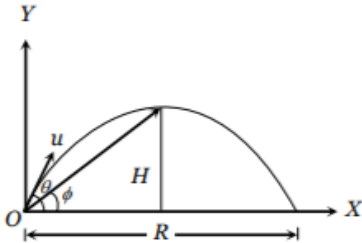


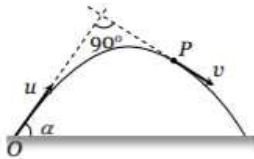
## XI Physics: 04 Projectile and Circular Motion | 2018

1. The trajectory of a projectile is represented by  $y = \sqrt{3}x - gx^2/2$ . The angle of projection is? (Ans:  $60^\circ$ )

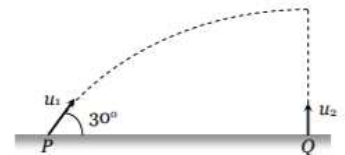
**Note for Competitive Exams:** The angle of elevation  $\phi$  of the highest point of the projectile and the angle of projection  $\theta$  are related to each other as  $\tan\phi = (\tan\theta)/2$



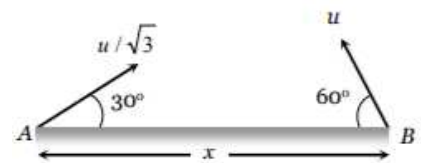
2. A body starts from the origin with an acceleration of  $6 \text{ m/s}^2$  along the x-axis and  $8 \text{ m/s}^2$  along the y-axis. Its distance from the origin after 4 seconds will be? (Ans: **80 m**)
3. A body is thrown at angle  $30^\circ$  to the horizontal with the velocity of  $30 \text{ m/s}$ . After 1 sec, its velocity will be (in  $\text{m/s}$ ) ( $g = 10 \text{ m/s}^2$ )? (Ans:  **$10\sqrt{7} \text{ m/s}$** )
4. A particle is projected from point O with velocity  $u$  in a direction making an angle  $\alpha$  with the horizontal. At any instant its position is at point P at right angles to the initial direction of projection. Its velocity at point P is? (Ans:  **$u \cot\alpha$** )



5. A particle P is projected with velocity  $u_1$  at an angle of  $30^\circ$  with the horizontal. Another particle Q is thrown vertically upwards with velocity  $u_2$  from a point vertically below the highest point of path of P. Show that the necessary condition for the two particles to collide at the highest point is  $u_1 = 2u_2$ .

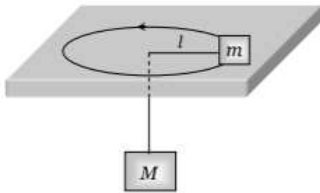


6. Two particles are separated at a horizontal distance  $x$  as shown in figure. They are projected at the same time as shown in figure with different initial speed. Show that the time after which the horizontal distance between the particles become zero is  $t = x/u$ .



7. A cord can bear a maximum force of  $100 \text{ N}$  without breaking. A body of mass  $1 \text{ kg}$  tied to one end of a cord of length  $1 \text{ m}$  is revolved in a horizontal plane. What is the maximum linear speed of the body so that the cord does not break? (Ans:  **$10 \text{ m/s}$** )
8. A mass is supported on a frictionless horizontal surface. It is attached to a string and rotates about a fixed O. If the length of the string and angular velocity are doubled, the tension in centre at an angular velocity the string which was initially  $T_0$  is now? (Ans:  **$8T_0$** )

9. A stone is rotated steadily in a horizontal circle with a period  $T$  by a string of length  $l$ . If the tension in the string is kept constant and  $l$  increases by 1%, what is the percentage change in  $T$ ? (Ans: 0.5%)
10. Two masses  $m$  and  $M$  are connected by a light string that passes through a smooth hole  $O$  at the centre of a table. Mass  $m$  lies on the table and  $M$  hangs vertically.  $m$  is moved round in a horizontal circle with  $O$  as the centre. If  $l$  is the length of the string from  $O$  to  $m$  then the frequency with which  $m$  should revolve so that  $M$  remains stationary is?



11. A ball rolls off the top of a stairway with a constant horizontal velocity  $u$ . If the steps are  $h$  metre high and  $w$  metre wide, show that the ball will just hit the edge of the  $n$ th step if
- $$n = \frac{2hu^2}{gw^2}$$
12. A projectile can have the same range  $R$  for two angles of projection. If  $t_1$  and  $t_2$  be the time of flight in the two cases, then prove that  $t_1 t_2 = 2R/g$ .