## \#1612366

Topic: Capacitance
If $X$ is capacitance and $Y$ is the magnetic field which are related by $X=2 a Y^{2}$. dimension of $a$ will be:-

A $\left[M^{-1} L^{-2} T^{3} Q^{-3}\right]$
B $\quad\left[M^{-3} L^{-2} T^{4} Q^{4}\right]$
C $\left[M^{-2} L^{-1} T^{3} Q^{-3}\right]$
D $\quad\left[M^{-2} L^{-2} T^{3} Q^{-2}\right]$
Solution
$a=\frac{X}{2 Y^{2}}=\frac{\frac{Q}{V}}{2 \times\left(\frac{F}{Q_{V}}\right)^{2}}=\frac{Q^{3} v^{2}}{2 V F^{2}}$
$a=\frac{A^{3} T^{3} \times L^{2} \times T^{-2}}{2\left(\frac{M L^{2} T^{-2}}{A T}\right) \times M^{2} L^{2} t^{-4}}$
$a=\left[M^{-3} L^{-2} T^{4} Q^{4}\right]$

## \#1612368

Topic: Resistance and Resistivity
Sphere of inner radius $a$ and outer radius $b$ is made of $\rho$ uniform resistivity find resistance betwwen inner and outer surface

A $\frac{\rho}{4 \pi}\left(\frac{1}{a}-\frac{1}{b}\right)$
B $\quad \frac{\rho}{2 \pi}\left(\frac{1}{a}-\frac{1}{b}\right)$
C $\quad \frac{\rho}{3 \pi}\left(\frac{2}{a}-\frac{1}{b}\right)$
D $\quad \frac{\rho}{2 \pi}\left(\frac{2}{a}-\frac{1}{b}\right)$
Solution
$R=\int_{o}^{R} d R=\int_{a}^{b} \frac{\rho d r}{4 \pi_{r}^{2}}$
$R=\frac{\rho}{4 \pi}\left(\frac{1}{a}-\frac{1}{b}\right)$


## \#1612369

Topic: Cyanides and isocyanides


Which of the following reagent is not used to carry out the reaction?

B $\mathrm{LiAlH}_{4}$
C $\mathrm{Sn} / \mathrm{HCl}, \mathrm{NaBH}_{4}$
D $\mathrm{H}_{2} / \mathrm{Pd}$
Solution
Solution:- (C) $\mathrm{Sn} / \mathrm{HCl}, \mathrm{NaBH}_{4}$

\#1612388
Topic: Behaviour of real gases - Deviations from ideal behaviour
Pressure of 1 mole ideal is given by
$P=P_{Q}\left[1-\frac{1}{2}\left(\frac{V_{0}}{V}\right)^{2}\right]$
If volume of gas change from $V$ to $2 V$. Find change in temperature.

A $\frac{2 P_{0} V}{R}+\frac{P_{0} V_{0}^{2}}{4 V}$
B $\frac{3 P_{0} V}{R}+\frac{P_{0} V_{0}^{2}}{4 V}$
C $\frac{P_{0} V}{4 R}+\frac{P_{0} V_{0}^{2}}{4 V}$
$D \quad \frac{P_{0} V}{R}+\frac{P_{0} V_{0}^{2}}{4 V}$
Solution
Solution:- (D) $\frac{P_{0} V}{R}+\frac{P_{0} V_{0}^{2}}{4 V}$
$\frac{n R T}{V}=P_{\mathrm{Q}}\left[1-\frac{1}{2}\left(\frac{V_{0}}{V}\right)^{2}\right]$
$T=\frac{P_{0} V}{R} V_{1}-\frac{1}{2}\left(\frac{V_{0}}{V}\right)^{2}$
$\left.T_{i}=\frac{P_{0} Y_{1}-\frac{1}{R}}{2} \frac{V_{0}^{2}}{V^{2}} \right\rvert\,$
$T_{f}=\frac{P_{0} 2 V^{1}}{R}\left(1-\frac{V_{0}^{2}}{8 V^{2}}\right)$
$\Delta T=T_{f}-T_{i}=\frac{P_{0} V}{R}+\frac{P_{0} V_{0}^{2}}{4 V}$
$\frac{n R T}{V}=P_{0}\left[1-\frac{1}{2}\left(\frac{V_{0}}{V}\right)^{2}\right]$
$T=\frac{P_{0} V}{R} V_{1}-\left.\frac{1}{2}\left(\frac{V_{0}}{V}\right)^{2}\right|^{2}$
$T_{i}=\frac{P_{0} \bigvee_{1}-\frac{1}{2}}{R}\left|\frac{V_{0}^{2}}{V^{2}}\right|$
$\left.T_{f}=\frac{P_{0} 2 丩_{1}-\frac{V_{0}^{2}}{R}}{8 V^{2}} \right\rvert\,$
$\Delta T=T_{f}-T_{i}=\frac{P_{0} V}{R}+\frac{P_{0} V_{0}^{2}}{4 V}$

## \#1612401

Topic: Stress and Strain
A cylindrical wire has breaking stress of 376 MPa . If a force of 400 N is applied on wire then maximum diameter of wire such that it does not break:-

A $\quad 2.1 \mathrm{~mm}$

B $\quad 3.1 \mathrm{~mm}$
C $\quad 1.1 \mathrm{~mm}$
D $\quad 1.2 \mathrm{~mm}$

## Solution

Stress $=\frac{F}{A}=\frac{400}{\pi \frac{d^{2}}{4}}=376 \times 10^{6}$
$\frac{400 \times 4}{\pi \times 376 \times 10^{6}}=d^{2}$
$d=1.16 \times 10^{-3} m$
$d=1.1 \mathrm{~mm}$
\#1612412
Topic: Torque


Find torque required so that a coin of mass 1 kg rotates 25 revolution is 5 sec starting from rest.

A $6 \pi \times 10^{-4} \mathrm{Nm}$
B $\quad 5 \pi \times 10^{-4} N m$
C $\quad 7 \pi \times 10^{-4} \mathrm{Nm}$
D $\quad 9 \pi \times 10^{-4} N m$
Solution
$25 \times 2 \pi=\frac{1}{2} \times \alpha \times 25$
$\alpha=4 \pi \mathrm{rad} / \mathrm{sec}^{2}$
$T=l \alpha$
$=\left(\frac{M_{r}^{2}}{4}+M_{r}^{2}\right) \cdot \alpha$
$=\frac{5}{4} \times 1 \times\left(\frac{1}{100}\right)^{2} \times 4 \pi$
$=5 \pi \times 10^{-4} \mathrm{Nm}$

## \#1612419

Topic: Speed of Sound
A sound source is moving with speed $50 \mathrm{~m} / \mathrm{s}$ towards a fixed observer. Frequency observed by observer is 1000 Hz . Find out apparent frequency observed by observer when source is moving away from observer (speed of sound $=350 \mathrm{~m} / \mathrm{s}$ )

A
750 Hz
B 950 Hz
C 550 Hz
D 350 Hz

## \#1612420

Topic: LCR circuits


Find the time after which current in the circuit becomes $80 \%$ of its maximum value.

A $\frac{P n 2}{100}$
B $\frac{P n 3}{100}$
c $\frac{\operatorname{Pn5}}{100}$
D $\frac{\text { Pn } 6}{100}$
Solution

Subject: Physics | Shift 2 | 10th April 2019
$I_{s}=\frac{V}{R}=\frac{V}{0.9+0.1}=\frac{V}{1}$
$1=1 /\left(1-e^{-\frac{R}{L}}\right)$
$\left.0.8 V=\psi^{1-} e^{-\frac{1 \times t}{10 \times 10^{-3}}}\right)$
$0.8=1-e^{-100 t}$
$0.2=e^{-100 t}$
$e^{-100} t=5$
$t=\frac{P n 5}{100}$

## \#1612422

Topic: Basics of Friction


There are two block as shown in the figure of masses 1 kg and 4 kg . Friction coefficient between any two surface are 0.2 then find maximum value of horizontal force F so that both blocks moves together.

A $5 N$
B $\quad 10 \mathrm{~N}$
C $\quad 15 \mathrm{~N}$
D 20 N
Solution
For 1 kg block, $a_{\max }=\frac{\mu(1) g}{(1)}=2 \mathrm{~m} / \mathrm{s}^{2}$

So $F_{\text {man }}-\left(F_{r}\right)_{\text {ground }}=m_{\text {total }} a_{\text {max }}$
$F_{\text {man }}-\mu(4+1) g=(4+1) 2$
$F_{\text {man }}=20 \mathrm{~N}$
\#1612423
Topic: Pressure in Static Fluid
A block of sided 0.5 m is $30 \%$ submerged in a liquid of density $1 \mathrm{gm} / \mathrm{cc}$. Then find mass of an object placed on block for complete submergence.

A $\quad 87.3 \mathrm{~kg}$
B $\quad 85.3 \mathrm{~kg}$
C $\quad 82.3 \mathrm{~kg}$
D $\quad 80.3 \mathrm{~kg}$

## Solution

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Initial condition $B=m g$
$\rho \frac{3}{10} V g=m g . \quad \ldots$ (1)
$\rightarrow\left(1000 \mathrm{~kg} / \mathrm{m}^{3}\right) \frac{3}{10}(0.5 \mathrm{~m})^{3}=m$
$m=37.5 \mathrm{~kg}$
finally $\rho v g=(m+M) g \quad \ldots(2)$
From equation (1) \& (2)
$\frac{(m+M) g}{m g}=\frac{\rho V g}{\rho \frac{3}{10} V g}$
$1+\frac{M}{m}=\frac{10}{3}$
$\frac{M}{m}=\frac{7}{3}$
$\frac{M}{m}=\frac{7}{3}$
$M=\frac{7}{3}(37.5) \mathrm{kg}=87.3 \mathrm{~kg}$

## \#1612424

Topic: Magnetic Moment
Magnetic moment of a current carrying square loop be M . If it is converted in form of circle and same current is passed through it then find the new magnetic moment.

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

## Solution

Let current be $/$ and side of square is a

$$
\begin{aligned}
& M=1 \times a^{2} \\
& 4 a=2 \pi R
\end{aligned}
$$

$$
R=\frac{4 a}{2 \pi}=\left(\frac{2 a}{\pi}\right)
$$

$M^{\prime}=I \times$ Area $=I \times \pi R^{2}$

$$
\begin{aligned}
& =I \times \pi \times \frac{4 a^{2}}{\pi^{2}} \\
& =I_{a} 2 \times \frac{4}{\pi}
\end{aligned}
$$

$M^{\prime}=\frac{4 M}{\pi}$

\#1612426
Topic: Thin Lenses


The graph of magnification $v / s$ image distance of a thin lance is given. Its focal length will be -

A $f=\frac{-a}{c}$
B $\quad f=\frac{b}{c}$
C $f=\frac{-c}{b}$
D None of these

Solution
$m=\frac{f-V}{f}$
$m=1-\frac{V}{f}$
slope $=\frac{-1}{f}$
$\frac{-1}{f}=\frac{C}{b}$
$f=\frac{b}{c}$
\#1612427
Topic: Magnetic field


A current of $10 A$ is flowing in a equilateral triangle of side length $P=1 m$ as shown in figure. The magnetic field at centre of triangle is :

A $8 \times 10^{-6} T$

B $\quad 9 \times 10^{-5} T$
C $9 \times 10^{-6 T}$
D $\quad 10^{-5} T$
Solution

Subject: Physics | Shift 2 | 10th April 2019
Magnetic field due to wire $B C$ is $\Rightarrow B=\frac{\mu_{0}}{4 \pi} \frac{i}{\rho} \times \sqrt{3}\left[\frac{\sqrt{3}}{2}+\frac{\sqrt{2}}{2}\right] \otimes$
Net magnetic field at centre $=3 B$
$=\frac{\mu_{0}}{4 \pi} \frac{i}{\rho} \times \sqrt{3}\left[\frac{\sqrt{3}}{2}+\frac{\sqrt{3}}{2}\right] 3 \otimes$
$=\frac{\mu_{0}}{4 \pi} \frac{i}{\rho}-3(1) 3$
$=10^{-7} \times \frac{10}{1} \times 9=9 \times 10^{-6} T$

## \#1612431

Topic: Energy and Power


A particle of mass ' $m$ ' and charge ' $q$ ' is suspended from the ceiling with the help of an insulating wire of length ' $\rho$ '. It is placed in an uniform electric electric field as shown in figure. Then the time period of oscillation is :

A

$$
\sqrt{\frac{\rho}{\sqrt{g^{2}+\left(\frac{q E}{m}\right)^{2}}}}
$$

B

$$
2 \pi \sqrt{\frac{\rho}{\sqrt{g^{2}+\left(\frac{q E}{m}\right)^{2}}}}
$$

C

$$
2 \pi \sqrt{\frac{\rho}{\sqrt{g+\left(\frac{q E}{m}\right)}}}
$$

D

$$
2 \pi \sqrt{\frac{\rho}{\sqrt{g^{2}-\left(\frac{q E}{m}\right)^{2}}}}
$$

Solution
$T=2 \pi \sqrt{\left|\vec{g}^{+}+\frac{q_{E}^{*}}{m}\right|}$

$$
=2 \pi \sqrt{\frac{\rho}{\sqrt{g^{2}+\left(\frac{q E}{m}\right)^{2}}}}
$$

## \#1612432

Topic: Young's Modulus
A brass rod of length 1 m , area $1 \mathrm{~mm}^{2}$ and young's modulus $120 \times 10^{9} \mathrm{~N} / \mathrm{m}^{2}$ is connected with steel rod of length 1 m , area 1 mm and Young's modulus $60 \times 10^{9} \mathrm{~N} / \mathrm{m}^{2}$. Then the net stress so that extension of system is 0.2 mm

A $\quad 2 \times 10^{6} \mathrm{~N} / \mathrm{m}^{2}$
B $\quad 4 \times 10^{6} \mathrm{~N} / \mathrm{m}^{2}$
C $\quad 8 \times 10^{6} \mathrm{~N} / \mathrm{m}^{2}$

D $\quad 16 \times 10^{6} \mathrm{~N} / \mathrm{m}^{2}$
Solution
$Y_{\text {eq }}=\frac{\frac{\text { Stress }}{}\left(\frac{\Delta e}{\rho_{\text {eq }}}\right)}{\text { St }}$
$\frac{2 P}{Y_{e q} A}=\frac{P}{Y_{1} A}+\frac{P}{Y_{2} A}$
$Y_{e q}=\frac{2 Y_{1} Y_{2}}{Y_{1}+Y_{2}}=\frac{2 \times 120 \times 10^{9} \times 60 \times 10^{9}}{180 \times 10^{9}}$
$Y_{e q}=80 \times 10^{9}$

Stress $=Y_{e q} \frac{\Delta \rho}{\rho}=\frac{80 \times 10^{9} \times 2 \times 10^{-4}}{1 \mathrm{~m}}=16 \times 10^{6} \mathrm{~N} / \mathrm{m}^{2}$

## \#1612433

Topic: First Law of Thermodynamics
If $Q$ amount of heat is given to diatomic gas at constant volume to raise its temperature by $\Delta T$. Then for change of temperature how much amount of heat should be supplied $\bar{c}$ constant pressure?

A $\frac{5 Q}{7}$
B $\frac{7 Q}{5}$
C $\quad Q$

D $\quad 2 Q$

## Solution

$Q$ (Heat at constant volume) $=\Delta U$
$Q=n C_{v} \Delta T=n \frac{5 R}{2} \Delta T=\Delta U$
$Q_{p}($ Heat constant pressure $)=n C_{p} \Delta T=n \frac{7 R}{2} \Delta T$
$Q_{p}=\frac{7 Q}{5}$
\#1612435
Topic: Angular Momentum
A particle moves in space such that its position vector varies as vecr $=2 \hat{t}_{j}+3 t^{2} j$. If mass of particle is 2 kg then angular momentum of particle about origin at $t=2$ sec is :

A $12 \hat{k}$
B $48 \hat{k}$
C $\quad 36 \hat{k}$

D $\quad 24 \hat{k}$

## Solution

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$\vec{L}=m\left(r_{r} \times \vec{v}\right)$
$\vec{v}=2 \hat{i}+6 \hat{f}_{j}$
$\vec{v}=2 \hat{i}+12 \hat{j}$ at $t=2 \mathrm{sec}$
$\vec{L}=2\left|\begin{array}{ccc}\hat{i} & \hat{j} & \hat{k} \\ 4 & 12 & 0 \\ 2 & 12 & 0\end{array}\right|=2(12 \times 4-12 \times 2) \hat{k}$
$\vec{L}=48 \hat{k}$

## \#1612436

Topic: Basics of Projectile Motion
A projectile is projected upward with speed $2 \mathrm{~m} / \mathrm{s}$ on an incline plane of inclination $30^{\circ}$ at an angle of $15^{\circ}$ from the plane. Then the distance along the plane where projectile w fall is :

A $\frac{4}{15}$
B $\quad \frac{4}{5}\left(\frac{1}{\sqrt{3}}+\frac{1}{3}\right)$
C $\quad \frac{4}{5}\left(\frac{1}{\sqrt{3}}-\frac{1}{3}\right)$
D $\quad \frac{4}{\sqrt{3}}\left(\frac{1}{\sqrt{3}}-\frac{1}{3}\right)$

## Solution

On inclined plane (range) $R=\frac{2 U^{2} \sin \alpha \cos (\alpha+\beta)}{g \cos ^{2} \beta}$

Where $\alpha=15^{\circ}, \beta=30^{\circ}, U=2 \mathrm{~m} / \mathrm{s}$

On solving we get, $R=\frac{4}{5}\left(\frac{1}{\sqrt{3}}-\frac{1}{3}\right)$
\#1612437
Topic: Moment of Inertia of Common Bodies
A solid sphere of mass $m$ \& radius $R$ is divided in two parts of masses $\frac{7 m}{8} \& \frac{m}{8}$, and converted to a disc of radius $2 R \&$ solid sphere of radius 'r' respectively. Find $\frac{l_{1}}{I_{2}}$. If $I_{1} \& I_{2}$ art moment of inertia of disc \& solid sphere respectively.

A 160
B $\quad 140$
C 240
D 120
Solution

IDisc $=\frac{7 m}{8} \frac{(2 R)^{2}}{2}=I_{1}$

For solid sphere
$\frac{m}{8}=\left(\frac{4}{3} \pi r^{3}\right) \rho$
$\frac{\rho\left(\frac{4}{3} \pi R^{3}\right)}{8}=\frac{4}{3} \pi_{r}{ }^{3} \rho$
$\frac{R}{2}=r=$ Radius of solid sphere (s.s)
$I_{s s}=\left(\frac{M}{8} r^{2}\right) \frac{2}{5}$
$=\frac{M}{8}\left(\frac{R}{2}\right)^{2} \frac{2}{5}=I_{2} ; \quad$ So that $\frac{I_{1}}{I_{2}}=\frac{\frac{7 M(2 R)^{2}}{8} \frac{2}{2}}{\frac{2}{8}\left(\frac{R}{2}\right)^{2}}=140$

## \#1612438

Topic: Interference
In YDSE ratio of width of slit is $4: 1$, then ratio of maximum to minimum intensity


B 27

C 3

D 81

Solution
$I \propto W$
$\frac{l_{1}}{I_{2}}=\frac{4}{1}$
$\frac{I_{\text {max }}}{I_{\text {min }}}=\left(\frac{\sqrt{I_{1}}+\sqrt{I_{2}}}{\sqrt{\bar{I}_{1}}-\sqrt{I_{2}}}\right)^{2}=\left(\frac{\sqrt{\overline{1_{1} / I_{2}}+1}}{\sqrt{\sqrt{I_{1} / I_{2}}-1}}\right)^{2}=\left(\frac{\sqrt{4}+1}{\sqrt{4}-1}\right)^{2}=\left(\frac{2+1}{2-1}\right)=\left(\frac{3}{1}\right)=\frac{9}{1}$

## \#1612439

Topic: Electrostatic Potential


Two charge particle $P$ \& $Q$ having same charge $1 \mu C$ and mass $4 \mu k g$ are initially kept at the distance of 1 mm . Charge $P$ is fixed, then the velocity of charge particle $Q$ when the separation between them becomes 9 mm .

A $\quad 3 \times 10^{3} \mathrm{~m} / \mathrm{s}$
B $\quad 2 \times 10^{3} \mathrm{~m} / \mathrm{s}$
C $\quad 5 \times 10^{3} \mathrm{~m} / \mathrm{s}$
D $\quad 7 \times 10^{3} \mathrm{~m} / \mathrm{s}$

Loss in $P E=$ gain in $K E$
$K \times 10^{-6} \times 10^{-6}\left[\frac{1}{10^{-3}}-\frac{1}{9 \times 10^{-2}}\right]=\frac{1}{2} m v^{2}$
$9 \times 10^{9} \times \frac{10^{-6} \times 10^{-6}}{10^{-3}} \times \frac{8}{9}=\frac{1}{2} \times 4 \times 10^{-6} \times v^{2}$
$V=2 \times 10^{3} \mathrm{~m} / \mathrm{s}$

## \#1612447

Topic: Zener Diode


In the circuit diagram of zener diode as shown in figure, when the value of $V_{0}$ is 8 volt, the current through zener diode $\mathrm{s} i_{1}$ and when $V_{0}$ is 16 volt, the corresponding current is $i_{2}$. Find the value of $\left(i_{2}-i_{1}\right)$. (Zener breakdown voltage $\left.=v_{2}=6 \mathrm{~V}\right)$

A zero
B $\quad 5.0 \mathrm{~mA}$
C $\quad 1.5 \mathrm{~mA}$
D 8 mA
Solution
For $V_{0}=8$ Volt
$i_{0}=\frac{8-6}{1000}=2 \mathrm{~mA} ; i_{2}=\frac{6}{4000}=1.5 \mathrm{~mA}$
$\therefore i_{1}=(2-1.5)=0.5 \mathrm{~mA}$
for $V_{0}=16 \mathrm{Volt} ; i_{0}^{\prime}=\frac{10}{1000}=10 \mathrm{~mA}^{\prime} i_{2}^{\prime}=1.5 \mathrm{~mA}$
$\therefore i_{1}^{\prime}=10-1.5=8.5 \mathrm{~mA}$
$\Rightarrow i_{1}^{\prime}-i_{1}=8 \mathrm{~mA}$

\#1612449
Topic: Satellites

Subject: Physics | Shift 2 | 10th April 2019


A Satellite is revolving around a planet having mass $M=8 \times 10^{22} \mathrm{~kg}$ and radius $R=2 \times 10^{6} \mathrm{~m}$ as shown in figure. Find the number of revolutions made by the satellite around th planet in 24 hours.

A 9
B $\quad 10$
C $\quad 11$
D
12
Solution
$T=2 \pi \sqrt{\frac{R^{3}}{G M}}=2 \pi \sqrt{\frac{8 \times 10^{18}}{\frac{20}{3} \times 10^{-11 \times 8 \times 10^{22}}}}=7800 \mathrm{sec}$.

Number of revolutions $=\frac{24 \times 3600}{7800}=11.07=11$

## \#1612450

Topic: First Order Radioactive Decay
Two radioactive materials have decay constants $5 \lambda \& \lambda$.If Initially they have same no. of nuclei. Find time when ratio of nuclei become $\left(\frac{1}{e}\right)^{2}$ :
A $\frac{1}{2 \lambda}$
B $\frac{1}{\lambda}$
C $\frac{2}{\lambda}$
D $\frac{1}{4 \lambda}$
Solution
$\frac{N_{1}}{N_{2}}=\frac{N_{0 e^{-5 \lambda \times t}}}{N_{0 e^{-\lambda t}}}=\frac{1}{e^{2}}$
$e^{-4 \lambda t}=\frac{1}{e^{2}}$
$-4 \lambda t=-2$
$t=\frac{1}{2 \lambda}$

## \#1612451

Topic: Superposition and Interference
Two sound sources of frequency 9 Hz and 11 Hz are sounded together then which plot is correct after superposition of sound waves.


Subject: Physics | Shift 2 | 10th April 2019
B

c


D


Solution
$f_{b}=(11-9)=2 \mathrm{~Hz}$
$T_{b}=\frac{1}{2} \mathrm{sec} .=0.5 \mathrm{sec}$

## \#1612454

Topic: Efflux and Torricelli's Law
Water is flowing continuously from a tap of area $10^{-4} \mathrm{~m}^{2}$. The water velocity as it leaves the top is $1 \mathrm{~m} / \mathrm{s}$.
Find out area of the water stream at a distance 0.15 m below the top.

A $0.5 \times 10^{-4} \mathrm{~m}^{2}$
B $\quad 1 \times 10^{-4} m^{2}$
C $\quad 2 \times 10^{-4} m^{2}$
D $\quad 0.25 \times 10^{-4} \mathrm{~m}^{2}$
Solution
$A_{1} V_{1}=A_{2} V_{2}$
$v_{2}=\sqrt{v_{1}^{2}+2 g h}$
$v_{2}=\sqrt{1^{2}+2 \times 10 \times 0.15}$
$V_{2}=2 \mathrm{~m} / \mathrm{s}$
$10^{-4 \times 1}=A_{2} \times 2$
$A_{2}=0.5 \times 10^{-4} \mathrm{~m}^{2}$.

## \#1612471

Topic: Atomic Spectra and Spectral Series
$L i^{2+}$ is initially in ground state. when radiation of wavelength $\lambda_{0}$ incident on it, it emits 6 different wavelengths during de-excitation. Find $\lambda_{0}$.

A $1230^{\circ} \AA$
B $\quad 520 \AA$
C $970{ }_{A}^{\circ}$
D $1480{ }^{\circ}$
Solution
$6=\frac{n(n-1)}{2} \Rightarrow n=4$
$\frac{1}{\lambda}=R 2\left[\frac{1}{1^{2}}-\frac{1}{4^{2}}\right]=1.097 \times 10^{7}\left[\frac{1}{1}-\frac{1}{16}\right]$
$\lambda=970 \AA$

## \#1612476

Topic: Moment of Inertia of Common Bodies
A solid sphere of mass $M \&$ radius $R$ is divided in two parts of masses $\frac{7 M}{8} \& \frac{M}{8}$, and converted to a disc of radius $2 R \&$ solid sphere of radius 'r' resp. Find $\frac{I_{1}}{I_{2}}$, if $I_{1} \& I_{2}$ are moment of inertia of disc \& solid sphere respectively.

A 200
B 140
C 120
D 180
Solution
$I_{\text {Disc }}=\frac{7 m}{8} \frac{(2 R)^{2}}{2}=I_{1}$
Solid sphere
$\frac{M}{8}=\left(\frac{4}{3} \pi r^{3}\right) \rho$
$\frac{\rho\left(\frac{4}{3} \pi r^{3}\right)}{8}=\frac{4}{3} \pi r^{3} \rho$
$\frac{R}{2}=r=$ radius of solid sphere
Iss $=\left(\frac{M}{8} r^{2}\right) \frac{2}{5}$
$=\frac{M}{8}\left(\frac{R}{2}\right)^{2} \frac{2}{5}=I_{2}$;
So that $\frac{I_{1}}{I_{2}}=\frac{\frac{7 M(2 R)^{2}}{8}}{\frac{2}{5} \frac{M}{8}\left(\frac{R}{2}\right)^{2}}=140$
\#1612478
Topic: Photons and Photoelectric Effect
A beam of light incident on a surface has photons each of energy 1 mJ and intensity $25 \mathrm{w} / \mathrm{cm}^{2}$. Find number of photons incident per second if surface area is $25 \mathrm{~cm}^{2}$.

A $\quad 6.25 \times 10^{5} s^{-1}$

B $\quad 8.25 \times 10^{5} s^{-1}$

C $\quad 6.25 \times 10^{4} \mathrm{~s}^{-1}$

D $\quad 5.25 \times 10^{5} s^{-1}$
Solution

$$
\begin{aligned}
& I \times A=n \times \text { Energy of each photon } \\
& n=\frac{I A}{\text { energy of each photon }} \\
& \frac{25 \times 25}{1} \times 10^{-3} \\
& =6.25 \times 10^{-5} \mathrm{JS}^{-1}
\end{aligned}
$$

## \#1612495

Topic: Kinetic Friction

A particle of mass 20 gm is moving with velocity $1 \mathrm{~m} / \mathrm{s}$. it penetrates 20 cm wooden block(fixed) with average force $2.5 \times 10^{-2} \mathrm{~N}$. Find out speed particle when it come out from block.

A $\quad \frac{1}{\sqrt{3}} \mathrm{~m} / \mathrm{s}$
B $\quad \frac{1}{5} \mathrm{~m} / \mathrm{s}$
C $\frac{1}{2} \mathrm{~m} / \mathrm{s}$
D $\quad \frac{1}{7} \mathrm{~m} / \mathrm{s}$

## Solution

F. $x=\frac{1}{2} m V_{f}^{2}-\frac{1}{2} m V_{f}^{2}$
$\Rightarrow-2 \times 10^{-2} \times 02=\frac{1}{2} \times 20 \times 10^{-3}\left(V_{f}^{2}-1^{2}\right)$
$\Rightarrow-0.5=v_{f}^{2}-1^{2}$
$v_{f}^{2}=0.5$
$V_{f}=\frac{1}{\sqrt{2}} \mathrm{~m} / \mathrm{s}$

