EQUATION FOR 1D MOTION

Motion Under Gravity

If an object is falling freely ($u = 0$) under gravity, then equations of motion

(i) $v = u + gt$

(ii) $h = ut + gt^2$

(iii) $V^2 = u^2 + 2gh$

Note If an object is thrown upward then g is replaced by – g in above three equations.

It thus follows that

(i) Time taken to reach maximum height

$t_A = u / g = \sqrt{2h / g}$

(ii) Maximum height reached by the body

$h_{max} = u^2 / 2g$

(iii) A ball is dropped from a building of height h and it reaches after t seconds on earth. From the same building if two ball are thrown (one upwards and other downwards) with the same velocity u and they reach the earth surface after t, and t2 seconds respectively, then

$t = \sqrt{t_1 t_2}$

Equations of Uniformly Accelerated Motion

If a body starts with velocity (u) and after time t its velocity changes to v, if the uniform acceleration is a and the distance travelled in time t in s, then the following relations are obtained, which are called equations of uniformly accelerated motion.

(i) $v = u + at$

(ii) $s = ut + at^2$

(iii) $v^2 = u^2 + 2as$

(iv) Distance travelled in nth second.

$S_n = u + a / 2(2n - 1)$

If a body moves with uniform acceleration and velocity changes from u to v in a time interval, then the velocity at the mid point of its path

$\sqrt{u^2 + v^2} / 2$

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(iv) When a body is dropped freely from the top of the tower and another body is projected horizontally from the same point, both will reach the ground at the same time.