

Class: IX
Subject: Physics
Topic: Motion In a Plane
No. of Questions: 20
Duration: 60 Min
Maximum Marks: 60

Q1. A projectile is projected with a kinetic energy E . Its range is R . It will have the minimum kinetic energy after covering a horizontal distance equal to

- (a) $0.25 R$
- (b) $0.5 R$
- (c) $0.75 R$
- (d) R

Ans: b

Hint: Kinetic energy would be minimum at max height, i.e. $R/2$

Q2. A gun fires two bullets at 60° and 30° with horizontal. The bullets strike at some horizontal distance. The ratio of maximum height for the two bullets is in the ratio

- (a) $2 : 1$
- (b) $3 : 1$
- (c) $4 : 1$
- (d) $1 : 1$

Ans: b

Hint: Use the formulas of Maximum Height and Range and compare

Q3. A body is projected at an angle of 30° to the horizontal with speed 30 m/s . What is the angle of velocity with horizontal after 1.5 seconds?

- (a) 0°
- (b) 30°
- (c) 60°

(d) 90°

Ans: a

Hint: $R = S^x = u^x t + 1/2 a^x t^2$

Since, $a_x = 0$

Q4. A body is projected such that its KE at the top is $3/4$ th of its initial KE. What is the angle of projectile with the horizontal?

(a) 30°

(b) 60°

(c) 45°

(d) 120°

Ans: a

Hint: Find out the Kinetic and potential energy at the given positions and compare

Q5. A body is thrown with a velocity of 9.8 ms^{-1} making an angle of 30° with the horizontal. It will hit the ground after a time

(a) 3.0 s

(b) 2.0 s

(c) 1.5 s

(d) 1 s

Ans: d

Hint: Use horizontal distance covered equation

Q6. If the horizontal range of a projectile is equal to the maximum height reached, then the corresponding angle of projection is

(a) $\text{Tan}^{-1}(1)$

(b) $\text{Tan}^{-1}(\sqrt{3})$

(c) $\text{Tan}^{-1}(4)$

(d) $\text{Tan}^{-1}(12)$

Ans: c

$\tan^{-1}(H/R/2)$

Q7. In uniform circular motion, the velocity vector and acceleration vector are

- (a) Perpendicular to each other
- (b) Same direction
- (c) Opposite direction
- (d) Not related to each other

Ans: a

Hint: In circular motion tangential velocity is perpendicular to the Radial acceleration.

Q8. The circular motion of a particle with constant speed is

- (a) Periodic but not simple harmonic
- (b) Simple harmonic but not periodic
- (c) Periodic and simple harmonic
- (d) neither periodic nor simple harmonic

Ans: a

Q9. Two projectiles are fired from the same point with the same speed at angles of projection 60° and 30° respectively. Which one of the following is true?

- (a) Their maximum height will be same
- (b) Their range will be same
- (c) Their landing velocity will be same
- (d) Their time of flight will be same

Ans: b

Hint: When all the parameters are same except angle of projection, if the sum of angle of projection is 90° , then they would have same range.

Q10. The time of flight of a projectile on an upward inclined plane depends upon

- (a) Angle of inclination of the plane
- (b) Angle of projection
- (c) The value of acceleration due to gravity
- (d) All of these

Ans: d

Hint: $T = 2 u \sin(\text{angle of projection})/g$

Q11. At the highest point on the trajectory of a projectile, its

- (a) Potential energy is minimum.
- (b) Kinetic energy is maximum
- (c) Total energy is maximum
- (d) Kinetic energy is minimum.

Ans: d

Hint: At highest point K.E. is maximum but P.E. would be max.

Q12. Two bullets are fired horizontally, simultaneously and with different velocities from the same place. Which bullet will hit the ground earlier?

- (a) It would depend upon the weights of the bullets.
- (b) The slower one.
- (c) The faster one.
- (d) Both will reach simultaneously.

Ans: d

Hint: Whatever the initial horizontal velocity is, the vertical velocity would be same for both the bullets.

Q13. In the case of a projectile fired at an angle equally inclined to the horizontal and vertical with velocity u the horizontal range is

- (a) $\frac{u^2}{g}$
- (b) $\frac{u^2}{2g}$
- (c) $\frac{u^2}{3g}$
- (d) $\frac{u^2}{4g}$

Ans: a

Hint: Angle of Projection = 45°

Q14. The greatest height to which a man can throw a ball is h . What is the greatest distance to which he can throw the ball?

- (a) $h/4$
- (b) $h/2$
- (c) h
- (d) $2h$

Ans: d

Hint: Using maximum height formula, calculate the relation of initial velocity with angle of projection and put the value in equation of Range.

Q15. A cricket ball is hit with a velocity 25 ms^{-1} , 60° above the horizontal. How far above the ground, ball passes over a fielder 50 m from the bat (consider the ball is struck very close to the ground). Take $\sqrt{3} = 1.7$ and $g = 10 \text{ ms}^{-2}$

- (a) 6.8 m
- (b) 7 m
- (c) 5 m
- (d) 10 m

Ans: c

Hint: For the given values, Use equation of trajectory.

Q16. A projectile is thrown horizontally with a speed of 20 ms^{-1} . If g is 10 ms^{-2} , then the speed of the projectile after 5 second will be nearly

- (a) 0.5 ms^{-1}
- (b) 5 ms^{-1}
- (c) 54 ms^{-1}
- (d) 500 ms^{-1}

Ans: c

Hint: Use first equation of motion along horizontal direction.

Q17. A ball is projected at such an angle that the horizontal range is three times the maximum height. The angle of projection of the ball is

- (a) $\sin^{-1}\left(\frac{3}{4}\right)$
- (b) $\sin^{-1}\left(\frac{4}{3}\right)$
- (c) $\cos^{-1}\left(\frac{4}{3}\right)$
- (d) $\tan^{-1}\left(\frac{4}{3}\right)$

Ans: d

Hint: Relate equations of Range and Height for projection.

Q18. A bullet is fired with a speed of 1500 m/s in order to hit a target 100 m away. If $g = 10 \text{ m/s}^2$, the bullet should be aimed

- (a) 15 cm above the target
- (b) 10 cm above the target
- (c) 2.2 cm above the target
- (d) Directly towards the target

Ans: c

Hint: For the given height and range, use equation of trajectory to calculate angle of projection and then calculate maximum height gained

Q19. A bomb is dropped from an aero plane moving horizontally at a constant speed. If air resistance is taken into consideration, then the bomb

- (a) Falls on earth exactly below the aero plane
- (b) Falls on the surface of earth exactly behind the aero plane
- (c) Falls on the earth ahead of the aero plane
- (d) Flies with the aero plane

Ans: b

Hint: if there is no resistance, bomb will drop at a place exactly below the flying aero plane. But when we take into account air resistance, bomb will face deceleration in its velocity. So, it will fall on the earth exactly behind the aero plane.

Q20. A cyclist moving at a speed of 20 m/s takes a turn, if he doubles his speed then chance of overturn

- (a) Is doubled
- (b) Is halved
- (c) Becomes four times
- (d) Becomes $\frac{1}{4}$ times

Ans: d

Hint: When the cyclist takes the turn, it experiences a centrifugal force which is equal to $\frac{mv^2}{R}$. it tries to overcome the cyclist in outward direction. If speed becomes twice, the value of centrifugal force too increases to 4 times its earlier value. $\frac{1}{4}$