DPP

DAILY PRACTICE PROBLEMS

CLASS : XITH
DATE :

Solutions

SUBJECT : PHYSICS
DPP NO. : 6

Topic :- MOTION IN A STRAIGHT LINE

1 **(a)**

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

$s = \frac{1}{2}at^2$ $[\because u = 0]$

It is an equation of parabola

2 **(b)**

Speed of stone in a vertically upward direction is $20 m/s$. So for vertical downward motion we will consider $u = -20\ m/s$

$v^2 = u^2 + 2gh = (-20)^2 + 2 \times 9.8 \times 200 = 4320\ m/s$

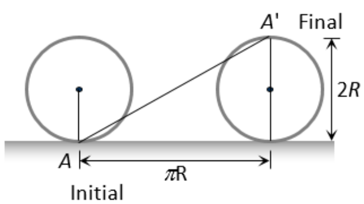
$\therefore v \simeq 65 m/s$

3 **(a)**

$h = \frac{1}{2}gt^2 = \frac{1}{2} \times 10 \times (4)^2 = 80\ m$

4 **(c)**

Horizontal distance covered by the wheel in half revolution $= \pi R$



So the displacement of the point which was initially in contact with ground

$= AA' = \sqrt{(\pi R)^2 + (2R)^2}$

$= R\sqrt{\pi^2 + 4} = \sqrt{\pi^2 + 4}$ [As $R = 1m$]

5 **(b)**

$h = \frac{1}{2}gt^2$

$h' = \frac{1}{2}g(t - t_0)^2$

$$h - h' = \frac{1}{2}g[t^2 - (t - t_0)^2]$$

$$= \frac{1}{2}g[t^2 - t^2 - t_0^2 + 2tt_0]$$

$$\Delta h = \frac{1}{2}gt_0(2t - t_0)$$

Δh is increasing with time

6 **(d)**

Average acceleration = $\frac{\text{Change in velocity}}{\text{Time taken}} = \frac{v_2 - v_1}{t_2 - t_1}$

$$= \frac{[10 + 2(5)^2] - [10 + 2(2)^2]}{3} = \frac{60 - 18}{3} 14 m/s^2$$

7 **(d)**

Relative velocity

$= 10 + 5 = 15\ m/sec$

$\therefore t = \frac{150}{15} = 10\ sec$

8 **(a)**

If a body starts from rest with acceleration α and then retards with retardation β and comes to rest. The total time taken for this journey is t and distance covered is S

Then $S = \frac{1}{2}\frac{\alpha\beta t^2}{(\alpha + \beta)} = \frac{1}{2}\frac{5 \times 10}{(5 + 10)} \times t^2$

$\Rightarrow 1500 = \frac{1}{2}\frac{5 \times 10}{(5 + 10)} \times t^2 \Rightarrow t = 30\ sec$

9 **(a)**

$h = \frac{1}{2}gt^2 = \frac{1}{2} \times 10 \times (4)^2 = 80\ m$

10 **(a)**

Effective speed of bullet

$=$ speed of bullet + speed of police jeep

$= 180\ m/s + 45\ km/h = (180 + 12.5)\ m/s = 192.5\ m/s$

Speed of thief's jeep $= 153\ km/h = 42.5\ m/s$

Velocity of bullet $w.r.t.$ thief's car $= 192.5 - 42.5 = 150\ m/s$

11 **(b)**

$v = u + a\,t$

$2 \times 100 = 100 + 10t$ or $t = 10$ s

12 **(b)**

Bullet will take $\frac{100}{1000} = 0.1 sec$ to reach target.

During this period vertical distance (downward) travelled by the bullet $= \frac{1}{2}gt^2 = \frac{1}{2} \times 10 \times (0.1)^2 m = 5 cm$

So the gun should be aimed 5 cm above the target

13 **(a)**

Average velocity $= \frac{2 \times 8 \times 12}{8 + 12} ms^{-1} = 9.6 ms^{-1}$

14 **(a)**

$s=\frac{1}{2}gt^2, v=\frac{1}{2}g\times 2t=gt$

15 **(b)**

Average speed is the ratio of distance to time taken

Distance travelled from 0 to $5s=40\ m$

Distance travelled from 5 to $10s=0\ m$

Distance travelled from 10 to $15s=60\ m$

Distance travelled from 15to $20s=20$

So, total distance $=40+0+60+20=120\ m$

Total time taken $=20\ minutes$

Hence, average speed

$=\frac{\text{distance travelled }(m)}{\text{time (min)}}=\frac{120}{20}=6\ m/min$

16 **(c)**

From given figure, it is clear that the net displacement is zero. So average velocity will be zero

17 **(d)**

$v=\sqrt{2\ gh}$ ...(i)

After rebounce, $v^2=u^2-2gh$

Or $u^2=v^2+2\ gh'$

$\therefore$ $u^2=2\ gh'$ ...(ii)

$\therefore$ $\frac{v^2}{u^2}=\frac{2gh}{2gh'}$

Or $h'=h\times\frac{u^2}{v^2}$

$=h\times\left(\frac{80}{100}\right)^2=0.64\ h$

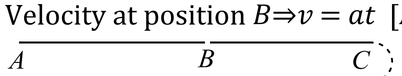
18 **(b)**

In this problem point starts moving with uniform acceleration a and after time t (Position B) the direction of acceleration get reversed i.e. the retardation of same value works on the point. Due to this velocity of points goes on decreasing and at position C its velocity becomes zero. Now the direction of motion of point reversed and it moves from C to A under the effect of acceleration a.

We have to calculate the total time in this motion.

Starting velocity at position A is equal to zero.

Velocity at position $B\Rightarrow v=at$ [As $u=0$]



Distance between A and B, $S_{AB} = \frac{1}{2}at^2$

As same amount of retardation works on a point and it comes to rest therefore

$S_{BC} = S_{AB} = \frac{1}{2}a\,t^2$

$\therefore S_{AC} = S_{AB} + S_{BC} = a\,t^2$ and time required to cover this distance is also equal to t.

$\therefore$ Total time taken for motion between A and $C = 2t$

Now for the return journey from C to A $\left(S_{AC} = at^2\right)$

$S_{AC} = u\,t + \frac{1}{2}at^2 \Rightarrow at^2 = 0 + \frac{1}{2}at_1^2 \Rightarrow t_1 = \sqrt{2}t$

Hence total time in which point returns to initial point

$T = 2t + \sqrt{2}\,t = (2 + \sqrt{2})t$

19 **(c)**

$t = \sqrt{\frac{2h}{(g + a)}} = \sqrt{\frac{2 \times 2.7}{(9.8 + 1.2)}} = \sqrt{\frac{5.4}{11}} = \sqrt{0.49} = 0.7$ sec

As $u = 0$ and lift is moving upward with acceleration

20 **(d)**

Man walks from his home to market with a speed of 5 km/h. Distance $= 2.5$ km and time $= \frac{d}{v} = \frac{2.5}{5} = \frac{1}{2}\,hr$ and he returns back with speed of 7.5 km/h in rest of time of 10 $minutes$

Distance $= 7.5 \times \frac{10}{60} = 1.25\ km$

So, Average speed $= \frac{\text{Total distance}}{\text{TOtal time}}$

$= \frac{(2.5 + 1.25)km}{(40/60)hr} = \frac{45}{8}\,km/hr$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	A	B	A	C	B	D	D	A	A	A
Q.	11	12	13	14	15	16	17	18	19	20
A.	B	B	A	A	B	C	D	B	C	D