DPP No. 2

SYLLABUS : KINEMATICS

1. A ball is thrown upwards. It returns to ground describing a parabolic path. Which of the following remains constant?

(A) Speed of the ball (B) Kinetic energy of the ball

(C) Vertical component of velocity (D) Horizontal component of velocity.

2. A bullet is fired horizontally from a rifle at a distant target. Ignoring the effect of air resistance, which of the following is correct?

	Horizontal Acceleration	**Vertical Acceleration**
(A)	$10\ ms^{-2}$	$10\ ms^{-2}$
(B)	$10\ ms^{-2}$	$0\ ms^{-2}$
(C)	$0\ ms^{-2}$	$10\ ms^{-2}$
(D)	$0\ ms^{-2}$	$0\ ms^{-2}$.

3. It was calculated that a shell when fired from a gun with a certain velocity and at an angle of elevation $\frac{5\pi}{36}$ rad should strike a given target in the same horizontal plane. In actual practice, it was found that a hill just prevented the trajectory. At what angle of elevation should the gun be fired to hit the target.

(A) $\frac{5\pi}{36}$ rad (B) $\frac{11\pi}{36}$ rad (C) $\frac{7\pi}{36}$ rad (D) $\frac{13\pi}{36}$ rad.

4. Velocity of a stone projected, 2 second before it reaches the maximum height, makes angle 53° with the horizontal then the velocity at highest point will be

(A) 20 m/s (B) 15 m/s (C) 25 m/s (D) 80/3 m/s

5. During projectile motion, acceleration of a particle at the highest point of its trajectory is

(A) g (B) zero

(C) less than g (D) dependent upon projection velocity

6. The speed at the maximum height of a projectile is half of its initial speed u. Its range on the horizontal plane is:

(A) $\frac{2u^2}{3g}$ (B) $\frac{\sqrt{3}u^2}{2g}$ (C) $\frac{u^2}{3g}$ (D) $\frac{u^2}{2g}$

7. The velocity of projec tion of a projectile is $(6\hat{i} + 8\hat{j})$ ms^{-1}. The horizontal range of the projectile is $(g = 10\ m/sec^2)$

(A) 4.9 m (B) 9.6 m (C) 19.6 m (D) 14 m

8. A cricketer can throw a ball to a maximum horizontal distance of 100 m. To what height above the ground can the cricketer throw the same ball with same speed.

(A) 10 m (B) 30 m (C) 50 m (D) 150 m

9. A gun kept on a straight horizontal road is used to hit a car, traveling along the same road away from the gun with a uniform speed of $72 \times \sqrt{2}$ km/hour. The car is at a distance of 50 metre from the gun, when the gun is fired at an angle of 45° with the horizontal. Find (i) the distance of the car from the gun when the shell hits it, (ii) the speed of projection of the shell from the gun. $[g = 10\ m/s^2]$

(A) 150 m, 50 m/s (B) 225 m, 60 m/s (C) 200 m, 50 m/s (D) 250 m, 50 m/s

10. One stone is projected horizontally from a 20 m high cliff with an initial speed of 10 ms^{-1}. A second stone is simultaneously dropped from that cliff. Which of the following is true?

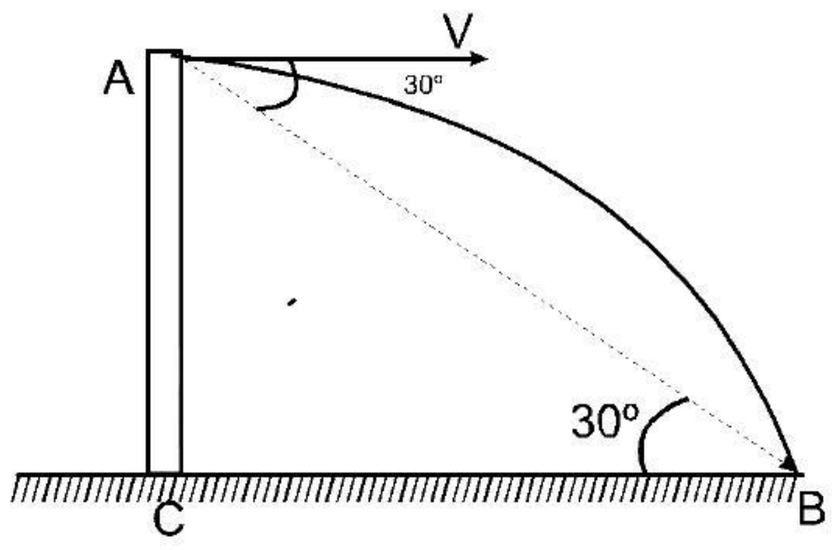
(A) Both strike the ground with the same speed.

(B) The stone with initial speed 10 ms^{-1} reaches the ground first.

(C) Both the stones hit the ground at the same time.

(D) None of these

11. An object is thrown horizontally from a point 'A' from a tower and hits the ground 3s later at B. The line from 'A' to 'B' makes an angle of 30° with the horizontal. The initial velocity of the object is : (take $g = 10\ m/s^2$)



(A) $15\sqrt{3}$ m/s (B) 15 m/s (C) $10\sqrt{3}$ m/s (D) $25/\sqrt{3}$ m/s

12. A stone projected at angle 'θ' with horizontal from the roof of a tall building falls on the ground after three second. Two second after the projection it was again at the level of projection. Then the height of the building is -

(A) 5 m (B) 25 m (C) 20 m (D) 15 m

13. The trajectory of a projectile fired horizontally with velocity *v* is a parabola given by :

(A) $y = \frac{g}{2v^2} x^2$ (B) $y = -\frac{g}{2v^2} x^2$ (C) $x = \frac{g}{2v^2} y^2$ (D) $x = -\frac{g}{2v^2} y^2$

14. A ball is projected from a certain point on the surface of a planet at a certain angle with the horizontal surface. The horizontal and vertical displacement x and y varies with time t in second as: $x = 10\sqrt{3}t$ and $y = 10t - t^2$. The maximum height attained by the ball is

(A) 100 m (B) 75 m (C) 50 m (D) 25 m.

15. A ball is thrown upward at an angle of 30° with the horizontal and lands on the top edge of a building that is 20 m away. The top edge is 5m above the throwing point. The initial speed of the ball in metre/second is (take g = 10 m/s^2) :

(A) $u = 40\sqrt{\frac{(4+\sqrt{3})}{13\sqrt{3}}}$ m/s (B) $u = 40\sqrt{\frac{4-\sqrt{3}}{13\sqrt{3}}}$ m/s

(C) $u = 40\sqrt{\frac{4+\sqrt{3}}{13}}$ m/s (D) $u = 40\frac{40}{\sqrt{\sqrt{3}(4+\sqrt{3})}}$ m/s

16. The equation of motion of a projectile is $y = 12x - 3/4\,x^2$. Given that g = 10 ms^{-2}. What is the range of the projectile?

(A) 36m (B) 30.6 m (C) 16 m (D) 12.4 m

17. The equation of a projectile is $y = \sqrt{3}x - \frac{gx^2}{2}$, find the angle of projection. Also find the speed of projection. Where at t = 0, x = 0 and y = 0 also $\frac{d^2x}{dt^2} = 0$ & $\frac{d^2y}{dt^2} = -g$.

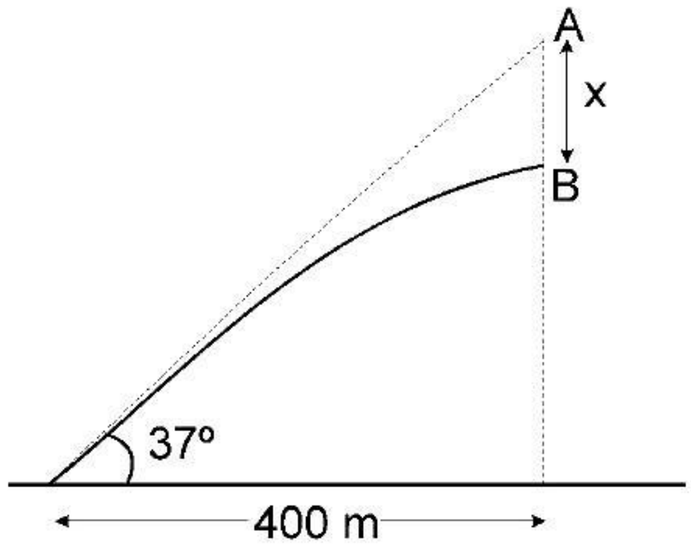
(A) 1m/s (B) 2m/s (C) 3m/s (D) 4m/s

18. A ball is horizontally projected with a speed v from the top of a plane inclined at an angle 45° with the horizontal. How far from the point of projection will the ball strike the plane?

(A) $\frac{v^2}{g}$ (B) $\frac{\sqrt{2}v^2}{g}$ (C) $\frac{2v^2}{g}$ (D) $\left[\frac{2\sqrt{2}v^2}{g}\right]$

19. A shooter aims his rifle at an angle of 37° with the horizontal to hit an object at A but the bullet hits at the point B, x below it. If the initial velocity of the bullet is 125 m/s the value of 'x' is :

(take g = 10 m/s^2)



(A) 19m (B) 80m (C) 40m (D) 48 m

20. A particle is projected at angle 37° with the incline plane in upward direction with speed 10 m/s. The angle of incline plane is given 53°. Then the maximum distance from the incline plane attained by the particle will be -

(A) 3m (B) 4 m (C) 5 m (D) zero

21. On an inclined plane of inclination 30º, a ball is thrown at an angle of 60º with the horizontal from the foot of the incline with a velocity of $10\sqrt{3}$ ms^{-1}. If g = 10 ms^{-2}, then the time in which ball will hit the inclined plane is -

(A) 1 sec. (B) 6 sec. (C) 2 sec. (D) 4 sec.

22. A stone is projected with speed 20 m/s at angle 37° with the horizontal and it hits the ground with speed 12 m/s due to air resistance. Assume the effect of air resistance is to reduce only horizontal component of velocity. Then the time of flight will be (g = 10 m/s^2) -

(A) greater than 2.4 sec (B) less than 2.4 sec.

(C) 2.4 sec. (D) depends on other data

23. A particle is projected under gravity at an angle of projection 45° with horizontal. Its horizontal range is 36 m. Find maximum Height attained by particle.

(A) 8 meter (B) 9 meter (C) 10 meter (D) 20 meter

24. A ball is projected horizontally with a velocity of 5 m s^{-1} from the top of a building 19.6 m high. How long will the ball take to hit the ground ? (g = 9.8 m/s^2)

(A) 1s (B) 2 s (C) 4s (D) 3 s

25. A bomb is dropped from an aeroplane when it is at a height h directly above the target. If the aeroplane is moving horizontally with a speed v, the distance by which the bomb will miss the target is given by

(A) $2v\sqrt{\frac{h}{g}}$ (B) $v\sqrt{\frac{h}{g}}$ (C) $v\sqrt{\frac{2h}{g}}$ (D) $v\frac{\sqrt{h}}{2g}$

ANSWER KEY

1.	(D)	**2.**	(C)	**3.**	(D)	**4.**	(B)	**5.**	(A)
6.	(B)	**7.**	(B)	**8.**	(C)	**9.**	(D)	**10.**	(C)
11.	(A)	**12.**	(D)	**13.**	(B)	**14.**	(D)	**15.**	(A)
16.	(C)	**17.**	(B)	**18.**	(D)	**19.**	(B)	**20.**	(A)
21.	(C)	**22.**	(C)	**23.**	(B)	**24.**	(B)	**25.**	(C)