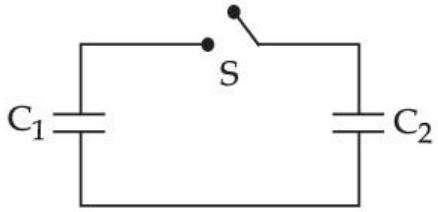
D

$7\,\frac{M v^2}{5R}$

Answer Given By Candidate:**Not Attempted**

Question ID:101010
Topic Name: Physics-Section A
Question:

Two capacitors having capacitance C_1 and C_2 respectively are connected as shown in figure. Initially, capacitor C_1 is charged to a potential difference V volt by a battery. The battery is then removed and the charged capacitor C_1 is now connected to uncharged capacitor C_2 by closing the switch S. The amount of charge on the capacitor C_2, after equilibrium, is :



A $\frac{C_1C_2}{(C_1+C_2)}V$

B $\frac{(C_1+C_2)}{C_1C_2}V$

C $(C_1+C_2)V$

D $(C_1-C_2)V$

Answer Given By Candidate:**B**

Question ID:101011
Topic Name: Physics-Section A
Question:

Given below two statements : One is labelled as Assertion (A) and other is labelled as Reason (R).

Assertion (A) : Non-polar materials do not have any permanent dipole moment.

Reason (R) : When a non-polar material is placed in an electric field, the centre of the positive charge distribution of it's individual atom or molecule coincides with the centre of the negative charge distribution.

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

A Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**.

B Both **(A)** and **(R)** are correct and **(R)** is not the correct explanation of **(A)**.

C (A) is correct but (R) is not correct.

D (A) is not correct but (R) is correct.

Answer Given By Candidate:A

Question ID:101012
Topic Name: Physics-Section A
Question:

The magnetic flux through a coil perpendicular to its plane is varying according to the relation $\phi = (5t^3 + 4t^2 + 2t - 5)$ Weber. If the resistance of the coil is 5 ohm, then the induced current through the coil at $t = 2$ s will be,

A 15.6 A

B 16.6 A

C 17.6 A

D 18.6 A

Answer Given By Candidate:A

Question ID:101013
Topic Name: Physics-Section A
Question:

An aluminium wire is stretched to make its length, 0.4% larger. The percentage change in resistance is :

A 0.4%

B 0.2%

C 0.8%

D 0.6%

Answer Given By Candidate:D

Question ID:101014
Topic Name: Physics-Section A
Question:

A proton and an alpha particle of the same velocity enter in a uniform magnetic field which is acting perpendicular to their direction of motion. The ratio of the radii of the circular paths described by the alpha particle and proton is :

A 1 : 4

B 4 : 1

C 2 : 1

D 1 : 2

Answer Given By Candidate:**B**

Question ID:101015
Topic Name: Physics-Section A
Question:

If Electric field intensity of a uniform plane electro magnetic wave is given as

$$E = -301.6\ \sin(kz-\omega t)\,\hat{a}_x + 452.4\ \sin(kz-\omega t)\,\hat{a}_y\ \frac{V}{m}.$$

Then, magnetic intensity 'H' of this wave in Am^{-1} will be :

[Given : Speed of light in vacuum $c = 3\times10^8\ ms^{-1}$, Permeability of vacuum $\mu_0 = 4\pi\times10^{-7}\ NA^{-2}$]

A $+0.8\ \sin(kz-\omega t)\,\hat{a}_y + 0.8\ \sin(kz-\omega t)\,\hat{a}_x$.

B $+1.0\times10^{-6}\ \sin(kz-\omega t)\,\hat{a}_y + 1.5\times10^{-6}\ (kz-\omega t)\,\hat{a}_x$

C $-0.8\ \sin(kz-\omega t)\,\hat{a}_y - 1.2\ \sin(kz-\omega t)\,\hat{a}_x$

D $-1.0\times10^{-6}\ \sin(kz-\omega t)\,\hat{a}_y - 1.5\times10^{-6}\ \sin(kz-\omega t)\,\hat{a}_x$

Answer Given By Candidate:**B**

Question ID:101016
Topic Name: Physics-Section A
Question:

In free space, an electromagnetic wave of 3 GHz frequency strikes over the edge of an object of size $\frac{\lambda}{100}$, where λ is the wavelength of the wave in free space. The phenomenon, which happens there will be :

A Reflection

B Refraction

C Diffraction

D Scattering

Answer Given By Candidate:**C**

Question ID:101017
Topic Name: Physics-Section A

Question:

An electron with speed v and a photon with speed c have the same de-Broglie wavelength. If the kinetic energy and momentum of electron are E_e and p_e and that of photon are E_{ph} and p_{ph} respectively. Which of the following is correct ?

A $\frac{E_e}{E_{ph}} = \frac{2c}{v}$

B $\frac{E_e}{E_{ph}} = \frac{v}{2c}$

C $\frac{p_e}{p_{ph}} = \frac{2c}{v}$

D $\frac{p_e}{p_{ph}} = \frac{v}{2c}$

Answer Given By Candidate:**D**

Question ID:101018
Topic Name: Physics-Section A
Question:

How many alpha and beta particles are emitted when Uranium $_{92}U^{238}$ decays to lead $_{82}Pb^{206}$?

A 3 alpha particles and 5 beta particles

B 6 alpha particles and 4 beta particles

C 4 alpha particles and 5 beta particles

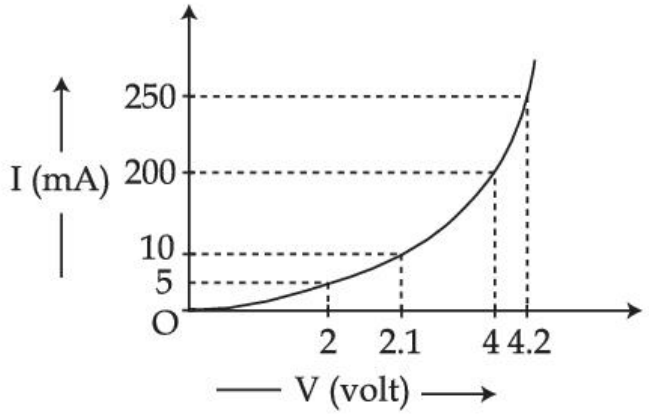
D 8 alpha particles and 6 beta particles

Answer Given By Candidate:**C**

Question ID:101019
Topic Name: Physics-Section A

Question:

The I-V characteristics of a p-n junction diode in forward bias is shown in the figure. The ratio of dynamic resistance, corresponding to forward bias voltage of 2 V and 4 V respectively, is :



A 1 : 2

B 5 : 1

C 1 : 40

D 20 : 1

Answer Given By Candidate:**D**

Question ID:101020
Topic Name: Physics-Section A
Question:

Choose the correct statement for amplitude modulation :

A Amplitude of modulating signal is varied in accordance with the information signal.

B Amplitude of modulated signal is varied in accordance with the information signal.

C Amplitude of carrier signal is varied in accordance with the information signal.

D Amplitude of modulated signal is varied in accordance with the modulating signal.

Answer Given By Candidate:**C**

Question ID:101021
Topic Name: Physics-Section B
Question:

A fighter jet is flying horizontally at a certain altitude with a speed of 200 ms^{-1}. When it passes directly overhead an anti-aircraft gun, a bullet is fired from the gun, at an angle θ with the horizontal, to hit the jet. If the bullet speed is 400 m/s, the value of θ will be _____°.

Answer Given By Candidate:**Not Attempted**

Question ID:101022

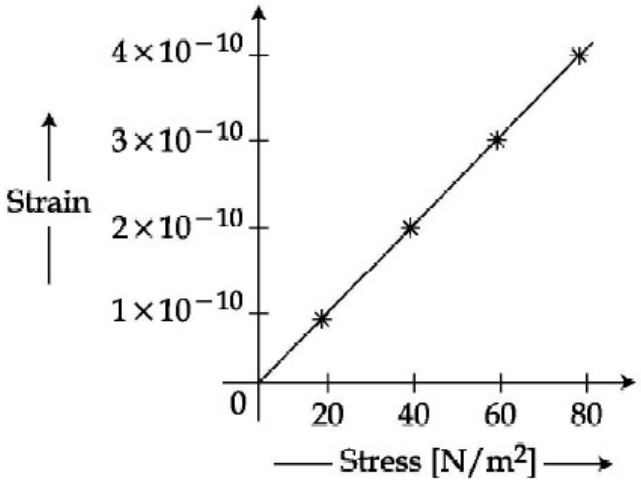
Topic Name: Physics-Section B
Question:

A ball of mass 0.5 kg is dropped from the height of 10 m. The height, at which the magnitude of velocity becomes equal to the magnitude of acceleration due to gravity, is _____m. [Use $g = 10\ m/s^2$]

Answer Given By Candidate:**Not Attempted**

Question ID:101023
Topic Name: Physics-Section B
Question:

The elastic behaviour of material for linear stress and linear strain, is shown in the figure. The energy density for a linear strain of 5×10^{-4} is _____ kJ/m^3. Assume that material is elastic upto the linear strain of 5×10^{-4}.



Answer Given By Candidate:**Not Attempted**

Question ID:101024
Topic Name: Physics-Section B
Question:

The elongation of a wire on the surface of the earth is 10^{-4} m. The same wire of same dimensions is elongated by 6×10^{-5} m on another planet. The acceleration due to gravity on the planet will be _____ ms^{-2}. (Take acceleration due to gravity on the surface of earth $= 10\ ms^{-2}$)

Answer Given By Candidate:**Not Attempted**

Question ID:101025
Topic Name: Physics-Section B
Question:

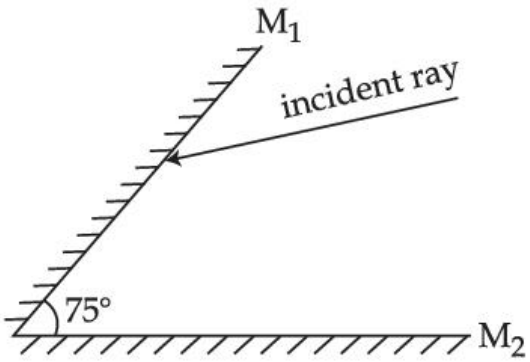
A 10 Ω, 20 mH coil carrying constant current is connected to a battery of 20 V through a switch. Now after switch is opened current becomes zero in 100 μs. The average e.m.f. induced in the coil is _____ V.

Answer Given By Candidate:**Not Attempted**

Question ID:101026
Topic Name: Physics-Section B

Question:

A light ray is incident, at an incident angle θ_1, on the system of two plane mirrors M_1 and M_2 having an inclination angle 75° between them (as shown in figure). After reflecting from mirror M_1 it gets reflected back by the mirror M_2 with an angle of reflection 30°. The total deviation of the ray will be _____ degree.



Answer Given By Candidate:**Not Attempted**

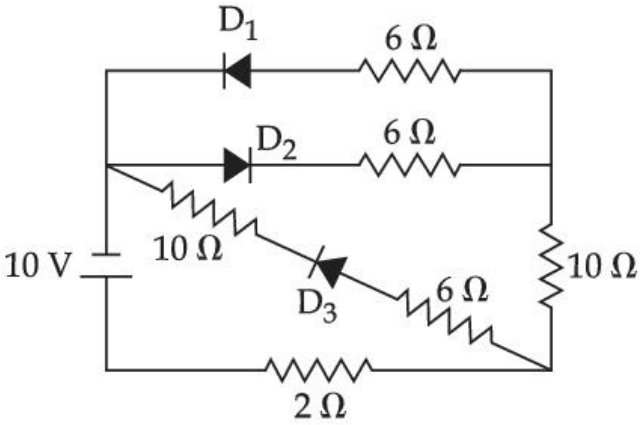
Question ID:101027
Topic Name: Physics-Section B
Question:

In a vernier callipers, each cm on the main scale is divided into 20 equal parts. If tenth vernier scale division coincides with nineth main scale division. Then the value of vernier contant will be _____ $\times 10^{-2}$ mm.

Answer Given By Candidate:**Not Attempted**

Question ID:101028
Topic Name: Physics-Section B
Question:

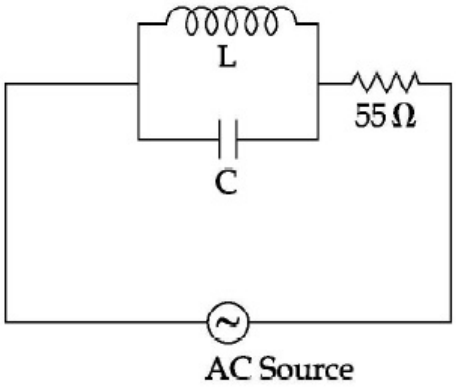
As per the given circuit, the value of current through the battery will be _____ A.



Answer Given By Candidate:**Not Attempted**

Question ID:101029
Topic Name: Physics-Section B

A 110 V, 50 Hz, AC source is connected in the circuit (as shown in figure). The current through the resistance 55 Ω, at resonance in the circuit, will be _____ A.

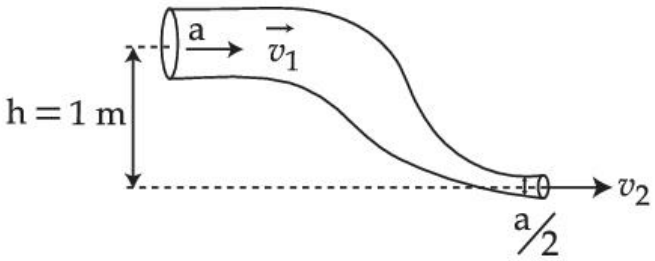


Question:

Answer Given By Candidate:**Not Attempted**

Question ID:101030
Topic Name: Physics-Section B
Question:

An ideal fluid of density 800 kgm^{-3}, flows smoothly through a bent pipe (as shown in figure) that tapers in cross-sectional area from a to $\frac{a}{2}$. The pressure difference between the wide and narrow sections of pipe is 4100 Pa. At wider section, the velocity of fluid is $\frac{\sqrt{x}}{6}$ ms^{-1} for x=_____. (Given g = 10 ms^{-2})



Answer Given By Candidate:**Not Attempted**

Question ID:101031
Topic Name: Chemistry-Section A
Question:

A commercially sold conc. HCl is 35% HCl by mass. If the density of this commercial acid is 1.46 g/mL, the molarity of this solution is :

(Atomic mass : Cl = 35.5 amu, H = 1 amu)

A 10.2 M

B 12.5 M

C 14.0 M

D 18.2 M

Answer Given By Candidate:**Not Attempted**

Question ID:101032
Topic Name: Chemistry-Section A
Question:

An evacuated glass vessel weighs 40.0 g when empty, 135.0 g when filled with a liquid of density 0.95 g mL^{-1} and 40.5 g when filled with an ideal gas at 0.82 atm at 250 K. The molar mass of the gas in g mol^{-1} is :

(Given : R = 0.082 L atm K^{-1} mol^{-1})

A 35

B 50

C 75

D 125

Answer Given By Candidate:**Not Attempted**

Question ID:101033
Topic Name: Chemistry-Section A
Question:

If the radius of the 3rd Bohr's orbit of hydrogen atom is r_3 and the radius of 4th Bohr's orbit is r_4. Then :

A $r_4 = \frac{9}{16} r_3$

B $r_4 = \frac{16}{9} r_3$

C $r_4 = \frac{3}{4} r_3$

D $r_4 = \frac{4}{3} r_3$

Answer Given By Candidate:**D**

Question ID:101034
Topic Name: Chemistry-Section A

Consider the ions/molecule

$O_2^+, O_2, O_2^-, O_2^{2-}$

Question: For increasing bond order the correct option is :

A $O_2^{2-} < O_2^- < O_2 < O_2^+$

B $O_2^- < O_2^{2-} < O_2 < O_2^+$

C $O_2^- < O_2^{2-} < O_2^+ < O_2$

D $O_2^- < O_2^+ < O_2^{2-} < O_2$

Answer Given By Candidate:**A**

Question ID:101035
Topic Name: Chemistry-Section A

The $\left(\frac{\partial E}{\partial T}\right)_P$ of different types of half cells are as follows :

A	B	C	D
1×10^{-4}	2×10^{-4}	0.1×10^{-4}	0.2×10^{-4}

(Where E is the electromotive force)

Question: Which of the above half cells would be preferred to be used as reference electrode ?

A A

B B

C C

D D

Answer Given By Candidate:**C**

Question ID:101036
Topic Name: Chemistry-Section A

Question: Choose the correct stability order of group 13 elements in their +1 oxidation state.

A Al < Ga < In < Tl

B Tl < In < Ga < Al

C Al < Ga < Tl < In

D Al < Tl < Ga < In

Answer Given By Candidate:**A**

Question ID:101037
Topic Name: Chemistry-Section A
Question:

Given below are two statements :

Statement I : According to the Ellingham diagram, any metal oxide with higher ΔG° is more stable than the one with lower ΔG°.

Statement II : The metal involved in the formation of oxide placed lower in the Ellingham diagram can reduce the oxide of a metal placed higher in the diagram.

In the light of the above statements, choose the **most appropriate** 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.

Answer Given By Candidate:**D**

Question ID:101038
Topic Name: Chemistry-Section A

Consider the following reaction :

$$2HSO_4^-(aq) \xrightarrow[(2)\ \text{Hydrolysis}]{(1)\ \text{Electrolysis}} 2HSO_4^- + 2H^+ + \mathbf{A}$$

Question: The dihedral angle in product **A** in its solid phase at 110 K is :

A 104°

B 111.5°

C 90.2°

D 111.0°

Answer Given By Candidate:**C**

Question ID:101039
Topic Name: Chemistry-Section A

Question: The correct order of melting point is :

A Be > Mg > Ca > Sr

B Sr > Ca > Mg > Be

C

Be > Ca > Mg > Sr

D Be > Ca > Sr > Mg

Answer Given By Candidate:**B**

Question ID:101040
Topic Name: Chemistry-Section A
Question: The correct order of melting points of hydrides of group 16 elements is :

A $H_2S < H_2Se < H_2Te < H_2O$

B $H_2O < H_2S < H_2Se < H_2Te$

C $H_2S < H_2Te < H_2Se < H_2O$

D $H_2Se < H_2S < H_2Te < H_2O$

Answer Given By Candidate:**A**

Question ID:101041
Topic Name: Chemistry-Section A
Consider the following reaction :

$$A + \text{alkali} \rightarrow B \text{ (Major Product)}$$

Question: If B is an oxoacid of phosphorus with no P–H bond, then A is :

A White P_4

B Red P_4

C P_2O_3

D H_3PO_3

Answer Given By Candidate:**A**

Question ID:101042
Topic Name: Chemistry-Section A
Question: Polar stratospheric clouds facilitate the formation of :

A $ClONO_2$

B HOCl

C ClO

D CH_4

Answer Given By Candidate:**A**

Question ID:101043

Topic Name: Chemistry-Section A

Given below are two statements :

Statement I : In 'Lassaigne's Test', when both nitrogen and sulphur are present in an organic compound, sodium thiocyanate is formed.

Statement II : If both nitrogen and sulphur are present in an organic compound, then the excess of sodium used in sodium fusion will decompose the sodium thiocyanate formed to give NaCN and Na_2S.

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

Question:

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.

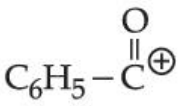
Answer Given By Candidate:**A**

Question ID:101044
Topic Name: Chemistry-Section A

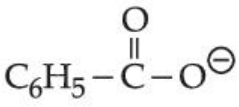
$$(C_7H_5O_2)_2 \xrightarrow{h\nu} [X] \rightarrow 2\dot{C}_6H_5 + 2CO_2$$

Question: Consider the above reaction and identify the intermidiate 'X'

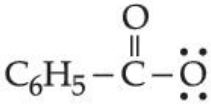
A



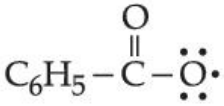
B



C

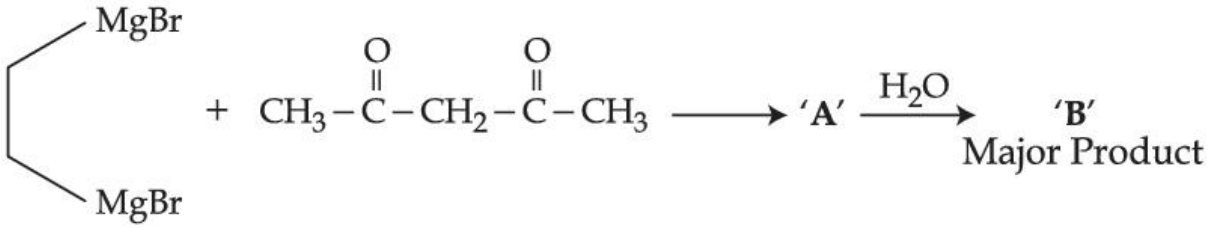


D



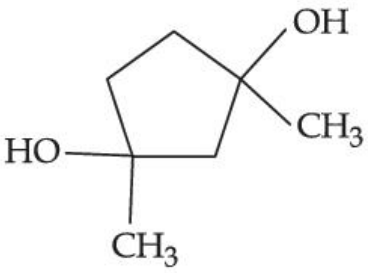
Answer Given By Candidate:**D**

Question ID:101045
Topic Name: Chemistry-Section A



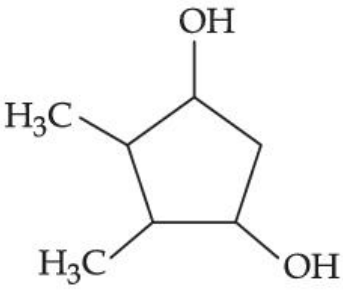
Question: Consider the above reaction sequence and identify the product **B.**

A

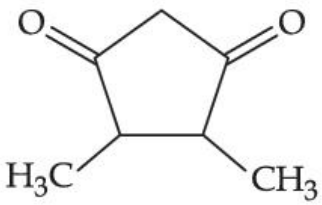


B

C



D

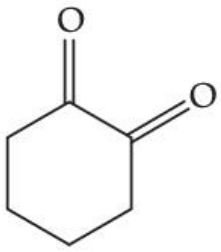


Answer Given By Candidate: **A**

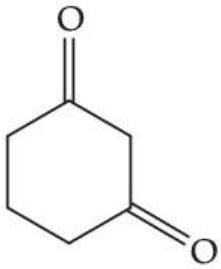
Question ID: 101046
Topic Name: Chemistry-Section A

Question: Which will have the highest enol content ?

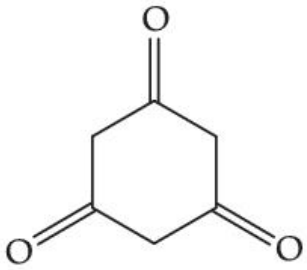
A



B



C



D

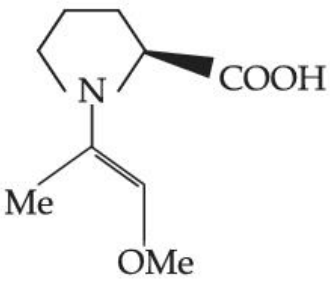
Answer Given By Candidate:**C**

Question ID:101047
Topic Name: Chemistry-Section A
Question:

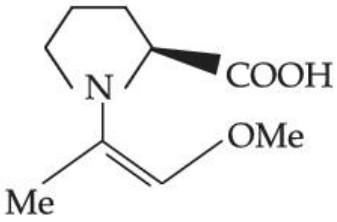
Among the following structures, which will show the most stable enamine formation ?

(Where Me is $-CH_3$)

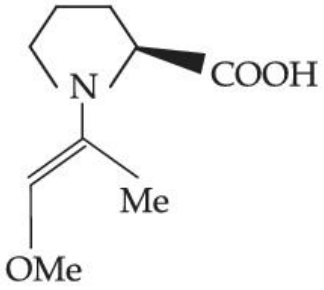
A



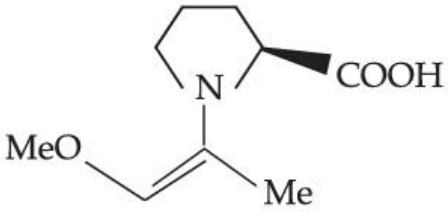
B



C



D



Answer Given By Candidate:**C**

Question ID:101048
Topic Name: Chemistry-Section A

Question:

Which of the following sets are **correct** regarding polymer ?

(A) Copolymer : Buna-S

(B) Condensation polymer : Nylon-6,6

(C) Fibres : Nylon-6,6

(D) Thermosetting polymer : Terylene

(E) Homopolymer : Buna-N

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

A (A), (B) and (C) are correct

B (B), (C) and (D) are correct

C (A), (C) and (E) are correct

D (A), (B) and (D) are correct

Answer Given By Candidate:**A**

Question ID:101049
Topic Name: Chemistry-Section A

Question: A chemical which stimulates the secretion of pepsin is :

A Anti histamine

B Cimetidine

C Histamine

D Zantac

Answer Given By Candidate:**D**

Question ID:101050
Topic Name: Chemistry-Section A
Question: Which statement is **not** true with respect to nitrate ion test ?

A A dark brown ring is formed at the junction of two solutions.

B Ring is formed due to nitroferrous sulphate complex.

C The brown complex is $[Fe(H_2O)_5\ (NO)]SO_4$.

D Heating the nitrate salt with conc. H_2SO_4, light brown fumes are evolved.

Answer Given By Candidate:**D**

Question ID:101051
Topic Name: Chemistry-Section B
Question:
For complete combustion of methanol

$$CH_3OH(l) + \frac{3}{2}O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$$

the amount of heat produced as measured by bomb calorimeter is 726 kJ mol^{-1} at 27°C. The enthalpy of combustion for the reaction is $-x$ kJ mol^{-1}, where x is _____. (Nearest integer)

(Given : $R = 8.3\ JK^{-1}\ mol^{-1}$)

Answer Given By Candidate:**Not Attempted**

Question ID:101052
Topic Name: Chemistry-Section B
Question:
A 0.5 percent solution of potassium chloride was found to freeze at -0.24°C. The percentage dissociation of potassium chloride is _____. (Nearest integer)

(Molal depression constant for water is 1.80 K kg mol^{-1} and molar mass of KCl is 74.6 g mol^{-1})

Answer Given By Candidate:**Not Attempted**

Question ID:101053
Topic Name: Chemistry-Section B
Question:

50 mL of 0.1 M CH_3COOH is being titrated against 0.1 M NaOH. When 25 mL of NaOH has been added, the pH of the solution will be _____ $\times 10^{-2}$. (Nearest integer)

(Given : pK_a $(CH_3COOH) = 4.76$)

log 2 = 0.30

log 3 = 0.48

log 5 = 0.69

log 7 = 0.84

log 11 = 1.04

Answer Given By Candidate:**Not Attempted**

Question ID:101054
Topic Name: Chemistry-Section B
Question:

A flask is filled with equal moles of A and B. The half lives of A and B are 100 s and 50 s respectively and are independent of the initial concentration. The time required for the concentration of A to be four times that of B is _____s.

(Given : ln 2 = 0.693)

Answer Given By Candidate:**Not Attempted**

Question ID:101055
Topic Name: Chemistry-Section B
Question:

2.0 g of H_2 gas is adsorbed on 2.5 g of platinum powder at 300 K and 1 bar pressure. The volume of the gas adsorbed per gram of the adsorbent is _____ mL.

(Given : R = 0.083 L bar K^{-1} mol^{-1})

Answer Given By Candidate:**Not Attempted**

Question ID:101056
Topic Name: Chemistry-Section B
Question:

The spin-only magnetic moment value of the most basic oxide of vanadium among V_2O_3, V_2O_4 and V_2O_5 is _____ B.M. (Nearest integer)

Answer Given By Candidate:**Not Attempted**

Question ID:101057
Topic Name: Chemistry-Section B
Question:

The spin-only magnetic moment value of an octahedral complex among $CoCl_3 \cdot 4NH_3$, $NiCl_2 \cdot 6H_2O$ and $PtCl_4 \cdot 2HCl$, which upon reaction with excess of $AgNO_3$ gives 2 moles of AgCl is _____ B.M. (Nearest Integer)

Answer Given By Candidate:**Not Attempted**

Question ID:101058
Topic Name: Chemistry-Section B
Question:

On complete combustion 0.30 g of an organic compound gave 0.20 g of carbon dioxide and 0.10 g of water. The percentage of carbon in the given organic compound is _____. (Nearest Integer)

Answer Given By Candidate:**Not Attempted**

Question ID:101059
Topic Name: Chemistry-Section B
Question:

Compound 'P' on nitration with dil. HNO_3 yields two isomers (A) and (B). These isomers can be separated by steam distillation. Isomers (A) and (B) show the intramolecular and intermolecular hydrogen bonding respectively. Compound (P) on reaction with conc. HNO_3 yields a yellow compound 'C', a strong acid. The number of oxygen atoms is present in compound 'C' _____.

Answer Given By Candidate:**Not Attempted**

Question ID:101060
Topic Name: Chemistry-Section B
Question:

The number of oxygens present in a nucleotide formed from a base, that is present only in RNA is _____.

Answer Given By Candidate:**3**