

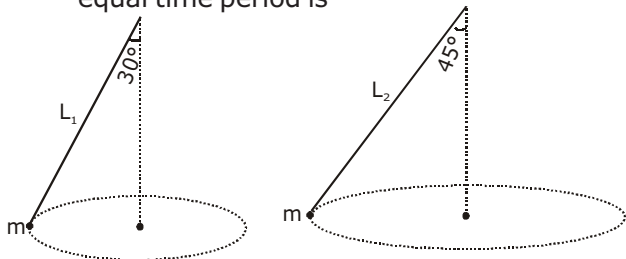
Dear student following is a Moderate level [0 0 ● 0 0] test paper. Score of 15 Marks in 10 Minutes would be a satisfactory performance. Questions 1-9 (+3, -1). (All Questions have Single Options correct)

Q.1 A bullet is dropped from the same height when another bullet is fired horizontally. They will hit the ground
 (A) One after the other
 (B) Simultaneously
 (C) Depends on the observer
 (D) None of the above

Q.2 A projectile fired with initial velocity u at some angle θ has a range R . If the initial velocity be doubled at the same angle of projection, then the range will be
 (A) $2R$ (B) $R/2$ (C) R (D) $4R$

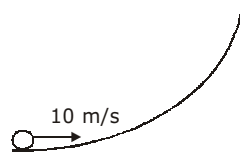
Q.3 Galileo writes that for angles of projectile at angle $(45 + \theta)$ and $(45 - \theta)$, the horizontal ranges described by the projectile are in the ratio of (if $\theta \leq 45$)
 (A) $2 : 1$ (B) $1 : 2$ (C) $1 : 1$ (D) $2 : 3$

Q.4 Two particles tied to different string are whirled in a horizontal circle as shown in figure. The ratio of length of the strings (L_2/L_1) so that they complete their circular path with equal time period is

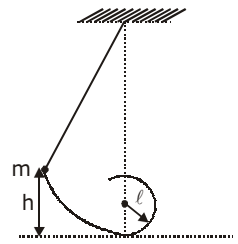


(A) $\sqrt{3}/2$ (B) $\sqrt{2}/3$ (C) 1 (D) None

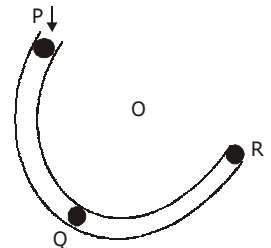
Q.5 A ring rolls without sliding on a horizontal surface with a velocity 10 m/s. It ascends a smooth continuous track as shown in the figure. The height upto which it will ascend is
 (A) 10 m (B) 5 m (C) 20 m (D) 5/2 m



Q.6 A peg is placed directly below the pendulum's point of support at a distance $\ell = 0.5$ m from the lowest point of the pendulum swing as shown in the fig. The minimum height h from which the pendulum can be released such that the string remains taut for at least one full revolution around the peg is
 (A) 0.75 m (B) 0.5 m (C) 1.25 m (D) 0.2 m



Q.7 Consider forces on a ball at high speed through a curved frictionless channel as illustration below, where the channel is fixed to a table top and viewed from above. Which of the following forces are acting on the ball at point Q. (Ignore air resistance)
 (I) A force in the direction of motion
 (II) A force pointing from Q to O exerted by the channel on the ball
 (III) A force pointing from O to Q
 (IV) A downward force from gravity
 (A) IV only (B) I and IV only
 (C) II and IV only (D) III and IV only



Q.8 A particle moves in xy plane according to the law $x = a \sin \omega t$ and $y = a(1 - \cos \omega t)$ where a and ω are constant. The particle traces
 (A) A straight line equally inclined to x and y axes
 (B) A parabola (C) A circle
 (D) None

Q.9 Match the quantities in column I with possible options from column II

Particle's motion	Trajectory
(a) Constant velocity	(p) Straight line
(b) Constant speed	(q) Circular
(c) Variable acceleration	(r) Parabolic
(d) Constant acceleration	(s) Elliptical.

PHYSICS IIT JEE (JUNE 4th WEEK CLASS TEST 3) (TWO-D- MOTION) ANSWER KEY

Name : Roll No. :

	A	B	C	D	5	A	B	C	D	9	(p)	(q)	(r)	(s)
1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	9	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	6	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	(a)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	(b)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	(c)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
										(d)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

ANSWER KEY

Que.	1	2	3	4	5	6	7	8
Ans.	B	D	C	A	B	C	C	C

Ans.9 (A) → (P); (B) → (P, Q, R, S); (C) → (P, Q, R, S); (D) → (P, R)

SOLUTIONS

Sol.1 (B)

Because the vertical components of velocities of both the bullets are same and equal

to zero and $t = \sqrt{\frac{2h}{g}}$.

Sol.2 (D)

$$R = \frac{u^2 \sin 2\theta}{g}$$

∴ $R \propto u^2$. If initial velocity be doubled then range will become four times.

Sol.3 (C)

For angle $(45^\circ - \theta)$,

$$R = \frac{u^2 \sin(90^\circ - 2\theta)}{g} = \frac{u^2 \cos 2\theta}{g}$$

For angle $(45^\circ + \theta)$,

$$R = \frac{u^2 \sin(90^\circ + 2\theta)}{g} = \frac{u^2 \cos 2\theta}{g}$$

Ratio is 1 : 1.

Sol.4 (A)

Time period is equal $T_p = T_1 = T_2$

$$T_p = \sqrt{\frac{L_1 \cos 30^\circ}{g}} = \sqrt{\frac{L_2 \cos 60^\circ}{g}}$$

$$\frac{L_1 \cos 30^\circ}{g} = \frac{L_2 \cos 60^\circ}{g}$$

$$\frac{L_2}{L_1} = \frac{g \cdot \cos 30^\circ}{g \cdot \cos 45^\circ} = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{\sqrt{2}}}$$

$$\frac{L_2}{L_1} = \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{2}}{1} = \sqrt{\frac{3}{2}}$$

$$\frac{L_2}{L_1} = \sqrt{\frac{3}{2}}$$

Sol.5 (B)

$$u = 10 \text{ m/s}, \quad \frac{1}{g} mu^2 = mgh$$

$$h = \frac{u^2}{2g} = \frac{(10)^2}{2 \times 10} = 5 \text{ m/s.}$$

Sol.6 (C)

It will complete the loop path if h is greater

than $\frac{5\ell}{2}$

$$h \geq \frac{5\ell}{2}$$

$$h \geq \frac{5 \times 0.5}{2} = \frac{2.5}{2} = 1.25 \text{ m.}$$

Sol.7 (C)

A force pointing from Q to O exerted by the channel on the ball and A down ward force from gravity.

Sol.8 (C)

$$x = a \sin \omega t \quad \dots(i)$$

$$y = a (1 - \cos \omega t) \quad \dots(ii)$$

$$x^2 = a^2 \sin^2 \omega t = a^2 (1 - \cos^2 \omega t)$$

$$x^2 = a^2 - a^2 \cos^2 \omega t$$

$$a^2 \cos^2 \omega t = a^2 - x^2 \quad \dots(iii)$$

$$y = a(1 - \cos \omega t) = a - a \cos \omega t$$

$$a - y = a \cos \omega t$$

$$(a - y)^2 = (a \cos \omega t)^2$$

$$a^2 + y^2 - 2ay = a^2 \cos^2 \omega t \quad \dots(iv)$$

put the value from equation (iii)

$$a^2 + y^2 - 2ay = a^2 - x^2$$

$$x^2 + y^2 - 2ay = 0$$

This is eqⁿ of circle.

Sol.9 (A → P)

(B → P, Q, R, S)

(C → P, Q, R, S)

(D → P, R)

- (i) Partical with constant velocity travel in strait line only.
- (ii) Partical with constant speed travel in strait line, circular, parabolic and elliptical.
- (iii) Partical with variable acceleration travel in strait line, circular, parabolic and elliptical.
- (iv) Partical with constant acceleration travel in straight line and parabolic.