DPP
DAILY PRACTICE PROBLEMS

CLASS : XIth
DATE :

Solutions

SUBJECT : PHYSICS
DPP NO. : 7

Topic :- MOTION IN A STRAIGHT LINE

1 **(c)**

As v^2=v^2 - $2as$⇒$u^2 = 2as$ ($\therefore v = 0$)

$\Rightarrow u^2 \propto s \Rightarrow \frac{u_2}{u_1} = \left(\frac{s_2}{s_1}\right)^{1/2}$

$\Rightarrow u_2 = \left(\frac{9}{4}\right)^{\frac{1}{2}} u_1 = \frac{3}{2} u_1 = 300 m/s$

2 **(b)**

$\int_0^x dx = \int_0^1 (v_0 + gt + ft^2) dt$

$x = v_0 + g\left(\frac{1}{2}\right) + f\left(\frac{1}{3}\right)$

3 **(d)**

Let the car accelerate at rate α for time t_1 then maximum velocity attained,

$v = 0 + at_1 = at_1$

Now, the car decelerates at a rate β for time $(t$ - $t_1)$ and finally comes to rest. Then,

$0 = v$ - $\beta(t$ - $t_1) \Rightarrow 0 = \alpha t_1$ - $\beta t + \beta t_1$

$\Rightarrow t_1 = \frac{\beta}{\alpha + \beta} t$

$\therefore v = \frac{\alpha\beta}{\alpha + \beta} t$

4 **(b)**

$a = \sqrt{a_x^2 + a_y^2}$

$= \left[\left(\frac{d^2x}{dy}\right)^2 + \left(\frac{d^2y}{dt^2}\right)^2\right]^{\frac{1}{2}}$

Here, $\frac{d^2y}{dx^2} = 0$

Hence, $a = \frac{d^2x}{dt^2} = 8\text{ms}^{-2}$

5 **(a)**

Let t_1 and t_2 be times taken by the car to go from X to Y and then from Y to X respectively.

Then, $t_1 + t_2 = \frac{XY}{v_u} + \frac{XY}{v_d} = XY\left(\frac{v_u + u_d}{v_u v_d}\right)$

Total distance travelled

$$= XY + XY = 2\ XY$$

Therefore, average speed of the car for this round trip is

$$\text{Average speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

$$v_{\text{av}} = \frac{2\ XY}{XY\left(\frac{v_u + v_d}{v_u v_d}\right)} \text{ or } v_{\text{av}} = \frac{2v_u v_d}{v_u + v_d}$$

6 **(d)**

Stopping distance $s \propto u^2$

$$\Rightarrow \qquad \frac{s_2}{40} = \left(\frac{90 \times \frac{5}{18}}{50 \times \frac{5}{18}}\right)^2$$

$$\Rightarrow \qquad s_2 = 129.6\text{ m}$$

7 **(c)**

$S \propto t^2 \Rightarrow \frac{S_1}{S_2} = \left(\frac{10}{20}\right)^2 \Rightarrow S_2 = 4S_1$

8 **(b)**

$\int_{6.25}^{0} \frac{dv}{\sqrt{v}} = -2.5 \int_0^t dt$

$|2\sqrt{v}|_{6.25}^{0} = -2.5t$

$2\sqrt{6.25} = 2.5t$

$t = 2sec$

9 **(a)**

$\frac{1}{2}at^2 = vt \Rightarrow t = \frac{2v}{a}$

10 **(d)**

Acceleration due to gravity is independent of mass of body

11 **(b)**

$$v = u + at$$

$\Rightarrow -2 = 10 + a \times 4$

$\therefore \quad a = -3$ ms^{-2}

12 **(c)**

Acceleration $= a = \dfrac{dv}{dt} = 0.1 \ \times 2t = 0.2t$

Which is time dependent *i.e.* non-uniform acceleration

13 **(c)**

Since acceleration due to gravity is independent of mass, hence time is also independent of mass (or density) of object

14 **(b)**

Time of ascent $= \frac{u}{g} = 6$ sec$\Rightarrow u = 60m/s$

Distance in first second $h_{first} = 60 - \frac{g}{2}(2 \times 1 - 1) = 55m$

Distance in seventh second will be equal to the distance in first second of vertical downward motion

$h_{seventh} = \dfrac{g}{2}(2 \times 1 - 1) = 5\ m \Rightarrow h_{first}/h_{seventh} = 11{:}1$

15 **(b)**

$x = a + bt^2, v = \dfrac{dx}{dt} = 2bt$

Instantaneous velocity $v = 2 \times 3 \times 3 = 18\ cm/sec$

16 **(d)**

$u = \sqrt{2gh} = \sqrt{2 \times 10 \times 20} = 20m/s$

and $T = \frac{2u}{g} = \frac{2 \times 20}{10} = 4\ sec$

17 **(c)**

If a stone is dropped from height h then

$h = \frac{1}{2}gt^2$ ...(i)

if a stone is thrown upward with velocity u then

$h = -u\,t_1 + \frac{1}{2}gt_1^2$ ...(ii)

If a stone is thrown downward with velocity u then

$h = ut_2 + \frac{1}{2}gt_2^2$ ...(iii)

From (i) (ii) and (iii) we get

$-ut_1 + \frac{1}{2}gt_1^2 = \frac{1}{2}gt^2$ ...(iv)

$ut_2 + \frac{1}{2}gt_2^2 = \frac{1}{2}gt^2$ ...(v)

Dividing (iv) and (v) we get

$$\therefore \frac{-ut_1}{ut_2} = \frac{\dfrac{1}{2}g(t^2 - t_1^2)}{\dfrac{1}{2}g(t^2 - t_2^2)}$$

Or $-\frac{t_1}{t_2} = \frac{t^2 - t_1^2}{t^2 - t_2^2}$

By solving $t = \sqrt{t_1 t_2}$

18 **(d)**

$3t = \sqrt{3x} + 6 \Rightarrow 3x = (3t - 6)^2$

$\Rightarrow x = 3t^2 - 12t + 12$

$v = \frac{dx}{dt} = 6t - 12$, for $v = 0, t = 2$ sec

$x = 3(2)^2 - 12 \times 2 + 12 = 0$

19 **(b)**

Let the total distance travelled by the body is $2S$. If t_1 is the time taken by the body to travel first half of the distance, then

$$t_1 = \frac{S}{2}$$

Let t_2 be the time taken by the body for each time interval for the remaining half journey.

$$\therefore \quad S = 3t_2 + 5t_2 = 8t_2$$

So, average speed $= \frac{\text{Total distance travelled}}{\text{Total time taken}}$

$$= \frac{2S}{t_1 + 2t_2} = \frac{2S}{\frac{S}{2} + \frac{S}{4}} = \frac{8}{3}\text{ms}^{-1}$$

20 **(a)**

Displacement = Area of upper trapezium- Area of lower trapezium

$= \frac{1}{2}(2 + 4) \times 4 - \frac{1}{2}(2 + 4)2 = 12 - 6 = 6\text{m}$

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