2) A stone is dropped freely in the river from a bridge. It takes 5 s to touch the water surface in the river. Calculate:

i. the height of the bridge from the water level.

ii. the distance covered by stone in the last second ($g = 9.8\ m/s^{-2}$)

ans) Initial speed = $u = 0\ m/s$

time = $t = 5$ sec

Case i.

distance travelled = height of bridge = h m

From the second equation of motion:

$s = ut + \frac{1}{2}at^2$ h

$= 0 \times t + \frac{1}{2} 9.8 \times 5 \times 5h$

$= 122.5$ m

∴ The height of the bridge from water level is 122.5 m

Case ii.

Distance travelled in first 2 sec

$= (\frac{1}{2} \times 9.8 \times 2 \times 2)$

$= 4 \times 4.9$

$= 19.6$ m

3) A tennis ball is struck with a racket, firing it straight upward at 22 m/s. After how much time will it be falling at 15 meters per second?

Ans) Initial velocity of the tennis ball = 22 m/s

Final velocity = 15 m/s

Acceleration due to gravity = $-9.8\ m/s^2$

Time taken by the ball to hit the ground = $v = u + gt$

$\Rightarrow 15 = 22 + (-9.8)t$

$\Rightarrow -9.8t = 22 - 15$ $\quad -9.8t = 22 - 15$

$\Rightarrow t = \frac{7}{-9.8}$ $\quad t = \frac{7}{9.8}$

$\Rightarrow t =$ $\quad t = 0.714285714285$

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Chapter :- 1

Free fall

Numerical

1) A ball is thrown upward with with an initial velocity of 10.0 m/s from the top of a 50.0 m tall building.
a) With what velocity will the ball strike the ground?
b) How long does it take the ball to strike the ground.

ans) Given,

Displacement = -50 m

$u = 10 m/s$

a) $v^2 = u^2 - 2gs$

$= (10m)^2 - 2(9.8 m/s^2)(-50m)$

$v^2 = 1.08 \times 10^3 m^2/s^2$

$v = \sqrt{1.08 \times 10^3 m^2/s^2}$ $\sqrt{1.08 \times 10^3 m^2/s^2}$

$= 32.9 m/s$

$= (-32.9 m/s)$

b) $v = u - gt$

$t = \frac{u - v}{g}$

$$= \frac{(10\,m/s - (-32 - 9\,m/s))}{9.80\,m/s^2}$$

$$= \frac{42.9\,m/s}{9.8\,m/s^2}$$

$$= 4.38\,s$$