

Dear student following is a Moderate level [00●00] 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)

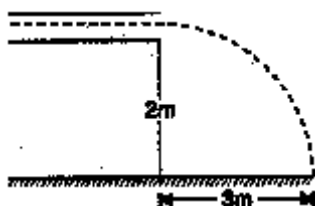
Q.1 When a body moves with a constant speed along circle.
 (A) No work is done on it
 (B) No acceleration is produced in the body
 (C) No force acts on the body
 (D) Its velocity remains constant

Q.2 A man projects a coin upwards from the gate of a uniformly moving train. The path of coin for the man will be
 (A) Parabolic (B) Inclined straight line
 (C) Vertical straight line
 (D) Horizontal straight line

Q.3 The range of a projectile for a given initial velocity is maximum when the angle of projection is 45°. The range will be minimum, if the angle of projection is
 (A) 90° (B) 180° (C) 60° (D) 75°

Q.4 A stone projected with a velocity u at an angle θ with the horizontal reaches maximum height H_1 . When it is projected with velocity u at an angle $\left(\frac{\pi}{2} - \theta\right)$ with the horizontal, it reaches maximum height H_2 . The relation between the horizontal range R of the projectile, H_1 and H_2 is
 (A) $R = 4 \sqrt{H_1 H_2}$ (B) $R = 4 (H_1 - H_2)$
 (C) $R = 4(H_1 + H_2)$ (D) $R = \frac{H_1^2}{H_2}$

Q.5 Water is flowing from a horizontal pipe fixed at a height of 2m from the ground. If it falls at a horizontal distance of 3m as shown in fig. the speed of water when it leaves the pipe is (Take $g = 9.8 \text{ m/s}^2$)



(A) 47 m/s (B) 4.7 m/s
 (C) 7.4 m/s (D) 14.7m/s

Q.6 A large number of bullets are fired in all directions with same speed v . What is the maximum area on the ground on which these bullets will spread.

(A) $\pi \frac{v^2}{g}$ (B) $\pi \frac{v^4}{g^2}$ (C) $\pi^2 \frac{v^4}{g^2}$ (D) $\pi^2 \frac{v^2}{g^2}$

Q.7 A particle of mass m is moving in a circular path of constant radius r such that its centripetal acceleration a_c is varying with time as $a_c = k^2 r t^4$, where k is a constant. The power delivered to the particle by the force acting on it is :

(A) 0 (B) $mk^2 r^2 t^2$
 (C) $\frac{1}{3} mk^2 r^2 t^2$ (D) $2mk^2 r^2 t^3$

The following questions consist of two statements one labelled Assertion (A) and the another labelled Reason (R). Select the correct answers to these questions from the codes given below :

(A) Both A and R are true and R is the correct explanation of A.
 (B) Both A and R are true but R is not correct explanation of A
 (C) A is true but R is false
 (D) A is false but R is true.

Q.8 Assertion : When a body of mass m is throw up with a velocity u making an angle 30° with the horizontal direction the change in momentum at the highest point is $mu/2$.

Reason : The velocity of the body at the highest point becomes zero.

Q.9 Assertion : A body of mass 5 kg is moving in a circle of radius 1 m with an angular velocity of 2 radius/sec. The centripetal force acting on the body is 20 N.

Reason : The centripetal force = $mr\omega^2$.

PHYSICS IIT JEE (JUNE 4th WEEK CLASS TEST 2) (TWO-D- MOTION) ANSWER KEY

Name : Roll No. :

	A	B	C	D		A	B	C	D		A	B	C	D
1	<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"/>	7	<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"/>	5	<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"/>
3	<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"/>	9	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9
Ans.	A	C	A	A	B	B	D	C	A

SOLUTIONS

Sol.1 (A)

When speed is constant in circular motion, it means work done by centripetal force is zero.

Sol.2 (C)

Because horizontal velocity is same for coin and the observer. So relative horizontal displacement will be zero.

Sol.3 (A)

$$\text{Range} = \frac{u^2 \sin 2\theta}{g}; \text{ when } \theta = 90^\circ, R = 0 \text{ i.e.}$$

the body will fall at the point of projection after completing one dimensional motion under gravity.

Sol.4 (A)

$$H_1 = \frac{u^2 \sin^2 \theta}{2g} \text{ and } H_2 = \frac{u^2 \sin^2(90 - \theta)}{2g}$$

$$= \frac{u^2 \cos^2 \theta}{2g}$$

$$H_1 H_2 = \frac{u^2 \sin^2 \theta}{2g} \times \frac{u^2 \cos^2 \theta}{2g}$$

$$= \frac{(u^2 \sin 2\theta)^2}{16g^2} = \frac{R^2}{16}$$

$$\therefore R = 4 \sqrt{H_1 H_2}$$

Sol.5 (B)

The velocity of water stream emerging from the pipe is horizontal. That is initial vertical component of velocity is zero ($u_y = 0$). The time t taken by stream to hit the ground is given by

$$H = \frac{1}{2}gt^2$$

$$\text{or } t = \sqrt{\frac{2H}{g}} = \sqrt{\frac{2 \times 2}{9.8}} \text{ second}$$

$$= \frac{\sqrt{20}}{7} \text{ second}$$

Also $x = ut$

$$\Rightarrow u = \frac{x}{t} = \frac{3 \times 7}{\sqrt{20}} = \frac{21}{\sqrt{20}} = 4.7 \text{ m/s}$$

Sol.6 (B)

Area in which bullet will spread = πr^2
For maximum area,

$$r = R_{\text{max}} = \frac{v^2}{g} \text{ [when } \theta = 45^\circ \text{]}$$

$$\text{Maximum area } \pi R_{\text{max}}^2 = \pi \left(\frac{v^2}{g} \right)^2 = \frac{\pi v^4}{g^2}$$

Sol.7 (D)

$$a_c = k^2 r t^4 = \frac{v^2}{r} \text{ or } v = k r t^2$$

The tangential acceleration is $a_T = \frac{dv}{dt} = 2krt$

The tangential force on the particle,

$$F_T = ma_T = m2krt$$

Power delivered to the particle

$$= F_T v = (2mkrt)(krt^2)$$

$$= 2mk^2 r^2 t^3.$$

Sol.8 (C)

At highest point, the vertical component velocity is zero but horizontal component velocity is same as that at the point of projection. So the change in momentum at the highest point.

$$= mu \sin 30 - 0 = mu/2$$

Here Assertion is correct, the reason is wrong.

Sol.9 (A)

Here, both the Assertion and Reason are correct and Reason is correct explanation of Assertion.