DPP
DAILY PRACTICE PROBLEMS

CLASS : XITH
DATE :

Solutions

SUBJECT : PHYSICS
DPP NO. : 3

Topic :- MOTION IN A STRAIGHT LINE

1 **(a)**

Using

$V = u + at$

$V = gt$ ...(i)

Comparing with $y = mx + c$

Equation (i) represents a straight line passing through origin inclined x-axis (slope -g)

2 **(b)**

Let particle thrown with velocity u and its maximum height is H then $H = \frac{u^2}{2g}$

When particle is at height $H/2$, then its speed is 10 m/s

From equation $v^2 = u^2 - 2gh$

$(10)^2 = u^2 - 2g\left(\frac{H}{2}\right) = u^2 - 2g\frac{u^2}{4g} \Rightarrow u^2 = 200$

Maximum height $\Rightarrow H = \frac{u^2}{2g} = \frac{200}{2 \times 10} = 10\ m$

3 **(a)**

Since slope of graph remains constant for velocity-time graph

5 **(b)**

$v = u + \int a dt = u + \int (3t^2 + 2t + 2)dt$

$= u + \frac{3t^3}{3} + \frac{2t^2}{2} + 2t = u + t^3 + t^2 + 2t$

$= 2 + 8 + 4 + 4 = 18\ m/s$ (As $t = 2\ sec$)

6 **(b)**

For vertically upward motion, $h_1 = v_0 t - \frac{1}{2}gt^2$ and for vertically downward motion, $h_2 = v_0 t + \frac{1}{2}g\,t^2$

$\therefore$ Total distance covered in t sec $h = h_1 + h_2 = 2v_0 t$

7 **(a)**

An aeroplane files 400 m north and 300 m south so the net displacement is 100 m towards north

Then it files 1200 m upwards so $r = \sqrt{(100)^2 + (1200)^2}$

$= 1204\ m \simeq 1200\ m$

The option should be 1204 m, because this value mislead one into thinking that net displacement is in upward direction only

8 **(d)**

$x = 2t^3 + 21t^2 + 60t + 6$

$\therefore v = \frac{dx}{dt} = 6t^2 + 42t + 60$

But , $v = 0$ (given)

$t^2 + 7t + 10 = 0$

$\Rightarrow\ t = -5\text{s}$

or $t = -2\text{s}$

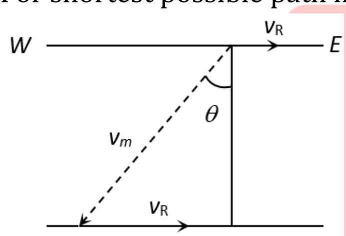
$a = \frac{dv}{dt} = 12t + 42$

$a\,|_{t=5s} = -60 + 42 = -18\text{ms}^{-2}$

$a\,|_{t=-2s} = -24 + 42 = 18\text{ms}^{-2}$

9 **(c)**

For shortest possible path man should swim with an angle $(90 + \theta)$ with downstream



From the fig,

$\sin\theta\ = \frac{v_r}{v_m} = \frac{5}{10} = \frac{1}{2}$

$\Rightarrow\ \therefore\ \theta = 30°$

So angle with downstream $= 90° + 30° = 120°$

10 **(c)**

Since displacement is always less than or equal to distance, but never greater than distance. Hence numerical ratio of displacement to the distance covered is always equal to or less than one

12 **(d)**

Average speed $= -\frac{\text{Total distance}}{\text{Total time}} = \frac{x}{t_1 + t_2}$

$= \frac{x}{\frac{x/3}{v_1} + \frac{2x/3}{v_2}} = \frac{1}{\frac{1}{3\times 20} + \frac{2}{3\times 60}} = 36\ km/hr$

13 **(a)**

Velocity required by body in 10 sec

$v = 0 + 2 \times 10 = 20\ m/s$

And distance travelled by it in 10 sec

$S_1 = \frac{1}{2} \times 2 \times (10)^2 = 100\ m$

Then it moves with constant velocity ($20\ m/s$) for 30 sec

$S_2 = 20 \times 30 = 600\ m$

After that due to retardation ($4\ m/s^2$) it stops

$S_3 = \frac{v^2}{2a} = \frac{(20)^2}{2 \times 4} = 50m$

Total distance travelled $S_1 + S_2 + S_3 = 750m$

14 **(c)**

Because acceleration is a vector quantity

15 **(a)**

Average speed $= \frac{2v_d v_u}{v_d + v_u}$

16 **(b)**

Boat covers distance of 16 km in a still water in hours

$ie\ \ v_B = \frac{16}{2} = 8\text{kmh}^{-1}$

Now, velocity of water

$v_W = 4\text{kmh}^{-1}$

Time taken for going upstream

$t_1 = \frac{8}{v_B - v_w} = \frac{8}{8-4} = 2\text{h}$

(As water current oppose the motion of boat) Time taken for going downstream

$t_2 = \frac{8}{v_B + v_w} = \frac{8}{8+4} = \frac{8}{12}\text{h}$

(As water current helps the motion of boat)

$\therefore$ Total time $= t_1 + t_2$

$= \left(2 + \frac{8}{12}\right)$h=2 h 40 min

18 **(d)**

$a = \frac{dv}{dt} = \frac{dv}{dx}\frac{dx}{dt} = v\frac{dv}{dx} = -\alpha x^2$ [Given]

$$\Rightarrow \int_{v_0}^{0} v dv = \alpha \int_{0}^{S} x^2\, dx \Rightarrow \left[\frac{v^2}{2}\right]_{v_0}^{0} = -\alpha\left[\frac{x^3}{3}\right]_0^S$$

$$\Rightarrow \frac{v_0^2}{2} = \frac{\alpha S^3}{3} \Rightarrow S = \left(\frac{3v^2}{2\alpha}\right)^{\frac{1}{3}}$$

19 **(b)**

$h_1 = \frac{1}{2} g t_1^2 = \frac{10}{2} \times (5)^2 = 125$ m

$h_2 = \frac{1}{2} g t_2^2 = \frac{10}{2} \times (3)^2 = 45$ m

$\therefore \quad h_1 - h_2 = 125 - 45 = 80$ m

20 **(b)**

$v_t = 4t^3 - 2t$

$\Rightarrow \frac{dx_t}{dt} = 4t^3 - 2t$

$\Rightarrow \int dx_t = \int 4t^3 dt - \int 2t dt$

$\Rightarrow x_t = t^4 - t^2$

Since, $x_t = 2$m

$t = \sqrt{2}$s (rejecting negative time)

Now acceleration,

$a_t = \frac{dv_t}{dt} = 12t^2 - 2 = 12(2) - 2 = 22\text{ms}^{-2}$

PE

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