PHYSICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 15

Total Marks : 24

Max. Time : 24 min.

Topic : Projectile Motion

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.8	**(3 marks, 3 min.)**	**[24, 24]**

1. A particle travels according to the equation $x = at^3$, $y = bt^3$. The equation of the trajectory is

(A) $y = \frac{ax^2}{b}$ (B) $y = \frac{bx^2}{a}$ (C) $y = \frac{bx}{a}$ (D) $y = \frac{bx^3}{a}$

2. Speed at the maximum height of a projectile is half of its initial speed u. Its range on the horizontal plane is:

(A) $\frac{2u^2}{3g}$ (B) $\frac{\sqrt{3}u^2}{2g}$ (C) $\frac{u^2}{3g}$ (D) $\frac{u^2}{2g}$

3. A cricket ball is hit for a six leaving the bat at an angle of 45° to the horizontal with kinetic energy k. At the top of trajectory the kinetic energy of the ball is :

(A) zero (B) k (C) $\frac{k}{\sqrt{2}}$ (D) $\frac{k}{2}$

4. A particle is projected from a horizontal floor with speed 10 m/s at an angle 30° with the floor and striking the floor after sometime. State which is correct.

(A) Velocity of particle will be perpendicular to initial direction two seconds after projection.

(B) Minimum speed of particle will be 5 m/sec.

(C) Displacement of particle after half second will be 35/4 m.

(D) Noneofthese

5. A body is projected with a speed u at an angle to the horizontal to have maximum range. At the highest point the speed is :

(A) zero (B) $u\sqrt{2}$ (C) u (D) $\frac{u}{\sqrt{2}}$

6. Ratio of the ranges of the bullets fired from a gun (of constant muzzle speed) at angle θ, 2θ & 4θ is found in the ratio x : 2 : 2, then the value of x will be (Assume same muzzle speed of bullets)

(A) 1 (B) 2 (C) $\sqrt{3}$ (D) none of these

7. A particle is projected with a speed $10\sqrt{2}$ m/s making an angle 45° with the horizontal. Neglect the effect of air friction. Then after 1 second of projection. Take $g=10\ m/s^2$

(A) the height of the particle above the point of projection is 5 m.

(B) the height of the particle above the point of projection is 10 m.

(C) the horizontal distance of the particle from the point of projection is 5 m.

(D) the horizontal distance of the particle from the point of projection is 15 m.

8. A particle has initial velocity, $\vec{v} = 3\hat{i}+4\hat{j}$ and a constant force $\vec{F} = 4\hat{i}-3\hat{j}$ acts on the particle. The path of the particle is :

(A) straight line (B) parabolic (C) circular (D) elliptical

Answers Key

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

Hint & Solutions

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2. At maximum height v = u cosθ

$\frac{u}{2} = v \quad \Rightarrow \cos\theta = \frac{1}{2} \quad \Rightarrow \theta = 60°$

$R = \frac{u^2 \sin 2\theta}{g} = \frac{u^2 \sin(120°)}{g}$

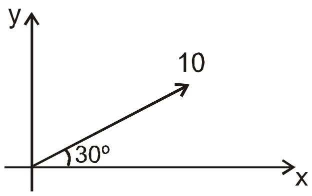
$= \frac{u^2 \cos 30°}{g} = \frac{\sqrt{3}\,u^2}{2g}$

3. At the top of trajectory,

$K' = \frac{1}{2} m(u \cos\theta)^2$

$= \frac{1}{2} mu^2 . \cos^2 45° = \frac{k}{2}$.

4. For A



Velocity of the particle will be perpendicular to the initial direction when $10 - g \sin 30° \, t = 0$

$\therefore$ t = 2 s,

but total time of flight $= \frac{2u \sin 30°}{g} = 1$ s.

So not possible

For B

Minimum speed during the motion is

$= u \cos 30^\circ = 10 \times \frac{\sqrt{3}}{2} = 5\sqrt{3}$ m/s.

For B

$t = \frac{1}{2}$ second

$\therefore$ particle is at highest point.

where, displacement = $\sqrt{\frac{R^2}{4} + H^2} = \frac{5\sqrt{13}}{4}$ m

5. For maximum range, $\theta = 45^\circ$

At the highest point, $v = u \cos\theta = \frac{u}{\sqrt{2}}$

6. Range is same for 2θ and 4θ.

$\therefore \quad 2\theta + 4\theta = 90^\circ \quad \Rightarrow \quad \theta = 15^\circ$

$\therefore$ Ratio of ranges will be sin30° : sin 60° : sin120°.

$$\frac{1}{2} : \frac{\sqrt{3}}{2} : \frac{\sqrt{3}}{2} \Rightarrow \frac{2}{\sqrt{3}} : 2 : 2$$

7. $y = u_x t - \frac{1}{2} . g t^2 \quad = 10 \times 1 - 5 \times 1^2 = 5$ m

$x = u_x t \qquad = 10 \times 1 = 10$ m

8. For constant acceleration if initial velocity makes an oblique angle with acceleration then path will be parabolic.