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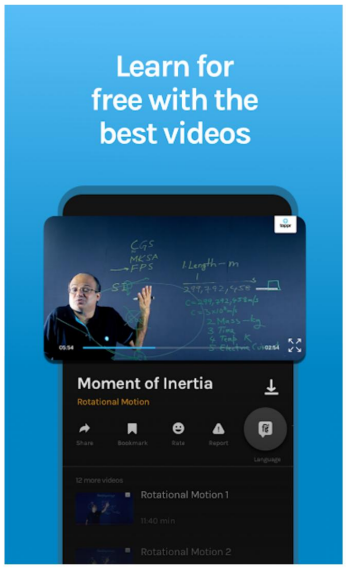

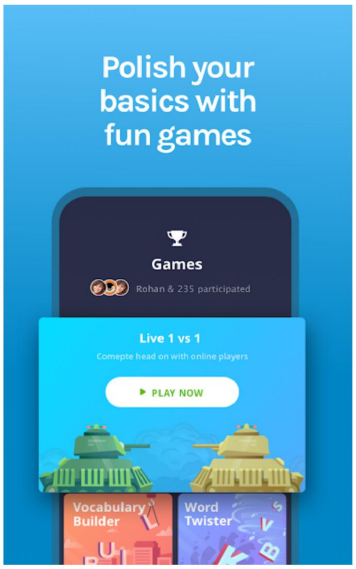

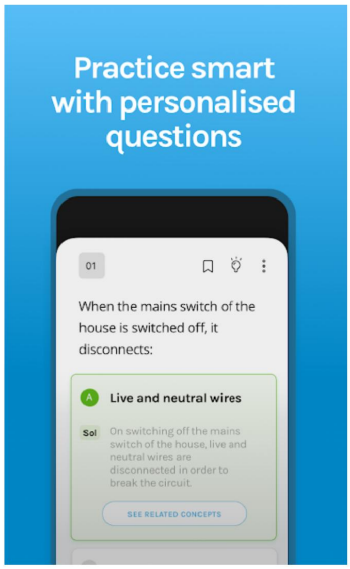

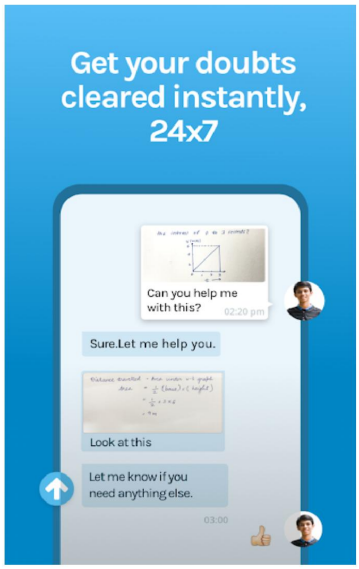

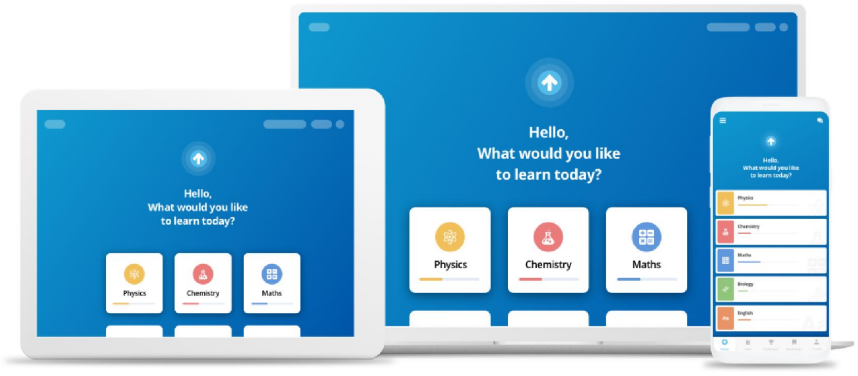

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Q.1.

A bomb of mass $16kg$ at rest explodes into two pieces of masses of $4kg$ and $12kg$. The velocity of the $12kg$ mass is $4ms^{-1}$. The kinetic energy of the other mass is :

A $96J$

B $144J$

C $288J$

D $192J$

SOLUTION

Let v be the velocity of the other mass.
The magnitude of their momentum will be same because initally the momentum will be zero.
So equating their momentum we get :
$4v = 12 \times 4$
$v = 12$
Kinetic energy of the other mass$= \frac{1}{2} \times 4 \times (12)^2 = 288J$

Q.2. During any collision

A Momentum is conserved

B Linetic energy is conserved

C Both conserved

D All

SOLUTION

During any collision, the momentum is conserved but the kinetic energy is not. This is because during collision, a part of kinetic energy is converted into heat sound energies.

Q.3. Which part of a mango tree has the highest potential energy?

A Fruit

B Flower

C Leaf

D Roots

SOLUTION

potential energy is defined as the energy possessed by a body by virtue of its position relative to others. As the fruit is at the highest point in the tree it possess maximum potential energy

Q.4.

Which of the following energy transformations take place when a sky diver jumps from an aeroplane with a parachute?

A Solar --- kinetic

B Kinetic --- wind

C Potential --- kinetic

D None of these

SOLUTION

When the sky driver is at height he posses potential energy when gets converted to kinetic energy when he jumps off the plane.

Q.5.

Assertion

In an elastic collision between two bodies, the relative speed of the bodies after collision is equal to the relative speed before the collision.

Reason

In an elastic, the linear momenta of the system is conserved.

A Both Assertion and Reason are correct and Reason is the correct explanation for Assertion

B Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion

C Assertion is correct but Reason is incorrect

D Assertion is incorrect and Reason correct

SOLUTION

Since elasticity and conservation law are not correlated hence Reason is not the correct explanation of the assertion but both are correct.

Q.6.

In a given process on an ideal gas, $dW = 0$ and $dQ < 0$. Then for the gas.

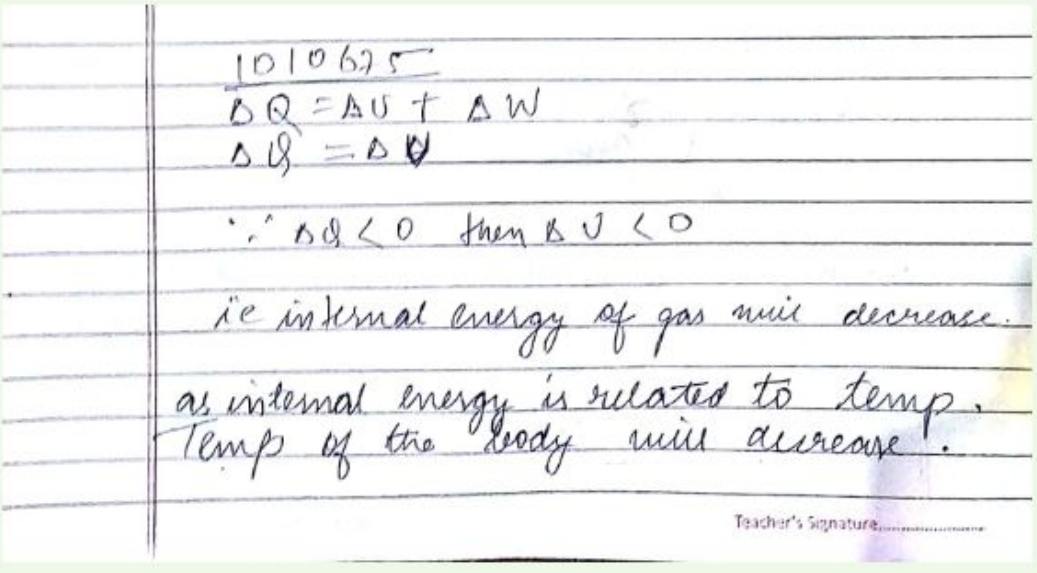
A The temperature will decrease

B The volume will increase

C The pressure will remain constant

D The temperature will increase

SOLUTION



Q.7.

Consider a car moving on a straight road with a speed of $100m/s$. The minimum distance at which car can be stopped is $(\mu_k = 0.5)$

A $800m$

B $1000m$

C $100m$

D $400m$

SOLUTION

Given, $Speed = 100m/s, \mu_k = 0.5, g = 10m/s^2$

So, when the car is stopped by the friction than its retarding force is:

$ma = \mu R \Rightarrow ma = \mu mg \Rightarrow a = \mu g$

Let us consider a car moves a distance with velocity u and stops,

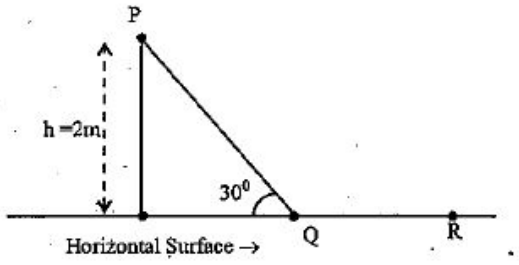
So, by the kinematic equation of motion,

$$v^2 - u^2 = 2as \Rightarrow u^2 as \Rightarrow s = \frac{u^2}{2\mu g} = \frac{100^2}{2 \times 0.5 \times 10} = 1000m$$

Q.8.

A point particle of mass m, moves along the uniformly rough track PQR as shown in the figure. The coefficient of friction , between the particle and the rough track equals μ. The particle is released, from rest, from the point P and it comes to rest at a point R. The energies, lost by the ball, over the parts, PQ and QR, of the track, are equal to each other, and no energy is lost when the particle changes direction from PQ and QR

The values of the coefficient of friction μ and the distance $x(= QR)$ are respectively close to:



A 0.2 and $3.5m$

B 0.29 and $3.5m$

C 0.29 and $6.5m$

D 0.2 and $6.5m$

SOLUTION

Given,
Distance $QR = x$
Distance $PQ = h\text{cosec}\theta = 2 \times \text{cosec}30^o = 4\,m$
Friction force on incline plane $F_r = \mu mg\cos 30^o = \frac{\sqrt{3}}{2}\mu mg$
Friction force on horizontal plane $F_r = \mu mg$

Since work done by friction on parts PQ and QR are equal

$$-\frac{\sqrt{3}}{2}\mu mg \times PQ = -\mu mg \times QR$$

$$\Rightarrow -\frac{\sqrt{3}}{2}\mu mg \times 4 = -\mu mg \times x$$

$$\Rightarrow x = 2\sqrt{3}\ m \cong 3.5m$$

from conservation of Energy
Potential Energy = Energy lost in friction

$$mgh = \frac{\sqrt{3}}{2}\mu mg \times 4 + \mu mg \times x$$

$$\Rightarrow mg \times 2 = \frac{\sqrt{3}}{2}\mu mg \times 4 + \mu mg \times 2\sqrt{3}$$

$$\Rightarrow mg \times 2 = 4\sqrt{3} \times \mu mg$$

$$\Rightarrow \mu = \frac{1}{2\sqrt{3}} \cong 0.29$$

Hence $x \cong 3.5m$ and $\mu \cong 0.29$

Q.9.

Match the following.

LIST 1		LIST 2	
A	Inelastic collision	1	kinetic energy of the system may decrease
B	Elastic collision	2	kinetic energy of the system may increase
C	Total work done is zero	3	kinetic energy of the system may remain constant
D	Non-conservative forces are not present	4	just before and after collision, momentum remains constant

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

SOLUTION

A. Inelastic collision : KE of system decreases momentum remains constant fuel before and after collusion.
B. Elastic collision : KE remains constant (4).
C. Total work done is zero : (3).
D. Non-conservative forces are not present : (1) (2) (3).
Hence, solved.

Q.10.

A body starts from rest with uniform acceleration and acquires a velocity v in time T. The instantaneous kinetic energy of the body at time t is proportional to:

A $(v/T)t$

B $\left(v^2/T\right)t^2$

C $\left(v^2/T^2\right)t$

D $\left(v^2/T^2\right)t^2$

SOLUTION

$$KE = \frac{1}{2}mv^2 = \frac{m}{2}(at)^2 = \frac{m}{2}\left(\frac{v}{T}t\right)^2$$

$$\because a = \frac{\Delta v}{\Delta t} = \frac{v}{T} \quad KE \propto \left(v^2/T^2\right)t^2$$