# DPP
DAILY PRACTICE PROBLEMS

CLASS : XITH
DATE :

**Solutions**

SUBJECT : PHYSICS
DPP NO. : 1

## TOPIC :- MOTION IN A STRAIGHT LINE

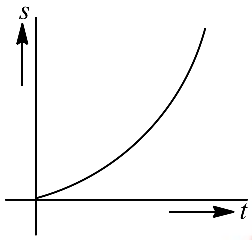
2 **(a)**

The equation of motion

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

$= 0 + \frac{1}{2} at^2 = \frac{1}{2} at^2$

The graph plot is as shown.




3 **(b)**

Let the initial velocity of ball be $u$

Time of rise $t_1 = \frac{u}{g+a}$ and height reached $= \frac{u^2}{2(g+a)}$

Time of fall $t_2$ is given by

$\frac{1}{2}(g-a)t_2^2 = \frac{u^2}{2(g+a)}$

$\Rightarrow t_2 = \frac{u}{\sqrt{(g+a)(g-a)}} = \frac{u}{(g+a)}\sqrt{\frac{g+a}{g-a}}$

$\therefore t_2 > t_1$ because $\frac{1}{g+a} < \frac{1}{g-a}$

4 **(b)**

$v = u + at = u + \left(\frac{F}{m}\right)t = 20 + \left(\frac{100}{5}\right) \times 10 = 220\ m/s$

5 **(d)**

If $t_1$ and $t_2$ are the time, when body is at the same height then,

$h = \frac{1}{2} g t_1 t_2 = \frac{1}{2} \times g \times 2 \times 10 = 10\ g$

6 **(b)**

Relative velocity of one train $w.r.t.$ other

$= 10 + 10 = 20 m/s$

Relative acceleration$= 0.3 + 0.2 = 0.5 m/s^2$

If train crosses each other then from $s = ut + \frac{1}{2}at^2$

$As, s = s_1 + s_2 = 100 + 125 = 225$

$\Rightarrow 225 = 20t + \frac{1}{2} \times 0.5 \times 0.5 \times t^2 \Rightarrow 0.5t^2 + 40t - 450 = 0$

$\Rightarrow t = \frac{-40 \pm \sqrt{1600 + 4.(005) \times 450}}{1} = -40 \pm 50$

$\therefore t = 10sec$ (Taking +ve value)

7 **(a)**

Distance between the balls = Distance travelled by first ball in 3 seconds – Distance travelled by second ball in 2 seconds = $\frac{1}{2}g(3)^2 - \frac{1}{2}g(2)^2 = 45 - 20 = 25\ m$

8 **(b)**

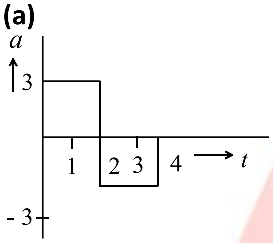
The velocity of balloon at height $h$, $v = \sqrt{2\left(\frac{g}{8}\right)h}$

When the stone released from this balloon, it will go upward with velocity, $= \frac{\sqrt{gh}}{2}$ (Same as that of balloon). In this condition time taken by stone to reach the ground

$t = \frac{v}{g}\left[1 + \sqrt{1 + \frac{2gh}{v^2}}\right] = \frac{\sqrt{gh}/2}{g}\left[1 + \frac{2gh}{gh/4}\right]$

$= \frac{2\sqrt{gh}}{g} = 2\sqrt{\frac{h}{g}}$

9 **(a)**




Taking the motion from 0 to 2 $s$

$u = 0, a = 3ms^{-2}, t = 2s, v = ?$

$v = u + at = 0 + 3 \times 2 = 6ms^{-1}$

Taking the motion from 2 $s$ to 4 $s$

$v = 6 + (-3)(2) = 0ms^{-1}$

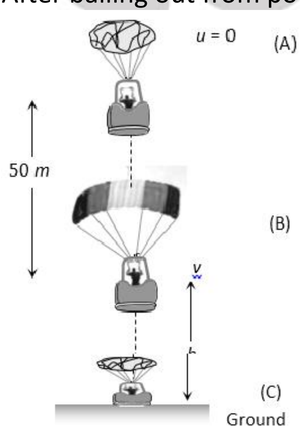
10 **(a)**

$H_{\max} = \frac{u^2}{2g} \Rightarrow H_{\max} \propto \frac{1}{g}$

On planet $B$ value of $g$ is $1/9$ times to that of $A$. So value of $H_{\max}$ will become 9 times $i.e.\ 2 \times 9 = 18\ metre$

11 **(a)**

After balling out from point $A$ parachutist falls freely under gravity. The velocity acquired by it will '$v$'



From $v^2 = u^2 + 2as = 0 + 2 \times 9.8 \times 50 = 980$
[As $u = 0, a = 9.8 m/s^2, s = 50\ m$]
At point $B$, parachute opens and it moves with retardation of 2 $m/s^2$ and reach at ground (point $C$) with velocity of 3 $m/s$
For the part '$BC$' by applying the equation $v^2 = u^2 + 2as$
$v = 3m/s, u = \sqrt{980}\ m/s, a = -2m/s^2, s = h$
$\Rightarrow (3)^2 = \left(\sqrt{980}\right)^2 + 2 \times (-2) \times h \Rightarrow 9 = 980 - 4h$
$\Rightarrow h = \dfrac{980 - 9}{4} = \dfrac{971}{4} = 242.7 \cong 243\ m$
So, the total height by which parachutist bail out $= 50 + 243 = 293\ m$

12 **(d)**
Acceleration due to gravity is independent of mass of body

13 **(b)**
Distance average speed $= \frac{2v_1v_2}{v_1+v_2} = \frac{2\times2.5\times4}{2.5+4}$
$= \dfrac{200}{65} = \dfrac{40}{13} km/hr$

14 **(d)**
$S \propto u^2$. If $u$ becomes 3 times then $S$ will become 9 times
$i.e.\ 9 \times 20 = 180m$

15 **(d)**
Average speed $= -\frac{\text{Total distance}}{\text{Total time}} = \frac{x}{t_1+t_2}$
$= \dfrac{x}{\dfrac{x/3}{v_1} + \dfrac{2x/3}{v_2}} = \dfrac{1}{\dfrac{1}{3\times 20} + \dfrac{2}{3 \times 60}} = 36\ km/hr$

16 **(d)**
$\because v = 0 + na \Rightarrow a = v/n$
Now, distance travelled in $n\ sec. \Rightarrow S_n = \frac{1}{2}an^2$ and
distance travelled in $(n-2) sec \Rightarrow S_{n-^2} = \frac{1}{2}a(n-2)^2$
$\therefore$ Distance travelled in last 2 seconds,
$= S_n - S_{n-2} = \frac{1}{2}an^2 - \frac{1}{2}a(n-2)^2$
$\dfrac{a}{2}[n^2 - (n-2)^2] = \dfrac{a}{2}[n + (n-2)][n - (n-2)]$
$= a(2n-2) = \dfrac{v}{n}(2n-2) = \dfrac{2v(n-1)}{n}$

17 **(c)**
When packet is released from the balloon, it acquires the velocity of balloon of value 12 $m/s$. Hence velocity of packet after 2 $sec$, will be
$v = u + gt = 12 - 9.8 \times 2 = -76\ m/s$

18 **(b)**
Distance covered =Area enclosed by $v - t$ graph
= Area of triangle $= \frac{1}{2} \times 4 \times 8 = 16\ m$

19 **(c)**
Mass does not affect maximum height
$H = \frac{u^2}{2g} \Rightarrow H \propto u^2$, So if velocity is doubled then height will become four times.i.e.$H = 20 \times 4 = 80m$

20 **(c)**
Distance covered in a particular time is

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

$s_1 = 0 + \frac{1}{\mathrm{g}}(2 \times 1 - 1) = \frac{\mathrm{g}}{2}$

$s_2 = 0 + \frac{1}{2}\mathrm{g}(2 \times 2 - 1) = \frac{3}{2}\mathrm{g}$

And $s_3 = 0 + \frac{1}{2}\mathrm{g}(2 \times 3 - 1) = \frac{5}{2}\mathrm{g}$

Hence, the required ration is

$s_1 : s_2 : s_3 = \frac{\mathrm{g}}{2} : \frac{3}{2}\mathrm{g} : \frac{5}{2}\mathrm{g} \qquad = 1 : 3 : 5$

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