Additional Problems For Self Practice (APSP)

PART- I : PRACTICE TEST PAPER

Max. Marks : 120 **Max. Time : 1 Hr.**

Important Instructions :

1. The test is of **1 hour** duration and max. marks 120.
2. The test consists **30** questions, **4 marks** each.
3. Only one choice is correct **1 mark** will be deducted for incorrect response. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.
4. There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instructions 3 above.

1. A particle when projected in vertical plane moves along the fixed smooth surface with initial velocity 20 m/s at an angle of 60º, so that its normal reaction on the surface remains zero throughout the motion. Then the slope of the tangent to the surface at height 5 m from the point of projection A will be :

(1) 30º (2) 45º (3) $\tan^{-1} 2$ (4) $\tan^{-1} \sqrt{2}$

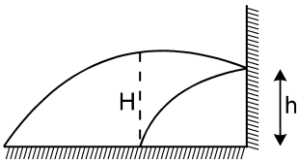
2. A particle at a height ' h ' from the ground is projected with an angle 30° from the horizontal, it strikes the ground making angle 45° with horizontal. It is again projected from the same point with the same speed but with an angle of 60° with horizontal. Find the angle it makes with the horizontal when it strikes the ground :

(1) $\tan^{-1}$ (4) (2) $\tan^{-1}$ (5) (3) $\tan^{-1}(\sqrt{5})$ (4) $\tan^{-1}(\sqrt{3})$

3. A particle is projected from a point (0, 1) on Y-axis (assume + Y direction vertically upwards) aiming towards a point (4, 9). It fell on ground which is along x axis in 1 sec.
Taking g = 10 m/s^2 and all coordinate in metres. Find the X-coordinate where it fell.

(1) (3, 0) (2) (4, 0) (3) (2, 0) (4) ($2\sqrt{5}$, 0)

4. A stone is projected from a horizontal plane. It attains maximum height 'H' & strikes a stationary smooth wall & falls on the ground vertically below the maximum height. Assuming the collision to be elastic the height of the point on the wall where ball will strike is

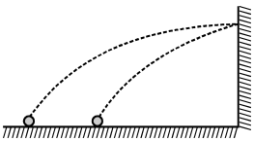


(1) $\frac{H}{2}$ (2) $\frac{H}{4}$ (3) $\frac{3H}{4}$ (4) None of these

5. The vertical height of the projectile at time t is given by $y = 4t - t^2$ and the horizontal distance covered is given by $x = 3t$. What is the angle of projection with the horizontal?
(1) $\tan^{-1}$ 3/5 (2) $\tan^{-1}$ 4/5 (3) $\tan^{-1}$ 4/3 (4) $\tan^{-1}$ 3/4

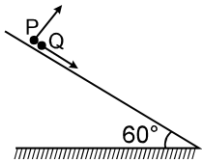
6. Ram can throw a ball on a horizontal surface upto a maximum distance of 50 m. The maximum height upto which he can throw the ball is
(1) 50 m (2) 25 m (3) 12.5 m (4) 100 m

7. A stone is projected from ground and hits a smooth vertical wall after 1 sec. and again falls back on the ground. The time taken by stone to reach the ground after the collision is 3 secs. The maximum height reached by the same stone if the vertical wall were not to be present is. (g = 10 m/s^2)



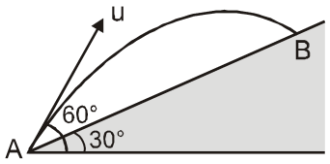
(1) 10 m (2) 12.5 m (3) 15 m (4) 20 m

8. A particle P is projected from a point on the surface of smooth inclined plane (see figure). Simultaneously another particle Q is released on the smooth inclined plane from the same position. P and Q collide after t = 4 second. The speed of projection of P is



(1) 5 m/s (2) 10 m/s (3) 15 m/s (4) 20 m/s

9. A stone is projected from point A with speed u making an angle 60° with horizontal as shown. The fixed inclined surface makes an angle 30° with horizontal. The stone lands at B after time t. Then the distance AB is equal to



(1) $\frac{ut}{\sqrt{3}}$ (2) $\frac{\sqrt{3}ut}{2}$ (3) $\sqrt{3}ut$ (4) 2 ut

10. If R and h represent the horizontal range and maximum height respectively of an oblique projection whose start point (i.e. point of projecteion) & end point are in same horizontal level. Then $\frac{R^2}{8h}$ + 2h represents
(1) maximum horizontal range (2) maximum vertical range
(3) time of flight (4) velocity of projectile at highest point

11. 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
(1) 20 m/s (2) 15 m/s (3) 25 m/s (4) 80/3 m/s

12. A stone projected from the ground level falls on the ground after 4 second. Then the height of the stone 1 second after the projection (Take g = 10 m/s^2)
(1) 5 m (2) 10 m (3) 15 m (4) 20 m

13. A body is projected at such an angle that the horizontal range is three times the greatest height. The angle of projection is
(1) 25° 8' (2) 33° 7' (3) 42° 8' (4) 53° 8'

14. Two bodies are projected with the same velocity. If one is projected at an angle of 30° and the other at an angle of 60° to the horizontal, the ratio of the maximum heights reached is
(1) 3 : 1 (2) 1 : 3 (3) 1 : 2 (4) 2 : 1

15. At the uppermost point of a projectile, its velocity and acceleration are at an angle of
(1) 180º (2) 90º (3) 60º (4) 45º

16. The maximum range of a gun horizontal terrain is 10 km. If g = 10 m/s^2 what must be the muzzle velocity of the shell
(1) 400 m/s (2) 200 m/s (3) 100 m/s (4) 50 m/s

17. A projectile can have the same range R for two angles of projection. If t_1 and t_2 be the times of flights in the two cases, then the product of the two time of flights is proportional to
(1) $\frac{1}{R^2}$ (2) R^2 (3) R (4) $\frac{1}{R}$

18. If two projectiles are fired at the angles 30º and 60º respectively then the ratio of their horizontal ranges is
(1) 2 : 1 (2) 4 : 1 (3) 1 (4) 1 : 2

19. If R and H represent the horizontal range and the maximum height achieved by a projectile then which of the relation exists?
(1) $\frac{H}{R} = 4\cot\theta$ (2) $\frac{R}{H} = 4\cot\theta$ (3) $\frac{H}{R} = 4\tan\theta$ (4) $\frac{R}{H} = 4\tan\theta$

20. For a given angle of the projectile if the initial velocity is doubled the range of the projectile becomes
(1) Half (2) One-fourth (3) Two times (4) Four times

21. If we can throw a ball upto a maximum height H, the maximum horizontal distance to which we can throw it is
(1) 2H (2) $\sqrt{2}H$ (3) H (4) $\frac{H}{2}$

22. A projectile can have the same range for two angles of projection. If h_1 and h_2 are maximum heights when the range in the two cases is R, then the relation between R, h_1 and h_2 is :
(1) $R = 4\sqrt{h_1h_2}$ (2) $R = 2\sqrt{h_1h_2}$ (3) $R = \sqrt{h_1h_2}$ (4) None of these

23. A projectile thrown with velocity v making angle θ with vertical gains maximum height H in the time for which the projectile remains in air the time period is
(1) $\sqrt{H\cos\theta/g}$ (2) $\sqrt{2H\cos\theta/g}$ (3) $\sqrt{4H/g}$ (4) $\sqrt{8H/g}$

24. A bomb is released from a horizontal flying aeroplane. The trajectory of bomb is
(1) a parabola (2) a straight line (3) a circle (4) a hyperbola

25. Two projectiles are fired from the same point with the same speed at angles of projection 60º and 30º respectively. Which one of the following is true?
(1) Their maximum height will be same (2) Their range will be same
(3) Their landing velocity will be same (4) Their time of flight will be same

26. When a body is thrown with a velocity u making an angle θ with the horizontal plane, the maximum distance covered by it in horizontal direction is-
(1) $\frac{u^2\sin\theta}{g}$ (2) $\frac{u^2\sin2\theta}{2g}$ (3) $\frac{u^2\sin2\theta}{g}$ (4) $\frac{u^2\cos2\theta}{g}$

27. An aeroplane is flying horizontal with a velocity of 600 km/h and at a height of 1960 m. When it is vertically at a point A on the ground, a bomb is released from it. The bomb strikes the ground at point B. The distance AB is-
(1) 1200 m (2) 0.33 km (3) 3.33 km (4) 33 km

28. The direction of motion of a projectile at the highest point of its trajectory becomes
(1) Horizontal (2) Vertical (3) Tangential (4) None of these

29. A bomb is dropped from an aeroplane moving horizontally at constant speed. When air resistance is taken into consideration, then the bomb-
(1) Flies with the aeroplane (2) Fall on earth ahead of the aeroplane
(3) Falls on earth behind aeroplane (4) Falls on earth exactly below the aeroplane

30. Two particles are projected with same initial velocity, one makes angle θ with vertical and another with horizontal. If their common range is R, then product of their time of flight is directly proportional to
(1) R (2) R^2 (3) 1/R (4) R^O

Practice Test (JEE-Main Pattern)

OBJECTIVE RESPONSE SHEET (ORS)

Que.	1	2	3	4	5	6	7	8	9	10
Ans.										
Que.	11	12	13	14	15	16	17	18	19	20
Ans.										
Que.	21	22	23	24	25	26	27	28	29	30
Ans.										

PART - II : PRACTICE QUESTIONS

1. Two projectiles of same mass and with same velocity are thrown at an angle 60° and 30° with the horizontal, then which will remain same-
(1) Time of flight (2) Range of projectile
(3) Max height acquired (4) All of them

2. If two bodies are projected at 30° and 60° respectively, with the same velocity, then
(1) Their ranges are same (2) Their heights are same
(3) Their times of flight are same (4) All of these

3. A particle is projected making angle 45º with horizontal having kinetic energy K. The kinetic energy at highest point will be
(1) $\frac{K}{\sqrt{2}}$ (2) $\frac{K}{2}$ (3) 2 K (4) K

4. A particle is dropped from a tower of height 10m and simultaneously another particle is projected horizontally from the top of a tower with speed 5 m/sec
(1) Both particles reach ground simultaneously (2) A reaches earlier than B
(3) B reaches earlier than A (4) None

5. If the horizontal range of a projectile is equal to the maximum height reached, then the corresponding angle of projection is
(1) $\tan^{-1}(1)$ (2) $\tan^{-1}(\sqrt{3})$ (3) $\tan^{-1}(4)$ (4) $\tan^{-1}(12)$

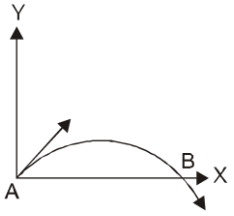
6. A missile is fired for maximum range with an initial velocity of 20 m/s. If g = 10 m/s^2, the range of the missile is :
(1) 40 m (2) 50 m (3) 60 m (4) 20 m

7. A projectile is fired at an angle of 45º with the horizontal. Elevation angle of the projectile at its highest point as seen from the point of projection is :
(1) 60º (2) $\tan^{-1}\left(\frac{1}{2}\right)$ (3) $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$ (4)45º

8. The horizontal range and the maximum height of a projectile are equal. The angle of projection of the projectiles is :
(1) $\theta = \tan^{-1}\left(\frac{1}{4}\right)$ (2) $\theta = \tan^{-1}(4)$ (3) $\theta = \tan^{-1}(2)$ (4) $\theta = 45^\circ$

9. A particle has initial velocity $\left(2\vec{i}+3\vec{j}\right)$ and acceleration $\left(0.3\vec{i}+0.2\vec{j}\right)$. The magnitude of velocity after 10 seconds will be :
(1) $9\sqrt{2}$ units (2) $5\sqrt{2}$ units (3) 5 units (4) 9 units

10. The velocity of a projectile at the initial point A is $\left(2\hat{i}+3\hat{j}\right)$ m/s. It's velocity (in m/s) at point B is :



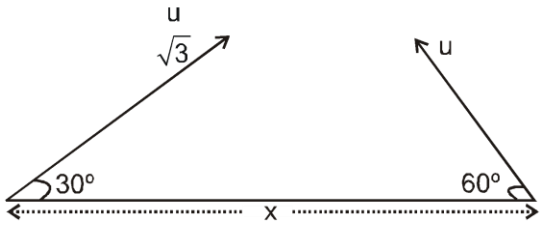
(1) $-2\hat{i}+3\hat{j}$ (2) $2\hat{i}-3\hat{j}$

(3) $2\hat{i}+3\hat{j}$ (4) $-2\hat{i}-3\hat{j}$

11. A projectile is fired from the surface of the earth with a velocity of $5ms^{-1}$ and angle θ with the horizontal. Another projectile fired from another planet with a velocity of $3ms^{-1}$ at the same angle follows a trajectory which is identical with the trajectory of the projectile fired from the earth. The value of the acceleration due to gravity on the planet is : (given = $9.8\ ms^{-2}$)

(1) 3.5 (2) 5.9 (3)16.3 (4)110.8

12. Two particles separated at a horizontal distance x as shown in fig. they projected at the same line as shown in fig. with different initial speeds. The time after which the horizontal distance between them become zero :-



(1) $\frac{x}{u}$ (2) $\frac{u}{2x}$ (3) $\frac{2u}{x}$ (4) None of these

13. A particle is projected at an angle of 45º from 8 m before the foot of a wall, just touches the top of wall and falls on the ground on the opposite side at a distance 4 m from it. The height of wall is :-

(1) $\frac{2}{3}m$ (2) $\frac{4}{3}m$ (3) $\frac{8}{3}m$ (4) $\frac{3}{4}m$

14. In case of a projectile fired at an angle equally indined to the horizontal and vertical with velocity (u). The horizontal range is :-

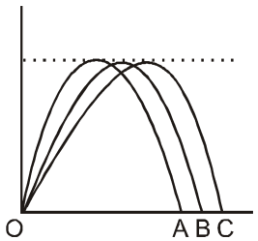
(1) $\frac{u^2}{g}$ (2) $\frac{u^2}{2g}$ (3) $\frac{2u^2}{g}$ (4) $\frac{u^2}{g^2}$

15. A student is able to throw a ball vertically to maximum height of 40 m. The maximum distance to which the student can throw the ball in the horizontal direction :-

(1) 40 $(2)^{1/2}$m (2) 20 $(2)^{1/2}$m (3) 20 m (4) 80 m

16. Three projectile A, B and C are thrown from the same point in the same plane. Their trajectories are shown in the figure. Then which of the following statement is true :-

(1) The time of flight is the same for all the three
(2) The launch speed is greatest for particle C
(3) The horizontal velocity component is greatest for particle C
(4) All of the above



17. A projectile is thrown with an intial velocity of $\vec{v}=a\hat{i}+b\hat{j}$, if the range of projectile is double of maximum height reached by it then : -

(1) a = 2 b (2) b = a (3) b = 2a (4) b = 4a

18. The equation of projectile is $y=16x-\frac{x^2}{4}$ then the horizontal range is : -

(1) 16 m (2) 8 m (3) 64 m (4) 12.8 m

19. If a projectile is fired at an angle θ with the vertical with velocity u, then maximum height attained is given by :-

(1) $\frac{u^2 \cos\theta}{2g}$ (2) $\frac{u^2 \sin^2\theta}{2g}$ (3) $\frac{u^2 \sin^2\theta}{g}$ (4) $\frac{u^2 \cos^2\theta}{2g}$

20. If R is the maximum horizontal range of a particle, then the greatest height attained by it is : -

(1) R (2) 2R (3) $\frac{R}{2}$ (4) $\frac{R}{4}$

Answers

PART-I

1.	(4)	**2.**	(3)	**3.**	(3)	**4.**	(3)	**5.**	(3)	**6.**	(2)	**7.**	(4)
8.	(2)	**9.**	(1)	**10.**	(1)	**11.**	(2)	**12.**	(3)	**13.**	(4)	**14.**	(2)
15.	(2)	**16.**	(1)	**17.**	(3)	**18.**	(3)	**19.**	(2)	**20.**	(2)	**21.**	(1)
22.	(1)	**23.**	(4)	**24.**	(1)	**25.**	(2)	**26.**	(3)	**27.**	(3)	**28.**	(1)
29.	(3)	**30.**	(1)										

PART-II

1.	(2)	**2.**	(1)	**3.**	(2)	**4.**	(1)	**5.**	(3)	**6.**	(1)	**7.**	(2)
8.	(2)	**9.**	(2)	**10.**	(2)	**11.**	(1)	**12.**	(1)	**13.**	(2)	**14.**	(1)
15.	(4)	**16.**	(4)	**17.**	(3)	**18.**	(3)	**19.**	(4)	**20.**	(4)		