LEVEL # 1

Questions based on Simple Projection

Q.1 A ball is thrown upward and it returns to ground describing a parabolic path. Which of the following remains constant ?
(A) kinetic energy of the ball
(B) speed of the ball
(C) horizontal component of velocity
(D) vertical component of velocity

Q.2 At the top of the trajectory of a projectile the direction of its velocity and acceleration are-
(A) Parallel to each other
(B) inclined at an angle of 45° to the horizontal
(C) Perpendicular to each other
(D) None of the above statement is correct

Q.3 Three particles, A , B and C are projected from the same point with same initial speeds making angles 30°, 45° and 60° respectively with the horizontal. Which of the following statement is correct ?
(A) A, B and C have equal ranges
(B) ranges of A and C are equal and less than that of B
(C) ranges of A and C are equal and greater than that of B
(D) A, B and C have equal ranges

Q.4 If a man wants to hit a target, he should point his rifle-
(A) higher than the target
(B) lower than the target
(C) in the direction of the target
(D) nothing can be said

Q.5 The horizontal range covered by projectile is proportional to
(A) its velocity
(B) square of its velocity
(C) sine of the angle of projection
(D) square of the sine of the angle of projection

Q.6 The horizontal range for projectile is given by
(A) $\frac{u^2 \sin^2\theta}{g}$ (B) $\frac{u^2 \sin 2\theta}{g}$
(C) $\frac{u^2 \sin 2\theta}{2g}$ (D) $\frac{u^2 \cos 2\theta}{g}$

Q.7 The maximum vertical height attained by a projectile is
(A) $\frac{U^2 \sin\theta}{g}$ (B) $\frac{U^2 \sin 2\theta}{g}$
(C) $\frac{U^2 \sin 2\theta}{2g}$ (D) $\frac{U^2 \sin^2\theta}{2g}$

Q.8 Equation of motion of a projectile is
(A) $y = x\tan\theta - \frac{gx^2}{2u^2\cos^2\theta}$
(B) $y = x\tan\theta + \frac{gx^2}{2u^2\cos^2\theta}$
(C) $y = x\sin\theta - \frac{gx^2}{2u\cos^2\theta}$
(D) $y = x\sin\theta + \frac{gx^2}{2u^2\cos^2\theta}$

Q.9 A cannon on a level plane is aimed at an angle α above the horizontal and a shell is fired with a muzzle velocity v towards a vertical cliff a distance R away. The height from the bottom at which the shell strikes the side walls of the cliff is-
(A) $R\tan\alpha - \frac{1}{2}\frac{gR^2}{v_0^2\cos^2\alpha}$
(B) $R\tan\alpha - \frac{1}{2}\frac{gR^2}{v_0^2}$
(C) $R\sin\alpha - \frac{1}{2}\frac{gR^2}{v_0^2\sin^2\alpha}$
(D) $R\tan\alpha + \frac{1}{2}\frac{gR^2}{v_0^2}$

Q.10 A player kicks up a ball at an angle θ to the horizontal. The horizontal range is maximum when θ equals-
(A) 30º (B) 45º (C) 60º (D) 90º

Q.11 The angle of projection of a body is 15º . The other angle for which the range is the same as the first one is equal to-
(A) 30º (B) 45º (C) 60º (D) 75º

Q.12 A particle is projected such that the horizontal range and vertical height are the same. Then the angle of projection is-
(A) $\pi/4$ (B) $\tan^{-1}(4)$
(C) $\tan^{-1}(1)$ (D) $\pi/3$

Q.13 A ball is thrown at an angle of 45º with the horizontal with kinetic energy E. The kinetic energy at the highest point during the flight is-
(A) Zero (B) E/2
(C) E (D) $(2)^{1/2}E$

Q.14 A ball is thrown with initial energy 100J at an angle θ to the horizontal . If its energy at the top becomes 30 J then angle of projection-
(A) $\theta = 45^\circ$ (B) $\theta = 30^\circ$
(C) $\theta = \cos^{-1}(3/10)$. (D) $\theta = \cos^{-1}(3/10)^{1/2}$

Q.15 The horizontal and vertical distances travelled by a particle in time t are given by $x = 6t$ and $y = 8t - 5t^2$. If $g = 10$ m/sec^2, then the initial velocity of the particle is-
(A) 8 m/sec (B) 10 m/sec
(C) 5 m/sec (D) zero

Q.16 A body is thrown with a velocity of 9.8 m/s making an angle of 30º with the horizontal. It will hit the ground after a time-
(A) 3 s (B) 2 s
(C) 1.5 s (D) 1 s

Q.17 The maximum range of a projectile is 22 m. When it is thrown at an angle of 15º with the horizontal, its range will be-
(A) 22 m (B) 6 m
(C) 15 m (D) 11 m

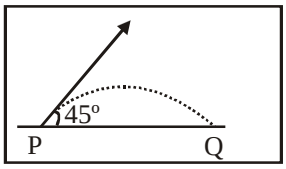
Q.18 A boy throws a ball with a velocity v_0 at an angle α to the horizontal. At the same instant he starts running with uniform velocity to catch the ball before it hits the ground . To achieve this, he should run with a velocity of-
(A) $v_0 \cos\alpha$ (B) $v_0 \sin\alpha$
(C) $v_0 \tan\alpha$ (D) $\sqrt{v_0^2 \tan\alpha}$

Q.19 The maximum range of a gun on a horizontal terrain is 16 km. If $g = 10$ m/sec^2 , the muzzle velocity of the shell must be-
(A) 400 m/sec (B) 160 $\sqrt{10}$ m/sec
(C) 1600 m/sec (D) 200 $\sqrt{2}$ m/sec

Q.20 The range of the particle which is projected at an angle of 15º is 1.5 km. What will be the range for an angle of projection 45º
(A) 0.5 km (B) 1.5 km
(C) 2.5 km (D) 3 km

Q.21 A body is projected at an angle θ with horizontal. Another body is projected with the same velocity at an angle θ with the vertical. The ratio of the time of flights is-
(A) 1:1 (B) $\tan^2\theta$:1
(C) 1 : cot θ (D) tan 2θ : 1

Q.22 A projectile of mass m is fired with velocity v from the point P at an angle 45º with the horizon. The magnitude of change in momentum when it passes through the point Q on the same horizontal line on which P lies is-



(A) mv $\sqrt{2}$ (B) $\frac{1}{2}$ mv
(C) Zero (D) 2 mv

Q.23 The kinetic energy of a projectile at the highest point is-
(A) Zero
(B) Maximum
(C) Minimum
(D) Equal to total energy

Q.24 The equation of a projectile is $y = \sqrt{3}\,x - \frac{gx^2}{2}$. The angle of projection is-
(A) 30º (B) 60º
(C) 45º (D) None

Q.25 The equation of projectile is $y = 16x - \frac{5x^2}{4}$. The horizontal range is -
(A) 16 m (B) 8 m
(C) 3.2 m (D) 12.8 m

Q.26 For angles of projection of a projectile at angles $(45 + \theta)$ and $(45 - \theta)$, the horizontal ranges describe by the projectile are in the ratio of (if $\theta \le 45º$)-
(A) 2 : 1 (B) 1: 2
(C) 1: 1 (D) 2 : 3

Q.27 A projectile thrown with a speed v at an angle θ has a range R on the surface of the earth. For same v and θ, its range on the surface of moon will be -
(A) R/6 (B) 6R
(C) R/36 (D) 36 R

Q.28 In a projectile motion the velocity -
(A) is always perpendicular to the acceleration
(B) is never perpendicular to the acceleration
(C) is perpendicular to the acceleration for one instant only
(D) is perpendicular to the acceleration for two instant

Q.29 Two projectile A and B are projected with angle of projection 15º for the projectile A and 45º for the projectile B. If R_A and R_B be the horizontal range for the two projectiles, then -
(A) $R_A < R_B$
(B) $R_A = R_B$
(C) $R_A > R_B$
(D) The information is insufficient to decide the relation of R_A with R_B

Q.30 A body is projected with a speed 'u' at an angle to the horizontal to have maximum range at the highest point the velocity is–
(A) Zero (B) u
(C) $\frac{u}{\sqrt{2}}$ (D) $u\sqrt{2}$

Q.31 If two stones projected from the same point with same initial speed but an angle $\pi/3$ and $\pi/6$ respectively have their ranges R_1 and R_2, then-
(A) $R_1 = 2R_2$ (B) $R_1 = R_2$
(C) $R_1 = 5R_2$ (D) $R_1 = 25R_2$

Q.32 The time of flight of projectile is 10 second and its range is 500 m. The maximum height reached by it will be ($g = 10\ m/s^2$)-
(A) 25 m (B) 50 m
(C) 82 m (D) 125 m

Q.33 If four balls A, B, C, D are projected with same speed at angles of 15º, 30º, 45º and 60º with the horizontal respectively, the two balls which will fall at the same place will be-
(A) A and B (B) A and D
(C) B and D (D) A and C

Q.34 A ball is thrown at an angle θ with the horizontal. Its kinetic energy is 100 J and it becomes 30 J at the highest point. The angle of projection is-
(A) 45º (B) 30º
(C) $\cos^{-1}\left(\frac{3}{10}\right)$ (D) $\cos^{-1}\left(\sqrt{\frac{3}{10}}\right)$

Q.35 A body is projected at an angle of 30º to the horizontal with a speed of 40 m/s. The angle with the horizontal after 2 seconds will be-
(A) 10° (B) 30°
(C) 45° (D) 0°

Questions based on Horizontal Projection

Q.36 A marble A is dropped vertically, another identical marble B is projected horizontally from the same point at the same instant
(A) A will reach the ground earlier than B
(B) B will reach the ground earlier than A
(C) both A and B will reach the ground at the same instant
(D) none of the above

Q.37 A stone is just released from the window of a train moving along a horizontal straight track. The stone will hit the ground following a
(A) straight line path (B) circular path
(C) parabolic path (D) hyperbolic path

Q.38 The trajectory of a projectile fired horizontally with velocity u is parabola given by-

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

(C) $y = \frac{g}{2u^2} y^2$ (D) $y = \frac{g}{2u^2} y^2$

Q.39 A body projected from the top of a tower horizontally with an initial velocity 20 m/s hits the ground at an angle of 45º. The vertical component of velocity at the times of hitting is-

(A) 20 m/s (B) $20\sqrt{2}$ m/s

(C) $20/\sqrt{2}$ m/s (D) $10\sqrt{3}$ m/s

Q.40 From a tower of height h a particle is projected horizontally with velocity u and another thrown down with the same velocity u. If the time taken by these be t_1 and t_2 what is true ?

(A) $t_1 = t_2$ (B) $t_1 > t_2$

(C) $t_1 < t_2$ (D) $t_1 = 3t_2$

Q.41 An aeroplane moves with a horizontal velocity U. It drops a bomb from a height h. Then the time (t) taken by the bomb in reaching the ground will be equal to-

(A) $(2g/h)^{1/2}$ (B) $(2h/g)^{1/2}$

(C) $(h/2g)^{1/2}$ (D) $(4h/g)^{1/2}$

Q.42 An aeroplane is flying at a height of 1960 m in horizontal direction with a velocity of 360 km/hr. When it is vertically above the point A on the ground, it drops a bomb. The bomb strikes a point B on the ground, then the time taken by the bomb to reach the ground is-

(A) $20\sqrt{2}$ sec (B) 20 sec

(C) $10\sqrt{2}$ sec (D) 10 sec

Q.43 A body is thrown horizontally with velocity $\sqrt{2gh}$ from the top of a tower of height h. It strikes the level ground through the foot of tower at a distance x from the tower. The value of x is-

(A) h (B) h/2

(C) 2h (D) 2h/3

(C) $\frac{\pi}{2} - \alpha$ (D) $\frac{\pi}{2}$

Q.44 Two bullets are fired simultaneously, horizontally and with different speeds from the same place. Which bullet will hit the ground first ?

(A) The faster one

(B) The slower one

(C) Both will reach simultaneously

(D) Depends on the masses

Q.45 A bomber is flying horizontally with a constant speed of 150 m/s at a height of 78.4 m. The pilot has to drop a bomb at the energy target. At what horizontal distance from the target should be release the bomb ?

(A) 0 m (B) 300 m

(C) 600 m (D) 1000 m

Q.46 An aeroplane is moving with a horizontal velocity u at a height h above the ground. If a packet is dropped from it, the speed of the packet when it reaches the ground will be-

(A) $\sqrt{u^2 + 2gh}$ (B) $\sqrt{2gh}$

(C) $\sqrt{u^2 - 2gh}$ (D) 2gh

Q.47 A marble moving with a speed 0.2 m/s rolls off the edge of a table 0.8 m high. It will strike the floor at a distance from the table

(A) 0.04 m (B) 0.24 m

(C) 0.16 m (D) 0.08 m

Q.48 A ball is thrown horizontally and the same time another ball is dropped down from the top of a tower

(a) Both the balls will reach the ground at the same time

(b) Both will strike the ground with the same velocity

(A) (a) is true and (b) is false

(B) (a) is true and (b) is true

(C) (a) is false and (b) is true

(D) (a) is false and (b) is false

ANSWER KEY

LEVEL # 1

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	C	C	B	A	B	B	D	A	A	B	D	B	B	D	B	D	D	A	A	D
Q.No.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	C	A	C	B	D	C	B	C	D	C	B	D	C	D	D	C	C	B	A	B
Q.No.	41	42	43	44	45	46	47	48												
Ans.	B	B	C	C	C	A	D	A												