STEPPING STONE SCHOOL(HIGH)

Class : 10

Sub : Physics

Chapter : Work ,Energy and Power (Part6)

Date : 05.06.2020

Day : 9

Worksheet : 9

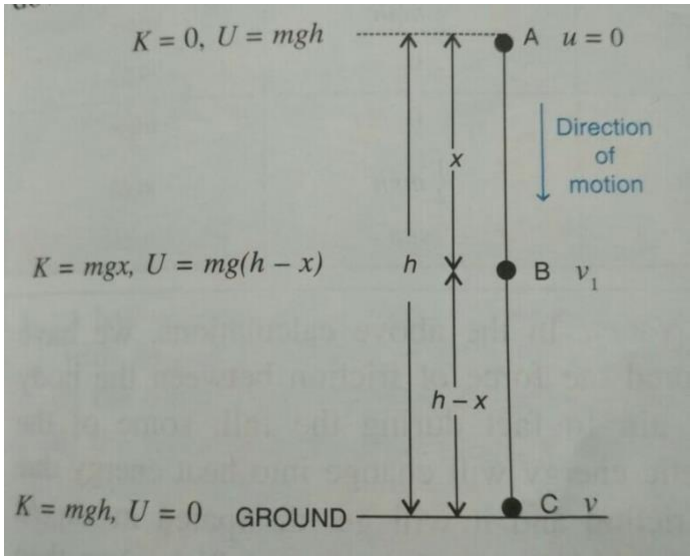
Topic : Conservation of Energy

Please read the notes carefully and on the basis of it copy down the questions and solve them on a clean sheet of paper arranged data wise and keep the worksheet ready in a file to be submitted on the opening day.

PRINCIPLE OF CONSERVATION OF ENERGY

According to the principle of conservation of energy, energy can neither be created nor can it be destroyed. It only changes from one form to another.

Verification that total mechanical energy remains constant for a freely falling body.



At position A (at height h above the ground) :

Initial velocity of body $= 0$ (since body is at rest at A)

$\therefore$ Kinetic energy $K = 0$

Potential energy $U = mgh$

Hence, total energy $= K + U = 0 + mgh = mgh$ ....(i)

At position B (when it has fallen through a distance x) :

Let v_1 be the velocity acquired by the body at B after falling through a distance x. Then $u = 0$, $S = x$, $a = g$

From equation $v^2 = u^2 + 2aS$

$v_1^2 = 0 + 2gx = 2gx$

$\therefore$ Kinetic energy $K = \frac{1}{2} m v_1^2$

$= \frac{1}{2} m \times (2gx) = mgx$

Now at B, height of body above the ground $= h - x$

$\therefore$ Potential energy $U = mg\,(h - x)$

Hence, total energy $= K + U$

$= mgx + mg(h - x) = mgh$ .....(ii)

At position C (on the ground) :

Let the velocity acquired by the body on reaching the ground be v. Then $u = 0$, $S = h$, $a = g$

From equation $v^2 = u^2 + 2aS$

$v^2 = 0 + 2gh$

or $v^2 = 2gh$

Kinetic energy $K = \frac{1}{2} m v^2$

$= \frac{1}{2} m \times (2gh) = mgh$

and potential energy $U = 0$ (at the ground when $h = 0$)

Hence total energy $= K + U = mgh + 0 = mgh$ ..(iii)

Exercise:

1.Name two examples in which the mechanical energy of a system remains constant.

2.A body is thrown vertically upwards. Its velocity keeps on decreasing. What happens to it's kinetic energy as its velocity becomes zero?

3.Name the type of energy possessed by the bob of a simple pendulum when it is at(a) the extreme position(b) the mean position and (c) between the mean and the extreme position.

4. A ball of mass 0.20kg is thrown vertically upwards with an initial velocity of 20m/s. Calculate the maximum potential energy it gains as it goes up.

5. A Hydroelectric power station takes its water from a lake whose water level is at a height of 50m above the turbine. Assuming an overall efficiency of 40% , Calculate the mass of water which must flow through the turbine each second to produce power output of 1MW.[$g=10m/s^2$]

Please tap on the hyperlink below to see the video content of the topic conservation of energy.

https://youtu.be/kReXFWI8M4g