YAKEEN NEET 2.0

2026

Motion in a straight line

PHYSICS | Lecture - 11

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Todays Goal

Motion under gravity

KPP-15

→ Part 1 ≡ Easy ≡ PYQ level से little above.

→ Part 2 =(Level up) ≡ Panic Mat hona...

- Learning
- Rank booster.

20% good

40 % V good.

60-70% Gajab

Q A particle is projected with velocity 80m/s along $+x$ Axis from origin s.t its acc is $-10 m/s^2$.

① Find when v become zero. $t = 8$

② find v at $t = 2$, $t = 10$

③ Find x-co-ordinate at $t = 2$, $t = 10$

④ When particle will come to origin. $\Rightarrow t = 16$

⑤ $t = 0 \longrightarrow t = 10$ Distance travel by particle.

⑥ $t = 0 \longrightarrow t = 10$ Avg acc.

⑦ $t = 0 \longrightarrow t = 10$ Avg velocity.

⑧ Find x_{max}

⑧ $v^2 = u^2 + 2as$

$0 = (80)^2 - 2 \times 10 \times x_{max}$

$x_{max} = \frac{(80)^2}{20} = 320$

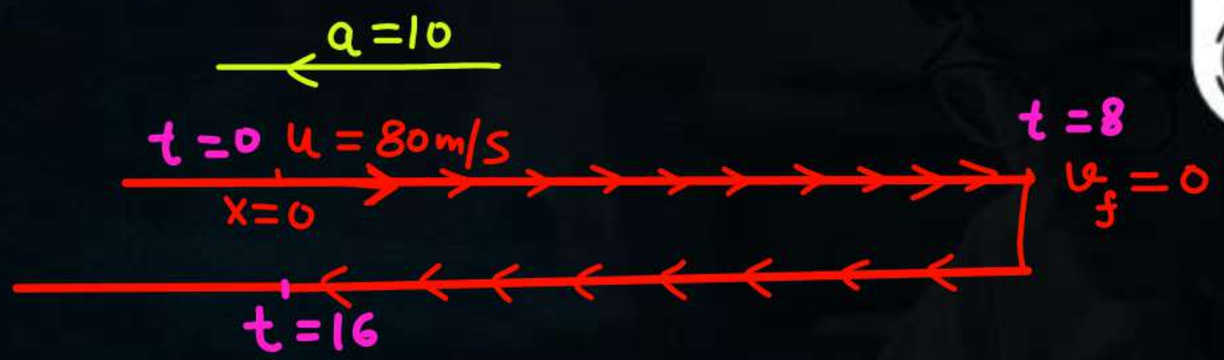
Stopping dist. $= \frac{u^2}{2a} = \frac{80^2}{2 \times 10}$

② $t=2$, $v=60$

$t=10$, $v=-20$

③ $t=2$, $x = 80\times 2 - \frac{1}{2}\times 10\times 2^2$

$x = 140$



$t=10$, $x = 80\times 10 - \frac{1}{2}\times 10\times 10^2 = 300$

$A_1 = \frac{1}{2}\times 8\times 80$

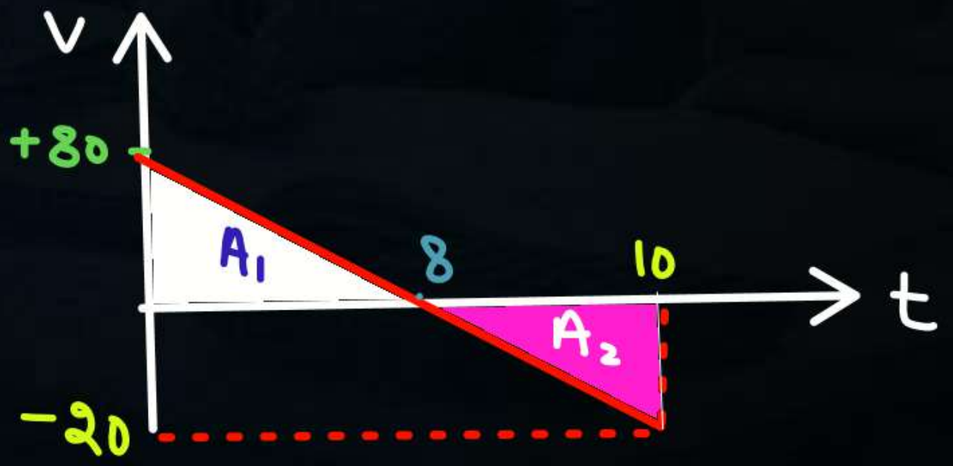
$= 320$

⑤ $(t=0 \rightarrow t=10)$ $A_1 = \frac{1}{2}\times 8\times 80 = 320$

$A_2 = \frac{1}{2}\times 2\times 20 = 20$

Displacement $= 320-20 = 300$

Distance $= 320+20 = 340$



$\langle \vec{acc} \rangle = \frac{v_f - v_i}{\text{time}} = \frac{-20-80}{10} = -10$

$\langle \vec{v} \rangle = \frac{300}{10} = 30$ or $\langle \vec{v} \rangle = \frac{\vec{u}+\vec{v}}{2} = \frac{80+(-20)}{2} = 30\hat{i}$

Motion Under Gravity

$$g = \frac{GM}{r^2} = \frac{GM}{(R+h)^2}$$

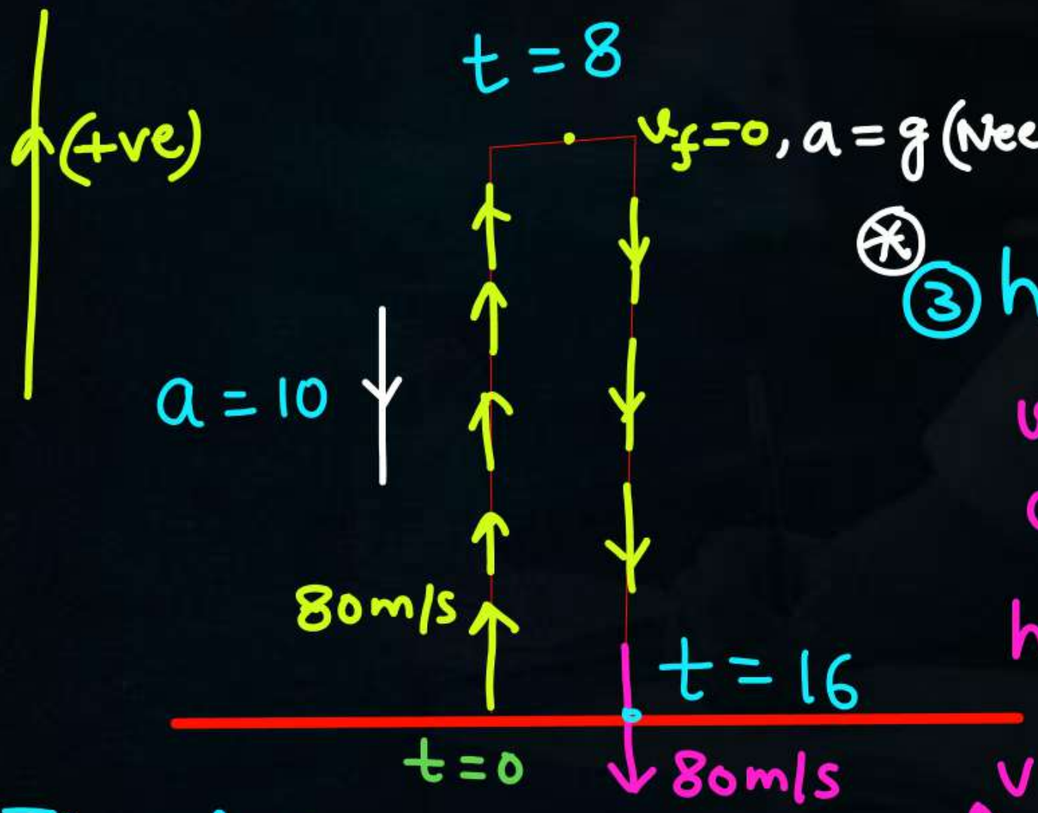
Assumption

- Air resistance & other forces except gravity is neglected until mention.
- Variation of g is neglected.

$g = 9.8\ m/s^2$

$g = 10\ m/s^2$ $\left(g \longrightarrow \text{Const}\right)$

Q A particle is projected vertically upward with velocity 80 m/s.



① Find when particle will comes to at rest

$t = 8$ sec

② $T = 8 + 8 = 16 =$ Time of flight

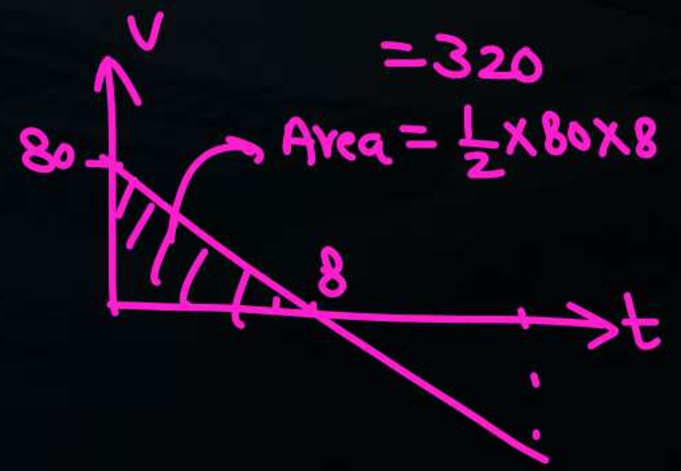
③ $h_{max} = \frac{u^2}{2a} = \frac{(80)^2}{2 \times 10} = 320$

✱ ③ h_{max} (3^{rd} eqⁿ of motion)

$v^2 = u^2 + 2as$

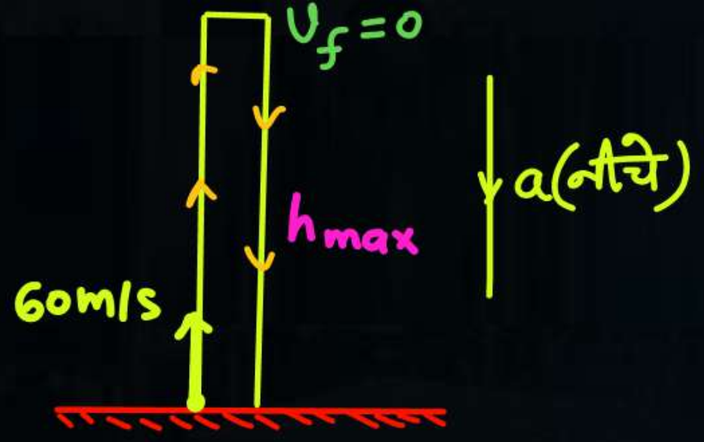
$0 = (80)^2 - 2 \times 10 \times h$

$h = 320 = h_{max}$



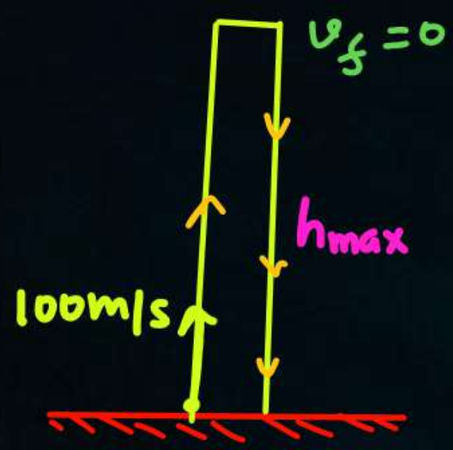
$= 320$

(1)



- Time of flight = T = 6+6 = 12
- $0^2 = (60)^2 - 2 \times 10 \times h_{max}$

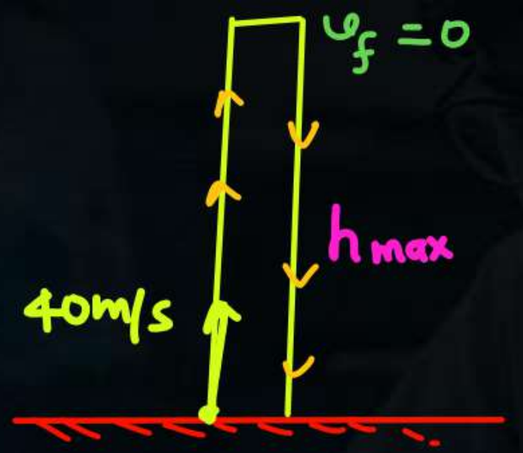
$h_{max} = 180$



$T = 10+10 = 20$

$0^2 = (100)^2 - 2 \times 10 \times h_{max}$

$h_{max} = 500$



$T = 4+4 = 8$

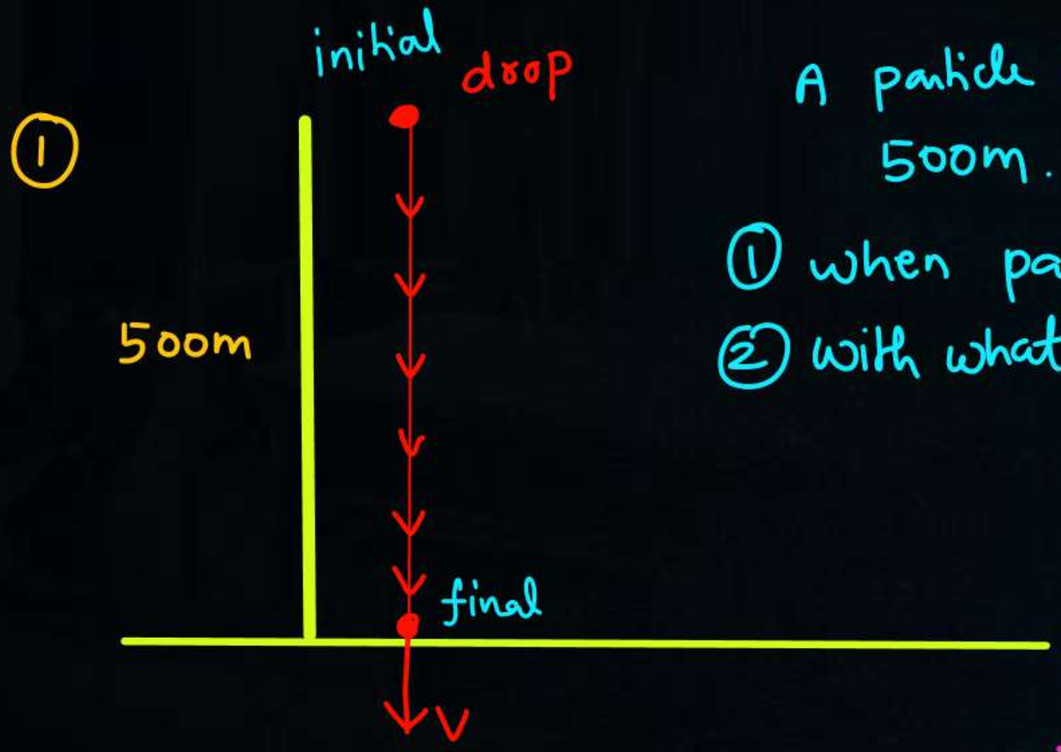
$0^2 = (40)^2 - 2 \times 10 \times h_{max}$

$h_{max} = 80$

Sign Convention

* SKC → Upar/Neeche → Jahan tera dil kare Udhar positive man lo
Answer will come same.

But Agar ques wale ne ye bol dia ki idhar positive mano to udhar hi manna.



A particle is drop from top of a tower of height 500m. find

① when particle will hit the ground

② with what velocity particle will hit the ground.

Sol^{n} Downward positive let

$u = 0$

$a = 10$ (downward)

$a = +10$

$S = 500$ (Neeche) $= +500$

① $S = ut + \frac{1}{2}at^2$

$500 = 0 + \frac{1}{2} \times 10 \times t^2$

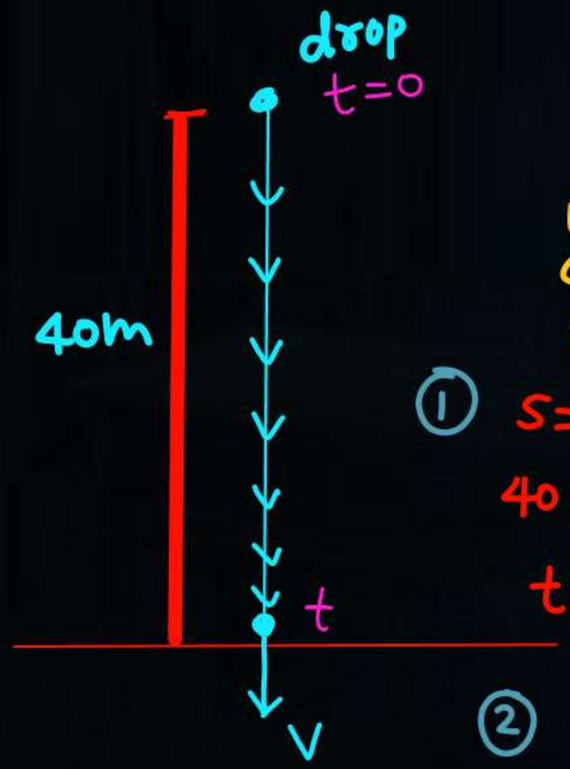
$\boxed{t = 10 \text{ sec}}$

② $v^2 = u^2 + 2as$

$v^2 = 0 + 2 \times 10 \times 500$

$\boxed{V = 100}$ Downward.

(2)



Downward positive.

$u = 0$

$a = +10$

$s = +40$

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

$40 = 0 + \frac{1}{2} \times 10 \times t^2$

$t = \sqrt{8} = 2\sqrt{2}$

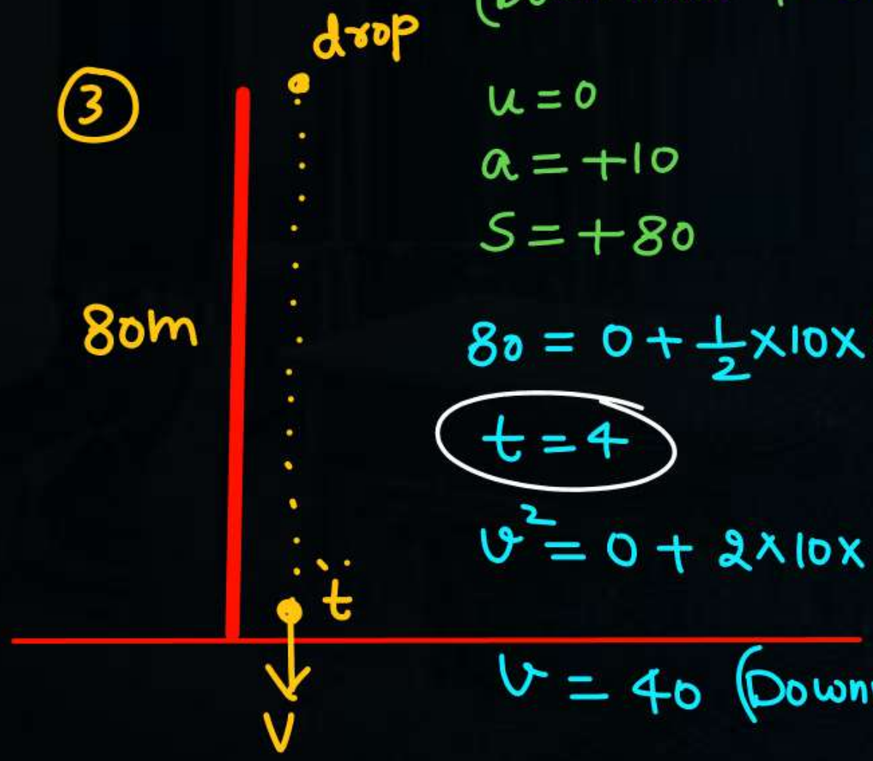
(2) $v^2 = 0^2 + 2 \times 10 \times 40$

$v = \sqrt{800}$

$v = 10\sqrt{8}$

(Downward positive)

(3)



$u = 0$

$a = +10$

$S = +80$

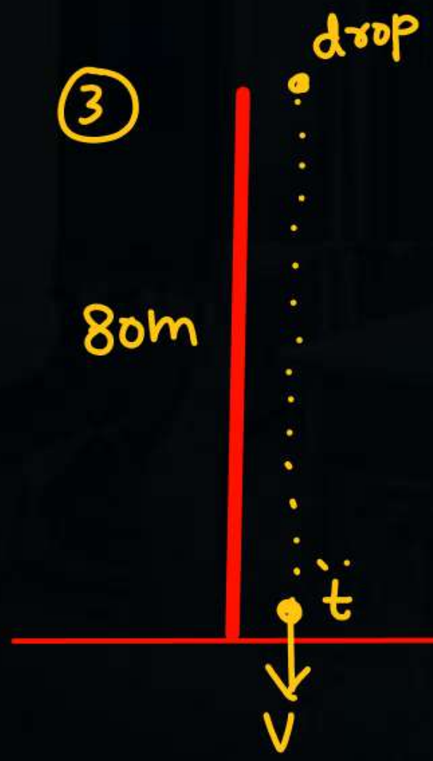
$80 = 0 + \frac{1}{2} \times 10 \times t^2$

$t = 4$

$v^2 = 0 + 2 \times 10 \times 80$

$v = 40$ (Downward.)

(Downward positive)



(3)

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(Downward positive)

③

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$S = +80$

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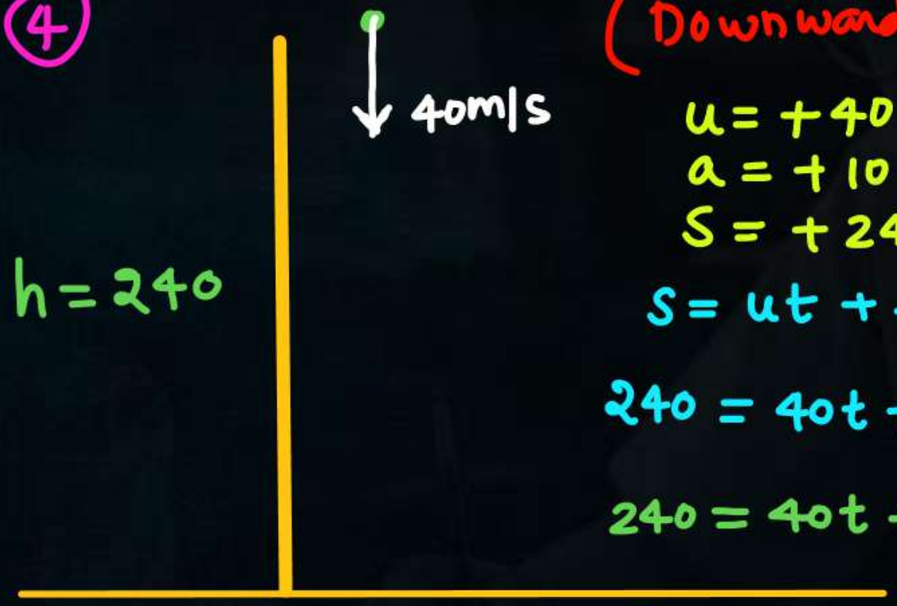
$t = 4$

$v^2 = 0 + 2 \times 10 \times 80$

$v = 40$ (Downward.)

④



(Downward +ve)

$u = +40$

$a = +10$

$S = +240$

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

$240 = 40t + \frac{1}{2} \times 10 \times t^2$

$240 = 40t + 5t^2$

$t^2 + 8t - 48 = 0$

$t^2 + 12t - 4t - 48 = 0$

$t(t+12) - 4(t+12) = 0$

$(t-4)(t+12) = 0$

$t = 4$

$t = -12$ ✗

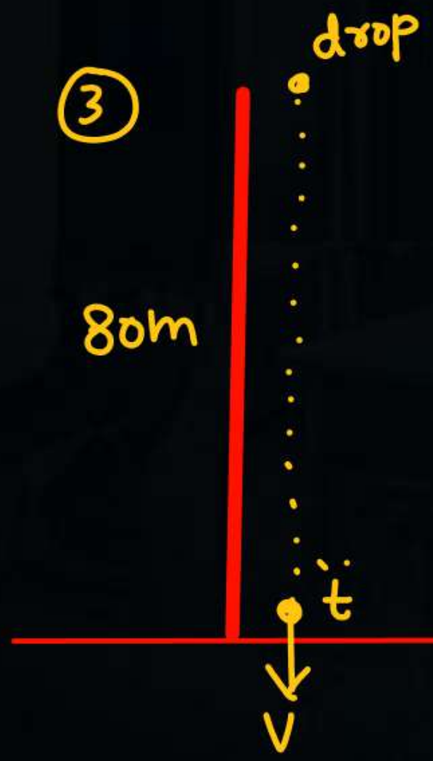
$v^2 = (40)^2 + 2 \times 10 \times 240$

$v =$ ✓

f

(Downward positive)

(3)



$u = 0$

$a = +10$

$S = +80$

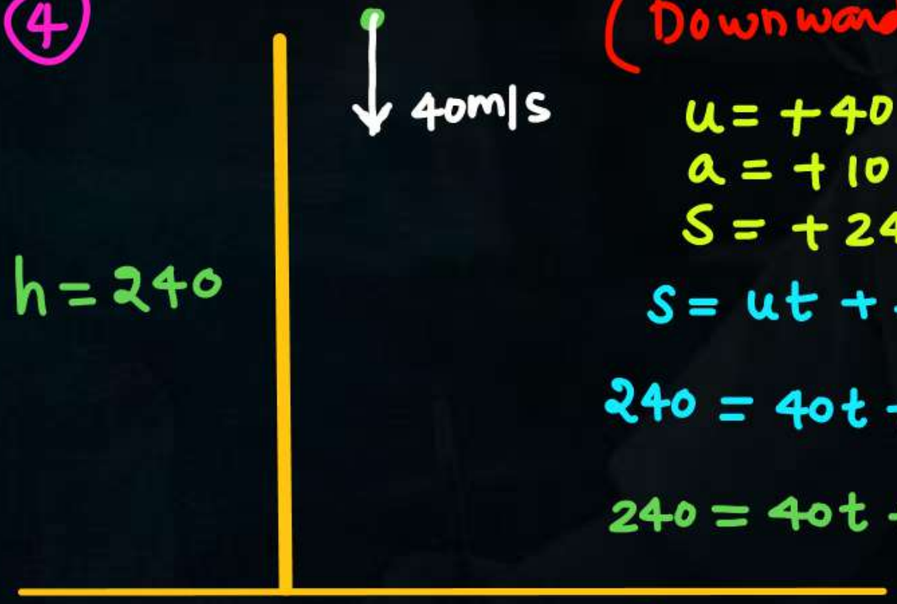
$80 = 0 + \frac{1}{2} \times 10 \times t^2$

$t = 4$

$v^2 = 0 + 2 \times 10 \times 80$

$v = 40$ (Downward.)

(4)



(Downward +ve)

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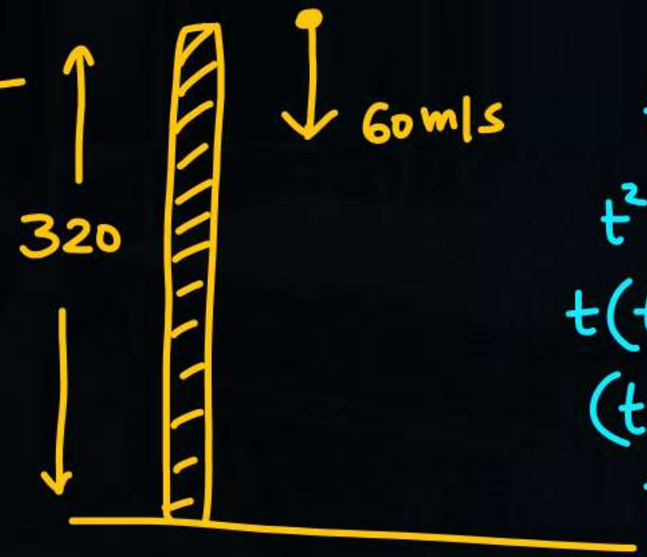
$t = -12$ ✗

$v^2 = (40)^2 + 2 \times 10 \times 240$

$v = 80$ f

Q



$t^2+12t-64=0$

$t^2+16t-4t-64=0$

$t(t+16)-4(t+16)=0$

$(t-4)(t+16)=0$

$\boxed{t=4}$

Downward (+ve)

$u=+60$

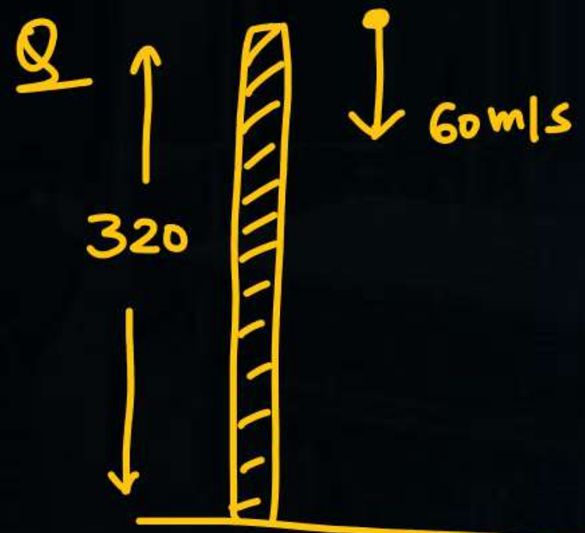
$a=+10$

$S=320$

$320 = 60t + \frac{1}{2}\times 10\times t^2$

$t^2+12t-64=0$

Q



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$t^2+16t-4t-64=0$

$t(t+16)-4(t+16)=0$

$(t-4)(t+16)=0$

$t=4$

Downward (+ve)

$u=+60$

$a=+10$

$S=320$

$320 = 60t + \frac{1}{2}\times 10\times t^2$

$t^2+12t-64=0$

$t^2-16t+4t-64=0$

$t(t-16)+4(t-16)=0$

$(t-16)(t+4)=0$

$t=16$

Downward (+ve)

$u=-60$

$a=+10$

$S=320$

$320 = -60t + \frac{1}{2}\times 10\, t^2$

$t^2-12t-64=0$

Q

Upward dir^n is positive

$u = +60$

$a = -10$

$s = -320$

$$-320 = 60t - \frac{1}{2} \times 10 \times t^2$$

$$-320 = 60t - 5t^2$$

$$5t^2 - 60t - 320 = 0$$

$$t^2 - 12t - 64 = 0$$

$$\boxed{t = 16}$$

Q

upward positive

$u = +40$

$a = -10$

$S = -240$ (Neeche)

$$-240 = 40t - \frac{1}{2}.10.t^2$$

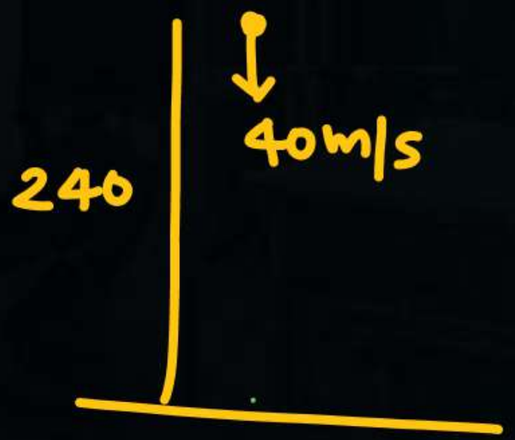
$$t = 12\,sec$$

($v = 80$ downward)

$$V_f^2 = (40)^2 + 2(-10)(-240)$$

$V_f = 80$ Downward.

Directly



$240 = 40t + \frac{1}{2} 10 t^2$

$320 = 60 + \frac{1}{2} \times 10 \times t^2$

Home work

- KPP - 15 part 1 (1 - 24)
- DPP
- Revise today notes

join it

THANK YOU