

Q5-6 7th foundation +

(1)

Thanks

(4)

Given $S = at - \frac{1}{2} 3 t^2$

From $S = ut + \frac{1}{2} a t^2$

By comparing with $a = -3 \text{ m/s}^2$

(5)

By comparing Given equation with $S = ut + \frac{1}{2} a t^2$

clearly $u = 0$

(6)

⑥

A ————— B

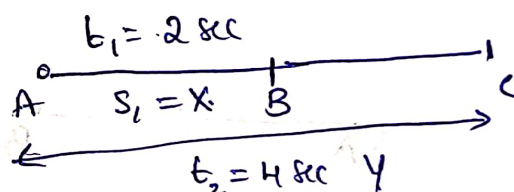
* $u_p = 15 \text{ m/s}$ $u_q = ?$ $a_p = a_q =$
 $u_q = 20 \text{ m/s}$ $u_q = 30 \text{ m/s}$

From $v = u + at$

For P	For Q
$\Rightarrow v_p = 15 + a_p t$	$v_q = u_q + a_q t$
	$\Rightarrow 30 = 20 + (a_p) t$
$\therefore v_p = 15 - 10$	$\Rightarrow 30 = 20 + a_q t$
$= 5 \text{ m/s}$	$\Rightarrow a_t = -10 \text{ m/s}$

⑦

initial velocity $u = 0$



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

For AB $\Rightarrow$	For AC
$x = 0 \times 2 + \frac{1}{2} a (2)^2$	$y = 0 \times 4 + \frac{1}{2} a (4)^2$
$x = \frac{1}{2} a \times 2^2$	$\Rightarrow y = \frac{1}{2} a \times 16 = 8a$
$x = 2a$	$\Rightarrow y = 2a + 6a$
	$\Rightarrow y = 8a$
	$y = 4(2a)$
	$= 4x$

(2)

Given initial velocity $u = 10 \text{ m/s}$ in time $= 5 \text{ sec}$
 velocity $v = 30 \text{ m/s}$ at what time t'
 $v' = 60 \text{ m/s}$

From $v = u + at$

$$\Rightarrow 30 = 10 + a \times 5$$

$$\Rightarrow 5a = 20$$

$$\Rightarrow \underline{a = 4 \text{ m/s}^2}$$

$$v' = v + at'$$

$$\Rightarrow 60 = 30 + 4t'$$

$$\Rightarrow 30 = 4t'$$

$$\Rightarrow t' = \frac{30}{4} = 7.5 \text{ sec}$$

(9)

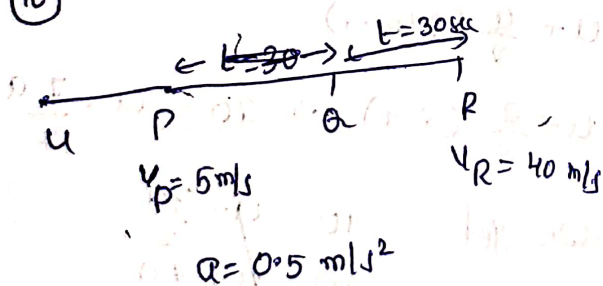
velocity $u = 6 \text{ m/s}$; $v = 0$; $a = ?$; $s = 3 \text{ m}$

$$\text{From } v^2 - u^2 = 2as$$

$$\Rightarrow 0^2 - 6^2 = 2 \times a \times 3$$

$$\Rightarrow -6^2 = 6a \Rightarrow a = -6 \text{ m/s}^2$$

(10)



From $v = u + at$ For QR

$$\Rightarrow v_R = v_Q + 0.5 \times 30$$

$$\Rightarrow 40 = v_Q + 15 \Rightarrow v_Q = 25 \text{ m/s}$$

From $v^2 - u^2 = 2as$ For PQ

$$\Rightarrow v_Q^2 - v_P^2 = 2(0.5)s$$

$$\Rightarrow (25)^2 - (5)^2 = s$$

$$\Rightarrow 30 \times 20 = s$$

$$\Rightarrow \underline{s = 600 \text{ m}}$$

For R → Q $v_Q \cdot s = ut + \frac{1}{2} at^2$

$$s = 5 \times 30 + \frac{1}{2} \times 0.5 (30)^2$$

$$= 150 + \frac{1}{2} \times 0.5 \times 900$$

$$= 150 + 225$$

$$\underline{RQ = 375 \text{ m}}$$



(12)

$$\text{From } S_n = u + \frac{a}{2} (2n-1)$$

For $n=2$

$$S_2 = u + \frac{a}{2} (2(2)-1)$$

$$S_2 = u + \frac{a}{2} (4-1) \Rightarrow S_2 = u + \frac{3a}{2}$$

For $n=1$

$$S_1 = u + \frac{a}{2} (2(1)-1)$$

$$= u + \frac{a}{2} (2-1) \Rightarrow u + \frac{a}{2}$$

(14), (15), (16)

$$n_1 = 2 \rightarrow S_1 = 10 \text{ m}$$

$$n_2 = 4 \rightarrow S_2 = 20 \text{ m}$$

let u , be the initial velocity
 a , be the acceleration.

From

$$S_n = u + \frac{a}{2} (2n-1)$$

For $n=2$

$$10 = u + \frac{a}{2} (2(2)-1) \Rightarrow 10 = u + \frac{a}{2} (4-1)$$

$$\Rightarrow 10 = u + \frac{3a}{2} \rightarrow (1)$$

For $n_2 = 4$

$$20 = u + \frac{a}{2} (2(4)-1)$$

$$\Rightarrow 20 = u + \frac{a}{2} (8-1) \Rightarrow 20 = u + \frac{7a}{2} \rightarrow (2)$$

By solving (1) & (2) we get

$$\begin{array}{r} 10 = u + \frac{3a}{2} \\ 20 = u + \frac{7a}{2} \\ \hline \end{array}$$

$$\Rightarrow -10 = \frac{-4a}{2} \Rightarrow 2a = 10$$

$$\Rightarrow a = 5 \text{ m/s}^2$$

sub a value in (1) we get

$$10 = u + \frac{3}{2} \times 5$$

$$\Rightarrow 10 = u + 7.5 \Rightarrow u = 10 - 7.5$$

$$= 2.5 \text{ m/s}$$

For $n=5^{\text{th}}$

$$S = u + \frac{a}{2} (2n-1)$$

$$\Rightarrow S = 2 \cdot 5 + \frac{5}{2} (2(5)-1)$$

$$= 2 \cdot 5 + \frac{5}{2} \times 9$$

$$= 2 \cdot 5 + (2 \cdot 5) \times 9$$

$$\Rightarrow 25 \text{ m}$$

(17)

Given $u = 2 \text{ m/s}$; acceleration $a = 2 \text{ m/s}^2$

time $t = 5 \text{ s}$

$$\text{From } S = ut + \frac{1}{2} at^2$$

$$\Rightarrow S = 2 \times 5 + \frac{1}{2} \times 2 \times 5^2$$

$$= 10 + 25 = 35 \text{ m}$$

(18)

initial velocity $u = 15 \text{ m/s}$

Final velocity $v = 5 \text{ m/s}$; Displacement $= 10 \text{ m}$

$$\text{From } v^2 - u^2 = 2as$$

$$\Rightarrow 5^2 - 15^2 = 2 \times a \times 10$$

$$\Rightarrow (5+15)(5-15) = 20a$$

$$\Rightarrow 20 \times (-10) = 20a$$

$$\Rightarrow a = -10 \text{ m/s}^2$$

(19)

let the initial velocity $u = 0$.Final velocity $v = 72 \text{ kmph}$

$$= 72 \times \frac{5}{18} = 4 \times 5 = 20 \text{ m/s}$$

$$\text{Time} = 5 \text{ min} = 5 \times 60 \text{ sec.}$$

$$\text{or } 5 \times \frac{1}{60} = \frac{1}{12} \text{ hrs.}$$

$$\therefore \text{From } s = ut + \frac{1}{2} at^2$$

$$\Rightarrow s = 0 \times \frac{1}{12} + \frac{1}{2} \times 72 \times \left(\frac{1}{12}\right)^2 \quad (12)$$

$$\text{From } v = u + at \Rightarrow s = \frac{1}{2} \times \frac{72}{12} \times 12 = 3 \text{ km}$$

$$\Rightarrow 72 = 0 + a \times \frac{1}{12}$$

$$\Rightarrow a = 72 \times 12$$

(20)

initial velocity $u = 72 \text{ kmph}$; final velocity $v = 18 \text{ kmph}$
 distance $s = 20 \text{ m}$
 $u = 20 \text{ m/s}$

$$\text{(a) } u = 72 \times \frac{5}{18} = 20 \text{ m/sec.}$$

$$\text{(d) Acceleration} = \frac{v^2 - u^2}{2s} = \frac{5^2 - 20^2}{2 \times 20} = \frac{25 - 400}{40} = \frac{-375}{8} = -9.375 \text{ m/s}^2$$

$$\text{(b) Time} = \frac{v - u}{a} = \frac{5 - 20}{(-9.375)} = \frac{-15}{-9.375} = \frac{15}{9.375} = 1.6 \text{ sec}$$

$$\text{(c) From } v^2 - u^2 = 2as \Rightarrow 0^2 - (20)^2 = 2(-9.375) \times s$$

$$\Rightarrow -400 = -18.75 \times s \Rightarrow s = \frac{400}{18.75} = 21.33 \text{ m.}$$



1 Task

Tea main level

④

20 m/s ①

Given $v = 5 + 8t$

After 5 sec $v = 5 + 8 \times 5$

$$= v = 5 + 40 = 45 \text{ m/s}$$

②

Initial velocity $u = 25 \text{ m/s}$

Final velocity $v = 0$: distance $s = 80 \text{ m}$

From $v^2 - u^2 = 2as$

$$\Rightarrow 0^2 - (25)^2 = 2 \times a \times 80$$

$$\Rightarrow -625 = 2 \times 80 \times a \Rightarrow a = \frac{-625}{160} = \frac{-62.5}{16} = -3.9 \text{ m/s}^2$$

③

Initial velocity $u = 300 \text{ cm/s} = 3 \text{ m/s}$

Acceleration $a = 300 \text{ cm/s}^2 = 3 \text{ m/s}^2$

Time $t = 3 \text{ sec.}$

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

$$= 3 \times 3 + \frac{1}{2} \times 3 \times (3)^2$$

$$= 9 + \frac{3}{2} \times 9$$

$$= 9 + 13.5$$



(k)

initial speed $u = 15 \text{ m/s}$

$$v = 0$$

distance $s = 3 \text{ m}$

$$\text{From } v^2 - u^2 = 2as$$

$$\Rightarrow 0^2 - (15)^2 = 2 \times a \times 3$$

$$\Rightarrow -15 \times 15 = 2 \times 3 \times a$$

$$\Rightarrow a = \frac{-75}{2} = -37.5 \text{ m/s}^2$$

(5)

particle is starting from rest $u = 0$

For $n=1$

$$s_n = u + \frac{a}{2} (2n-1)$$

$$\Rightarrow s_1 = 0 + \frac{a}{2} (2 \times 1 - 1)$$

$$\Rightarrow s_1 = \frac{a}{2} (2-1) = \frac{a}{2}$$

For $n=3$

$$s_3 = 0 + \frac{a}{2} (2(3)-1)$$

$$= \frac{a}{2} (6-1)$$

$$\Rightarrow s_3 = 5 \frac{a}{2}$$

$$\therefore \frac{s_1}{s_3} = \frac{\frac{a}{2}}{5 \frac{a}{2}} = \frac{1}{5}$$

(6)

$$\text{Given } u = 36 \text{ kmph} = \frac{36 \times 5}{18} = 10 \text{ m/s} ; v = 0 ; a = -4 \text{ m/s}^2$$

$$\text{From } v^2 - u^2 = 2as$$

$$\Rightarrow 0^2 - 10^2 = 2(-4)s$$

$$\Rightarrow -100 = -8s$$

$$\Rightarrow s = \frac{100}{8} = 12.5 \text{ m}$$

$u = 10 \text{ m/s}$
From

⑤

$$u = 10 \text{ m/s} ; a = 10 \text{ m/s}^2 ; s = 3 \text{ m}$$

$$\text{From } v^2 - u^2 = 2as$$

$$\Rightarrow v^2 - 10^2 = 2 \times 10 \times 3$$

$$\Rightarrow v^2 - 100 = 60 \Rightarrow v = \sqrt{160} = 12.64 \text{ m/s}$$

⑥

$$u = 54 \text{ kmph} = 54 \times \frac{5}{18} = 15 \text{ m/s}$$

$$a = -0.4 \text{ m/s}^2$$

$$v = 0 ; s = ?$$

$$\text{From } v^2 - u^2 = 2as$$

$$\Rightarrow 0^2 - (15)^2 = 2(-0.4)s$$

$$\Rightarrow -225 = -0.8s \Rightarrow s = \frac{225}{0.8} = \frac{2250}{8} = 281.25 \text{ m}$$

⑦

$$\text{Given average velocity } \langle v \rangle = \frac{v+u}{2} = 0.34 \text{ m/s}$$

$$\text{change in velocity } v - u = 0.18 \text{ m/s}$$

$$\text{distance } s = 0.06 \text{ m}$$

$$\text{From } v^2 - u^2 = 2as$$

$$\Rightarrow (v+u)(v-u) = 2 \times a \times s \Rightarrow a = \frac{(v+u)}{2} \frac{(v-u)}{s} = 0.34 \times \frac{0.18}{0.06} = 1.02 \text{ m/s}^2$$

⑧

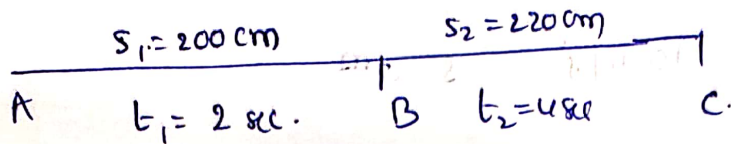
$$u = 4 \text{ m/s} ; a = 6 \text{ m/s}^2 ; n = 10 \text{ s}$$

$$s = u + \frac{a}{2} (2n-1) \Rightarrow s = 4 + 3(19)$$

$$s = 4 + \frac{6}{2} (2 \times 10 - 1) \Rightarrow s = 61 \text{ m}$$



14, 15, 16



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

For AB

$$s_1 = 2u + \frac{1}{2}a(2)^2$$

$$\Rightarrow 200 = 2u + 2a$$

$$\Rightarrow a + u = 100 \rightarrow (1)$$

For AC

$$s_1 + s_2 = u(6) + \frac{1}{2}a(6)^2$$

$$\Rightarrow 420 = 6u + \frac{1}{2}a \times 36 \rightarrow (2)$$

$$\Rightarrow 70 = u + 3a \rightarrow (2)$$

By solving (1) & (2) we get

$$u + a = 100$$

$$u + 3a = 70$$

$$-2a = 30$$

$$\Rightarrow a = -15 \text{ m/s}^2$$

From (1)

$$-15 + u = 100$$

$$\Rightarrow u = 115 \text{ cm/sec}$$

velocity at the end of 7th sec

$$s_n = u + \frac{a}{2}(2n-1)$$

$$= 115 + \frac{(-15)}{2}(2(7)-1)$$

$$= 115 - \frac{15}{2} \times 13$$

$$\approx 10 \text{ m}$$

(17)

$$u = 0; a = 4 \text{ m/s}^2; t = 10 \text{ sec}$$

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

$$= 0 \times 10 + \frac{1}{2} \times 4 \times 10^2$$

$$= 0 + 2 \times 100$$

$$s = 200 \text{ m}$$

(18)

$$a = 2 \text{ m/s}^2; u = 10 \text{ m/s}; t = 4 \text{ sec}$$

$$v = u + at$$

$$v = 10 + 2 \times 4$$

$$= 18 \text{ m/s}$$

