PHYSICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 11

Total Marks : 28

Max. Time : 28 min.

Topic : Rectilinear Motion

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.5	**(3 marks, 3 min.)**	**[15, 15]**
Multiple choice objective ('–1' negative marking) Q.6	**(4 marks, 4 min.)**	**[4, 4]**
Comprehension ('–1' negative marking) Q.7 to Q.9	**(3 marks, 3 min.)**	**[9, 9]**

1. A ball is thrown vertically upwards from the ground. It crosses a point at the height of 25 m twice at an interval of 4 secs. The ball was thrown with the velocity of

(A) 20 m/sec. (B) 25 m/sec.

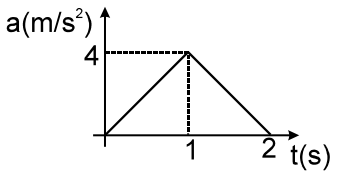
(C) 30 m/sec. (D) 35 m/sec.

2. The distance travelled by a freely falling body is proportional to

(A) the mass of the body (B) the square of the acceleration due to gravity

(C) the square of the time of fall (D) the time of fall

3. The acceleration–time graph of a particle moving on a straight line is as shown in figure. The velocity of the particle at time t = 0 is 2m/s. The velocity after 2 seconds will be



(A) 6 m/s (B) 4 m/s

(C) 2 m/s (D) 8 m/s

4. A parachutist drops freely from an aeroplane for 10 s before the parachute opens out. Then he descends with a net retardation of 2.5 ms^{-2}. If he bails out of the plane at a height of 2495 m and g = 10 ms^{-2}, his velocity on reaching the ground will be

(A) 2.5 ms^{-1} (B) 7.5 ms^{-1}

(C) 5 ms^{-1} (D) 10 ms^{-1}

5. The displacement of a body is given to be proportional to the cube of time elapsed. Acceleration of the body is proportional to :

(A) t^4 (B) t^3

(C) t^2 (D) t

6. A ball is thrown vertically up with a certain velocity. It attains a height of 40 m and comes back to the thrower. Then the:(g = 10m/s^2)

(A) total distance covered by it is 40 m (B) total displacement covered by it is 80 m

(C) total displacement is zero (D) the average velocity for round trip is zero

COMPREHENSION

A particle moves along x-axis. It's velocity is a function of time according to relation $V = (3t^2 - 18t + 24)$ m/s assume at t = 0 particle is at origin.

7. Distance travelled by particle in 0 to 3 second time interval is :

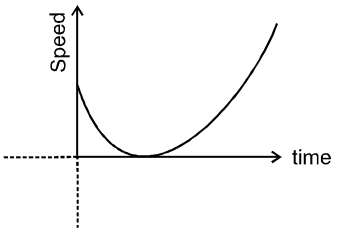
(A) 18 m (B) 20 m (C) 22 m (D) 24 m

8. Time interval in which particle speed continuous decreases?

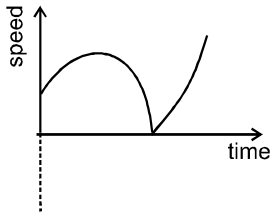
(A) 0 – 3 sec (B) 0 – 2 sec (C) 2–4 sec (D) 2–3 sec

9. Which of the following graph may be correct for the motion of particle

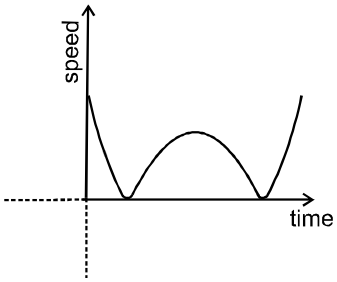
(A)



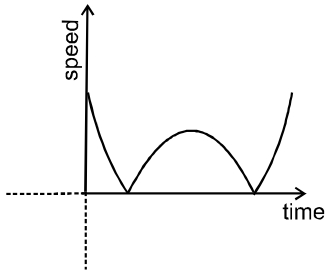
(B)



(C)



(D)



Answers Key

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1. (C) **2.** (C) **3.** (A) **4.** (C) **5.** (D)
6. (C,D) **7.** (C) **8.** (B) **9.** (D)

Hint & Solutions

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1. Let u be velocity of ball with which it is thrown.

$h = ut + (-\frac{1}{2}gt^2)$ $\quad 25 = ut - 5t^2$

$5t^2 - ut + 25 = 0$ Let t_1 , t_2 be its roots

$t_1 + t_2 = u/5, \quad t_1t_2 = 5$

Given, $t_2 - t_1 = 4$ sec.

$(t_2 - t_1)^2 = 16$

$\Rightarrow (t_2 + t_1)^2 - 4t_1t_2 = 16$

$\left(\frac{u}{5}\right)^2 - 4 \times 5 = 16$ $\quad u = 30$ m/sec.

2. For a freely falling body

$S = \frac{1}{2}gt^2 \quad S \propto t^2$.

3. $v(2) = v(0)$ + area under a–t graph from t = 0 to t = 2

$= 2 + \frac{1}{2}(2)(4) = 6$ m/s.

4. Distance covered in first 10 sec

$S_i = \frac{1}{2}(10)(10)^2 = 500$ m

Remaining height from ground = 2495 – 500 = 1995 m

u = gt = 10 × 10 = 100 m/s velocity on reaching the ground

$v^2 = (100)^2 + 2(-2.5) \times 1995$

$v^2 = 10000 - 9975 = 25$

v = 5 m/s.

5. Suppose the particle starts from origin at t = 0. Then at any time t,

$x \propto t^3$

$x = kt^3$ (K = constant)

$$v = \frac{dx}{dt} = 3kt^2$$

$$a = \frac{dv}{dt} = 6kt$$

$a \propto t$.

6. Displacement = 0 ($\because$ initial position = final position)

average velocity = 0 ($\because$ Total displacement = 0)

7. $V = (3t^2 - 18t + 24)$ m/s

$V = 3(t - 2)(t - 4)$

$$s = \left|\int_0^2 V dt\right| + \left|\int_2^3 V dt\right|$$

$$= \left|\int_0^2 (3t^2 - 18t + 24)dt\right| + \left|\int_2^3 (3t^2 - 18t + 24)dt\right| =$$

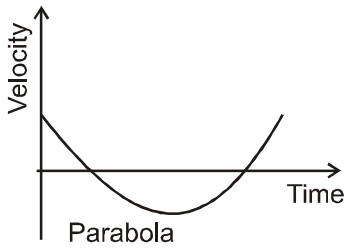
$|20| + |-2| = 22$ m

8. $V = 3(t - 2)(t - 4)$

$a = 6(t - 3)$

common interval in which V and a both have opposite sign is 0 to 2 sec

9. Velocity time graph will be



Speed time graph = |Velocity time graph|