

7th ws-5 - Advanced
Thank

①

①

$$\text{Given speed} = 144 \text{ kmph} = 144 \times \frac{5}{18} = 40 \text{ m/s}$$

$$\text{time} = 5 \text{ sec.}$$

$$\text{distance} = \text{speed} \times \text{time} = 40 \times 5 = 200 \text{ m} \rightarrow A$$

②



$$\text{Total distance} = 9 \text{ m.}$$

$$\text{Total time} = 4 \text{ sec.}$$

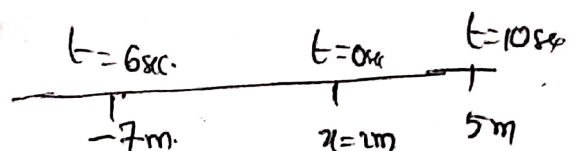
$$\langle \text{velocity} \rangle = \frac{\text{Total displacement}}{\text{Total time}}$$

$$= \frac{9}{4} = 2.25 \text{ m/s} \rightarrow B$$

③

$$\text{at } t_1 = 0 \text{ sec} \rightarrow x = 5 \text{ m}$$

$$t_3 = 10 \text{ sec} \quad x = 2 \text{ m.}$$



$$\text{Total displacement} = -5 + 2 = -3 \text{ m.}$$

$$\text{Total time} = 10 \text{ sec}$$

$$\langle \text{velocity} \rangle = \frac{\text{Total displacement}}{\text{Total time}} = \frac{-3}{10} = -0.3 \text{ m/s} \rightarrow C$$



④

Given $u = 70 \text{ m/s}$; $v = 80 \text{ m/s}$

$$\langle \text{velocity} \rangle = \frac{u+v}{2} = \frac{70+80}{2} = \frac{150}{2} = 75 \text{ m/s} \rightarrow c$$

⑤

$$d_1 = 6 \text{ km} \rightarrow t_1 = 18 \text{ min}$$

$$d_2 = 3 \text{ km} \rightarrow t_2 = 12 \text{ min}$$

$$d_3 = 1 \text{ km} \rightarrow t_3 = 10 \text{ min}$$

$$\text{Total distance travelled} = d_1 + d_2 + d_3$$

$$= 6 \text{ km} + 3 \text{ km} + 1 \text{ km}$$

$$= 10 \text{ km.}$$

$$\text{Total time} = t_1 + t_2 + t_3 = 18 + 12 + 10 = 40 \text{ min}$$

$$\langle \text{velocity} \rangle = \frac{\text{Total distance}}{\text{Total time}} = \frac{10}{40} = 0.25 \text{ km/min} \rightarrow D$$

⑥

$$u = 0 \rightarrow v = 72 \text{ kmph} = 72 \times \frac{5}{18} = 20 \text{ m/s} ; s = 40 \text{ m}$$

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

$$\Rightarrow 20^2 - 0^2 = 2(a)(40)$$

$$\Rightarrow \frac{400}{10} = 2 \times 40 a$$

$$\Rightarrow a = \frac{10}{2} = 5 \text{ m/s}^2 \rightarrow A$$

(2)

(7)

Given $u = 54 \text{ kmph}$ $a = -2 \text{ m/s}^2$
 $v = 36 \text{ kmph}$

$$\therefore u = 54 \times \frac{5}{18} \text{ m/s} = 15 \text{ m/s} \quad ; \quad v = 36 \times \frac{5}{18} = 10 \text{ m/s}$$

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

$$\therefore (v+u)(v-u) = 2as$$

$$\therefore (54+36) \times \frac{5}{18} (36-54) \times \frac{5}{18} = 2 \times (-2) \times s$$

$$\therefore 140 \times \frac{25}{18 \times 18} \times 22 = -4s$$

$$\therefore s = \frac{50 \times 140}{81} \text{ m} =$$

(7)

Given

$$u = 54 \text{ kmph}$$

$$= 54 \times \frac{5}{18} = 3 \times 5 = 15 \text{ m/s}$$

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

$$v = 36 \text{ kmph}$$

$$= 36 \times \frac{5}{18} = 10 \text{ m/s}$$

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

$$\therefore (10^2 - 15^2) = 2(-2)s$$

$$\therefore -125 = -4s$$

$$s = \frac{125}{4} = 31.25 \text{ m} \rightarrow A$$



8

$$u = 72 \text{ kmph} \quad v = 0 \quad t = 3 \text{ sec.}$$

$$\Rightarrow 72 \times \frac{5}{18}$$

$$\Rightarrow 20 \text{ m/s}$$

$$\text{From } v = u + at$$

$$\Rightarrow 0 = 20 + 3a$$

$$\Rightarrow a = -\frac{20}{3} = -6.67 \text{ m/s}^2 \rightarrow c$$

9

$$d = 800 \text{ m} \quad u = 0 \quad a = 8 \text{ m/s}^2$$

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

$$\Rightarrow u^2 = 2 \times 8 \times 800$$

$$\Rightarrow u = 80\sqrt{2} \text{ m/s} \rightarrow D$$

10

$$\begin{array}{c} \uparrow v \\ 40 \text{ m} \\ \rightarrow 30 \text{ m E} \end{array} \quad v_2 = 1.5 \text{ m/s}$$

$$v_1 = 2 \text{ m/s}$$

$$t_1 = \frac{d}{v_1} = \frac{30}{2} = 15 \text{ sec}$$

$$t_2 = \frac{d}{v_2} = \frac{40}{1.5} = \frac{400}{15} = 26.67 \text{ sec}$$

$$|\text{velocity}| = \frac{\text{Total distance}}{\text{Total time}} = \frac{30\hat{i} + 40\hat{j}}{15 + 26.67}$$

$$\Rightarrow \frac{\sqrt{30^2 + 40^2}}{41.67} = \frac{50}{41.67} = 1.19 \approx 1.2 \approx \frac{6}{5} \text{ m/s}$$

(14)

In one hour the minute hand completes one rotation
 $\therefore$ displacement = 0

$$\langle \text{velocity} \rangle = \frac{\text{Total displacement}}{\text{Total time}} = 0$$

(15)

$$s_1 = 29 \text{ m} \rightarrow t_1 = 5 \text{ sec.}$$

$$s_2 = 55 \text{ m} \rightarrow t_2 = 14 \text{ sec.}$$

$$\langle \text{velocity} \rangle = \frac{\text{Total distance}}{\text{total time}} = \frac{29 + 55}{5 + 14} = \frac{84}{19} = 4.42 \text{ m/s}$$

if $u = 0$ From $s = ut + \frac{1}{2}at^2$

$$\Rightarrow 29 = 0 \times 5 + \frac{1}{2}a(5)^2$$

$$\Rightarrow 2a = \frac{29}{2} \Rightarrow a = \frac{58}{25} = 2.32 \text{ m/s}^2$$

(16)

Given

$$u_1 = 50 \text{ kmph} \rightarrow s_1 = 6 \text{ m} \rightarrow v = 0.$$

$$u_2 = 100 \text{ kmph} \rightarrow s_2 = ?$$

From $s \propto u^2$

$$\Rightarrow \frac{s_2}{s_1} = \left[\frac{u_1}{u_2} \right]^2 \Rightarrow \frac{s_2}{6} = \frac{1}{4}$$

$$\Rightarrow \frac{s_2}{6} = \left[\frac{50}{100} \right]^2 \Rightarrow s_2 = 24 \text{ m}$$

(17)

$$u=0 \rightarrow v=108 \text{ kmph} \rightarrow t=15 \text{ sec}$$

$$= 108 \times \frac{5}{18}$$

$$= 30 \text{ m/s}$$

$$\begin{aligned} \therefore \text{From } v &= u + at \rightarrow 30 = 0 + a \times 15 \\ &\rightarrow 30 = 15a \\ &\rightarrow a = 2 \text{ m/s}^2 \end{aligned}$$

(18)

$$\text{Given } u = 24 \text{ m/s} ; a = 0.5 \text{ m/s}^2 ; t = 4 \text{ sec.}$$

$$\begin{aligned} \text{From } s &= ut + \frac{1}{2} at^2 = 24 \times 4 + \frac{1}{2} \times 0.5 \times 4^2 \\ &= 96 + \frac{1}{2} \times 0.5 \times 16 = 96 + 4 = 100 \text{ m} \end{aligned}$$

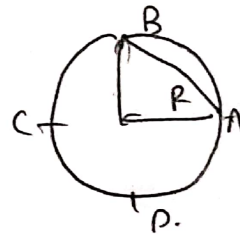
(19)

$$\text{Given } t = 4 \text{ sec.}$$

(a)

Average velocity for $\frac{1}{2}$ rotation

$$= \frac{\text{Displacement}}{\text{Time}} = \frac{2R}{2} = R \rightarrow g$$



(b)

$$\langle \text{speed} \rangle = \frac{\text{Total distance}}{\text{Time}} = \frac{\pi R}{2} \rightarrow h.$$

(c)

$$\text{Acceleration} = \frac{\Delta \text{velocity}}{\text{Time}} = \frac{R}{2} \rightarrow f$$

(h)

$$\text{Acceleration} = \frac{\sqrt{2} R}{1} = \sqrt{2} R \rightarrow h \left[\text{For } \frac{1}{4} \text{th rotation} \right]$$

$$(\text{velocity}) = \frac{\text{Displacement}}{\text{Time}} = \frac{AB = \sqrt{2} R}{t \text{ sec}}$$

Task

CVQ

(2)

$$\text{Total distance covered} = 2\text{cm} + 1.5\text{cm} + 2.5\text{cm} + 3\text{cm} \\ = 10\text{cm}.$$

$$\text{Total time} = 4\text{ sec}$$

$$\langle \text{speed} \rangle = \frac{\text{Total distance}}{\text{Total time}} = \frac{10}{4} = 2.5\text{ cm/sec}$$

(3)

$$\text{Given } d_1 = 40\text{ km} \rightarrow t_1 = 1\text{ hr}$$

$$d_2 = 10\text{ km} \rightarrow t_2 = 15\text{ min} = \frac{15}{60}\text{ hr} = \frac{1}{4}\text{ hr}$$

$$v_1 = \frac{d_1}{t_1} = \frac{40}{1} = 40\text{ kmph} \quad ; \quad v_2 = \frac{10}{\frac{1}{4}} = 40\text{ kmph}$$

Since $v_1 = v_2$ then the body is in uniform motion

(4)

$$\text{Given } R = 200 \quad ; \quad t = 5\text{ min} = 5 \times 60 = 300\text{ sec.}$$

$$\text{Total distance for half revolution} = \pi R$$

$$= \frac{22}{7} \times 200$$

$$\langle \text{speed} \rangle = \frac{\text{Total distance}}{\text{Total time}} = \frac{\frac{22}{7} \times 200}{300} =$$

$$= \frac{44}{21}\text{ m/s.}$$

(1)

$$u_1 = 60 \text{ kmph} \rightarrow s_1 = 20 \text{ m.}$$

$$u_2 = 120 \text{ kmph} \rightarrow s_2 = ?$$

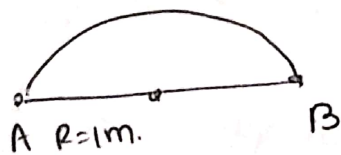
$$\text{From } s = \frac{v^2}{2a} \Rightarrow s \propto v^2$$

$$\Rightarrow \frac{s_1}{s_2} = \left(\frac{u_1}{u_2} \right)^2$$

$$\Rightarrow \frac{20}{s_2} = \left(\frac{60}{120} \right)^2 = \left(\frac{1}{2} \right)^2$$

$$\Rightarrow \frac{20}{s_2} = \frac{1}{4} \Rightarrow s_2 = 80 \text{ m} \rightarrow D$$

(2)



$$t = 1 \text{ sec.}$$

$$\text{displacement} = 2r = 2(1) = 2 \text{ m.}$$

$$\langle \text{velocity} \rangle = \frac{\text{displacement}}{\text{time}} = \frac{2}{1} = 2 \text{ m/s}$$

(3)

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

$$\begin{aligned} \text{distance covered by the body } s &= ut + \frac{1}{2} at^2 \\ &= 0 \times 2 + \frac{1}{2} \times 10 \times 2^2 \\ &= 0 + 20 = 20 \text{ m} \end{aligned}$$

(4)

$$u_1 = 24 \text{ m/s} ; u_2 = 36 \text{ m/s}$$

$$\begin{aligned} s &\propto u^2 \\ \Rightarrow \frac{s_1}{s_2} &= \left(\frac{u_1}{u_2} \right)^2 = \left(\frac{24}{36} \right)^2 = \left(\frac{2}{3} \right)^2 = \frac{4}{9} \end{aligned}$$

(5)

(5)

$$u = 10 \text{ m/s}; \quad t = 5 \text{ sec} \quad v = 20 \text{ m/s}$$

$$3 \text{ sec earlier velocity } v' = u + at' \quad (t' = 3 \text{ sec})$$

$$\rightarrow (1)$$

$$\text{From } v - u = at \quad \text{for } 5 \text{ sec}$$

$$\Rightarrow 20 - 10 = 5a$$

$$\Rightarrow a = \frac{10}{5} = 2 \text{ m/s}^2$$

From (1)

$$v' = 10 + 2 \times 3 = 10 + 6 = 16 \text{ m/s}$$

(6)

$$\text{Given } u_A = 0, \quad a_1, \quad t_1 = 2 \text{ sec.}$$

$$u_B = 0 \rightarrow a_2$$

Given displacement of A & B in 5th sec is same.

$$s_A = s_B$$

$$\Rightarrow u_A + \frac{a_A}{2} (2n-1) = u_B + \frac{a_B}{2} (2n-1)$$

$$\Rightarrow \frac{a_A}{2} (2 \times 5 - 1) = \frac{a_B}{2} (2 \times 5 - 1)$$

$$\Rightarrow a_A = a_B \quad \Rightarrow \frac{a_A}{a_B} = \frac{1}{1}$$

(7)

From A $\rightarrow$ B $\rightarrow$ C.

Displacement = length of diagonal

$$= \sqrt{2} \times \text{side} = \sqrt{2} l$$

$$\angle \text{velocity} = \frac{\text{Total displacement}}{\text{time}} = \frac{\sqrt{2} l}{t}$$



⑧

$$V_1 = 20 \text{ kmph} ; V_2 = 40 \text{ kmph} ; V_3 = 80 \text{ kmph}$$

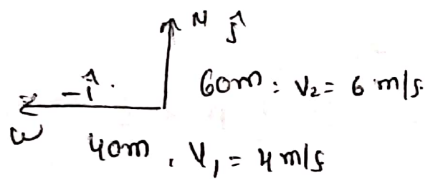
$$\langle \text{speed} \rangle = \frac{3V_1 V_2 V_3}{V_1 V_2 + V_2 V_3 + V_3 V_1}$$

$$= \frac{3 \times 20 \times 40 \times 80}{20 \times 40 + 40 \times 80 + 80 \times 20}$$

$$= \frac{3 \times 800 \times 80}{800 + 3200 + 1600} = \frac{3 \times 800 \times 80}{5600}$$

$$= \frac{240}{7} = 34 \text{ kmph}$$

⑨



$$\text{Total time} = \frac{S_1}{V_1} + \frac{S_2}{V_2}$$

$$= \frac{40}{4} + \frac{60}{6} = 20 \text{ s}$$

$$\langle \text{speed} \rangle = \frac{\text{total distance}}{\text{total time}}$$

$$= \frac{60 + 40}{20} = \frac{100}{20} = 5 \text{ m/s}$$

⑩

$$\text{Given } s = 1.5t - 4.8t^2$$

$$\text{Initial velocity at } t=0 \quad u = \frac{ds}{dt} = \frac{d}{dt} [1.5t - 4.8t^2]$$

$$= 1.5 - 4.8 \frac{d}{dt} (t^2)$$

$$= [1.5 - 4.8(2t)] = 1.5 - 9.6t$$

$$= 1.5 - 9.6(0)$$

$$= 1.5 \text{ m/s}$$



(6)

10th continuation

$$u = 1.5 - 9.6t$$

$$\begin{aligned}\text{Acceleration} &= \frac{du}{dt} = \frac{d}{dt} [1.5 - 9.6t] \\ &= \frac{d}{dt} (1.5) - 9.6 \frac{d}{dt} t \\ &= 0 - 9.6 = -9.6 \text{ m/s}^2\end{aligned}$$

(15)

Given $u = 0$: $a = 2 \text{ m/s}^2$: $v = 72 \text{ kmph} = 72 \times \frac{5}{18} = 20 \text{ m/s}$

From $v = u + at$

$$\Rightarrow 20 = 0 + 2t \Rightarrow 2t = 20 \Rightarrow t = 10 \text{ sec.}$$

velocity at the end of 7th sec

$$v = u + at = 0 + 2 \times 7 = 14 \text{ m/s.}$$

displacement

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

$$\Rightarrow (20)^2 - 0^2 = 2 \times 2 \times s$$

$$\Rightarrow 400 = 4s \Rightarrow s = 100 \text{ m}$$

(16)

Given ~~u = 6 m/s~~ $u = 6 \text{ m/sec}$: $a = 3 \text{ m/s}^2$: $n = 4^{\text{th}}$

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

$$s = 6 + \frac{3}{2} (2(4)-1)$$

$$= 6 + \frac{3}{2} \times 7$$

$$= 6 + \frac{21}{2} = 6 + 10.5 = 16.5 \text{ m}$$

(17)

Given $v_1 = 30 \text{ m/sec}$; $v_2 = 50 \text{ m/sec}$

If a body covers $\frac{1}{3}$ rd of distance with v_1 and $\frac{2}{3}$ rd of distance with speed v_2

$$\text{Average speed} = \frac{3v_1v_2}{2v_1 + v_2} = \frac{3 \times 30 \times 50}{2 \times 30 + 50}$$

$$= \frac{90 \times 50}{60 + 50} = \frac{90 \times 50}{110} = \frac{450}{11}$$

$$= 40.98 \text{ m/s}$$

(18)

Given

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

(a) initial velocity $u = 0$

(b) acceleration $a = \frac{v - u}{t} = \frac{10 - 0}{4} = \frac{10}{4} = 2.5 \text{ m/s}^2$

$$(c) s_n = u + \frac{a}{2} (2n - 1) = 0 + \frac{2.5}{2} (2(3) - 1) = 0 + \frac{2.5 \times 5}{2}$$

$$s_n = 6.25 \text{ m}$$

(d) distance travelled $s = ut + \frac{1}{2} at^2 = 0 \times 4 + \frac{1}{2} \times 2.5 \times 4^2$
 $= 0 + \frac{1}{2} \times 2.5 \times 16$
 $= 2.5 \times 8$
 $= 20 \text{ m}$