PHYSICS

| Class	PUC 2nd Yr.	
	Class work – 01	
Topic	Motion in 2-dimension	Aug. 2015

1. The acceleration remains constant during the projectile motion. (true or false)

2. In the path of the projectile, refer to the points where (i) potential energy is maximum. (ii) Kinetic energy is maximum (iii) total mechanical energy is maximum.

3. A ball of mass m is thrown vertically up. Another ball of mass 2m is thrown at an angle α with the vertical. Both of them stay in the air for the same period of time. What is the ratio of the height attained by the two?

4. A particle is projected with 100 m/s at 30^0 with the horizontal. Find
   (A) Velocity of the particle after 2 seconds
   (B) Angle between the initial velocity and the velocity after two seconds
   (C) The maximum height reached by the projectile

5. A stone is thrown with a velocity 20 m/s at 30^0 angle with the horizontal from the top of the building 15 m high. Find
   (A) The time after which the stone strikes the ground
   (B) The distance of the landing point of the stone from the building
   (C) The velocity with which the stone strikes the ground
   (D) The maximum height attained by the stone above the ground

6. A ball A is projected horizontally from some height. Another ball B, at the same time, is dropped from the same height. Which ball reaches the ground first?

7. In the above problem which ball will have a greater speed on reaching the ground?

8. A particle is projected at an angle α with the horizontal. Calculate the time when it is moving perpendicular to the initial direction.

9. At what angle should a ball be projected up an inclined plane, so that it may hit the plane normally? Take the angle of the plane with the horizontal to be αand the velocity to be v.

10. What is the average velocity of a particle projected from the ground with a speed u at an angle α with the horizontal over a time interval of its time of flight?

11. What is the change in the velocity in the above question?

12. A particle is projected at an angle of 60^0 with the horizontal with a speed 20m/s. Taking g = 10 ms^{-2}, find the time after which the speed of the particle becomes half of its initial speed.

13. A particle is projected with a velocity $20\sqrt{3}$ m/s at an angle 60^0 with the horizontal. Find the time after which the velocity vector makes an angle of 30^0 with the horizontal. g = 10 ms^{-2}

14. The ratio of the speed of the projectile at the time of projection to its speed at the top of its trajectory is x. Find the angle of projection with the horizontal.

15. A projectile is thrown with an initial velocity of $a\hat{i} + b\hat{j}$ m/s. If the range of the projectile is twice the maximum height reached by it, then

(a) a = 2b   (b) a = b   (c) b = 2a   (d) b = 4a

16. The vertical height y and the horizontal distance x of a projectile with origin as the point of projection are given by $y = 8t - 5t^2$ and $x = 6t$ where t is in seconds. Find the magnitude of the initial velocity.

(a) 8 m/s   (b) 6 m/s   (c) 10 m/s   (d) data insufficient

17. An object of mass m is projected with a momentum P at such an angle that its maximum height H is ¼ of horizontal range R. Its minimum kinetic energy is

(a) $\dfrac{P^2}{8m}$ (b) $\dfrac{P^2}{4m}$ (c) $\dfrac{3P^2}{4m}$ (d) $\dfrac{P^2}{m}$

Say true or false:

18. The speed of the projectile is minimum at its highest point.

19. The tangential acceleration of the projectile at the highest point is equal to g.

20. For a given speed, the time of flight does not depend upon the angles of projection.

21. The greatest height to which a man can throw a stone is H. the greatest distance to which he can throw is H/2.

22. A body feels weightlessness during projectile motion.

23. The instantaneous magnitude of the velocity is equal to the slope of the tangent drawn to the trajectory of the particle at that instant.

24. Find the minimum velocity with which the horizontal range is 160 m.
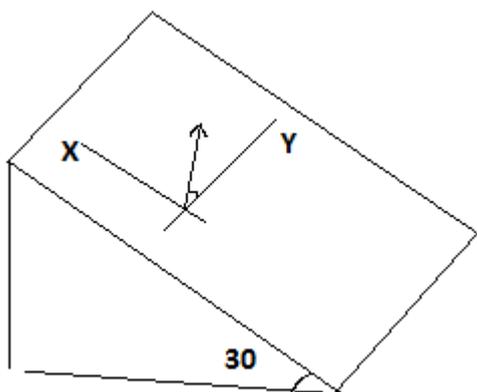
25.   A small sphere is projected with a velocity of 3 m/s at 60^0 with the Y-axis as shown on a smooth inclined plane. The motion of the sphere takes place in the X-Y plane. Calculate the magnitude of its velocity after two seconds.
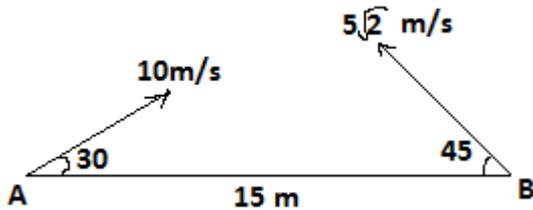
26. Two particles A and B are projected towards each other as shown. Will they collide?
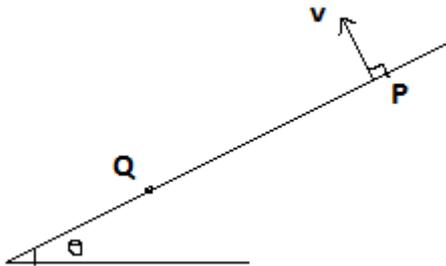
27. If the time taken by the projectile to reach Q is T, then PQ is equal to

    (a) $Tv\sin\theta$ (b) $Tv\cos\theta$ (c) $Tv\sec\theta$ (d) $Tvta\,n\,\theta$

28. If the time of flight of a projectile is doubled, what happens to the maximum height attained?

    (a) Halved   (b) remains unchanged   (c) doubled   (d) becomes 4 times

29. If R is the maximum horizontal range of a projectile, then the greatest height attained by it is

    (a) R   (b) 2R   (c) R/2   (d) R/4

30. A particle is projected with a velocity v so that its range on a horizontal plane is twice the greatest height attained. If g is the acceleration due to gravity then its range is

    (a) $\dfrac{4v^2}{5g}$ (b) $\dfrac{4g}{5v^2}$ (c) $\dfrac{4v^3}{5g^2}$ (d) $\dfrac{4v}{5g^2}$

31. The path of one projectile as seen by an observer on another projectile is

    (a) Straight line   (b) parabola   (c) ellipse   (d) circle

32. At a height 0.4 m from the ground, the velocity of the projectile is $\vec{v} = 6\hat{i} + 2\hat{j}$ m/s. The angle of projection is

    (a) 45^0 (b) 60^0 (c) 30^0 (d) $\tan^{-1}\left(\dfrac{3}{4}\right)$

33. A person sitting at the rear end of a compartment throws a ball towards the front end. The ball follows a parabolic path. The train is moving with a speed of 20 m/s. A person standing outside on the ground also observes the ball. How will the maximum height H and the range R seen by both be compared?

    (a) Same H different R

(b) Same H and R

(c) Different H and same R

(d) Different H and R

34. A car is moving horizontally along a straight line with a uniform velocity of 25 m/s. A projectile is to be fired from this car in such a way that it will return to the car after car has travelled 100 m. The speed of projection must be

(a) 10 m/s   (b) 20 m/s   (c) 15 m/s   (d) 25 m/s