CLASS - XI PHYSICS
Chapter -3 : Motion in a straight line
Module -3 (handout)

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) $s = ut + 1/2\ at^2$

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

(iv) Distance travelled in nth second.

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

Motion Under Gravity

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

(i) $v = u + gt$

(ii) $h = ut + 1/2\ gt^2$

(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_1 and t_2 seconds respectively, then

$$t = \sqrt{t_1 t_2}$$

(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

Relative Velocity

Relative velocity of one object with respect to another object is the time rate of change of relative position of one object with respect to another object.

Relative velocity of object A with respect to object B

$$V_{AB} = V_A - V_B$$
