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| | INDIAN SCHOOL AL WADI AL KABIR | |
| **Class: XI** | **Department: SCIENCE 2020 -2021**<br>**SUBJECT : PHYSICS** | **Date of completion:**<br>**02.07.2020** |
| **Worksheet No:02**<br>**With answers** | **Topic: MOTION IN A PLANE** | **Note:**<br>**A4 FILE FORMAT** |

## OBJECTIVE TYPE QUESTIONS

[1] Two projectiles A B are thrown from the same point with the same speed of 30m/s at angles of projection 50° and $\theta$ respectively , so that both the projectiles having the same range. Then the angle $\theta$ is

[a] $45^0$ [b.] $40^0$ [c] $50^0$ [d] $50^0$

For same range, two angles are $\theta and\ 90-\theta$

$\theta = 90 - 50 = 40$

[2] The range of a projectile, when launched at an angle of 15° with horizontal is 1.5km. What is the range of the projectile, when launched at an angle of 45° to the horizontal?

**Horizontal range = $R = u^2 sin2\Theta/g$**

$R = \frac{u^2 sin2\theta}{g}$

$1.5 = \frac{u^2 sin30}{g}$ or $\frac{u^2}{g} = 3$

$R1 = \frac{u^2 sin90}{g} = 3 \times 1 = 3km$

[a] 4km[b] 5km [c] 3.5 km[d] 3km

[3] If the muzzle velocity of the shell is 400m/s, the Maximum range of a gun along horizontal is

[a] 4km [b.]16 km [c] 8km [d] 20km

$Rmax = \frac{u^2}{g} = \frac{400 \times 400}{10} = 16km$

[4] The angular speed of a fly-wheel making 120 r.p.m is

$\omega = 2\pi f = 2\pi \frac{120}{60} = 4\pi$ rad/s

[a] $4\pi$ rad/s [b] $\pi$ rad/s [c] $2\pi$rad/s [d] $4\pi^2$ rad/s

[5] A body is whirled in a horizontal circle of radius 20cm. It has an angular velocity of 10 rad/s. What is the linear velocity at any point on the circular path?
$V = r\omega = 0.2 \times 10 = 2m/s$

[a]10m/s [b] 20 m/s [c] $\sqrt{2}$ m/s[d] 2 m/s

**Answer Key**
**[1]b [2][d][3]b[4]a[5]d**

## Very Short answer type questions (1marks)

[6] Name the only force acting on a projectile, when it is projected into the atmosphere?
Weight /force due to gravity

[7] A ball is thrown in a parabolic path. Is there any point at which the acceleration is perpendicular to the velocity ?
Maximum height
[8] A ball 'A' is dropped from the top a tower and another ball 'B' is projected horizontally from the same point. Which ball will reach the ground first ?
Both reaches the ground simultaneously

[9]What is the angle between the velocity vector and acc. vector in uniform circular motion ?
90
[10] Two bullets A and B are fired horizontally with different velocities ,$U_A$ and $U_B$ respectively .If $U_A$ is greater than $U_B$, which will reach the ground first. why?
Both reaches the ground simultaneously

**Answer Key**
**[6]** force due to gravity
[7]maximum height
[8] both at same time
[9]90
[10] both at same time

## Short answer type questions (2 marks)

[11] A boy is moving with velocity 3km/h along east and the rain is falling vertically with velocity 4km/hr. Calculate the velocity of rain relative to boy [take tan 37° =0.75]

Vrb = Vr – Vb = Vr + - Vb = ?
Apply triangle law of vector addition

V rb = $\sqrt{vr^2 + vb^2}$ = $\sqrt{4^2 + 3^2}$ = 5 $km/hr$

Tan $\theta$ = $\frac{opp}{adj}$ = $\frac{3}{4}$ = 0.75 or $\theta$ = 37°

[12]Show that when the horizontal range is maximum, height attained by the body is one fourth the maximum range in the projectile motion.

$R_{max}$ = $\frac{u^2}{g}$ ---[a] H = $\frac{u^2 sin^2_\theta}{2g}$ –[b]

For θ=45°

H = $\frac{u^2 sin^2_\theta}{2g}$ = $\frac{u^2 \, sin^2 45}{2g}$ = = $\frac{u^2}{4g}$

Ie H = $\frac{u^2}{4g}$ = $\frac{1}{4}$of the Rmax.

[13] A cricket ball is thrown at a speed of 28m/s in a direction $30^0$ above the horizontal. [i]Maximum height[ii] time of flight[iii] time taken to reach maximum height[iv] horizontal range.

[i] H = $\frac{u^2 sin^2_\theta}{2g}$ = $\frac{28^2 \, x \frac{1}{2} x \, 1/2}{2 \text{ x } 9.8}$ = 10m

[ii] $T$ = $\frac{2usin\theta}{g}$ = $\frac{2x \, 28 \, x \, sin30}{9.8}$ = 2.9 s

[iii] t = T/2 = 1.45 s

[iv] R = $\frac{u^2 sin2\theta}{g}$ = 28 x 28 x sin 60/9.8 =69.3m

## Long answer question (3 marks)

[14] What is angular velocity and angular acceleration? Establish a relation with

a) Angular velocity and linear velocity
b) Angular acceleration and linear acceleration

[15] Show that there are two angles $\theta_1$ and $\theta_2$ projections for the same horizontal range.

[16]An aero plane moving horizontally at 150m/s releases a bomb at a height of 500m.The bomb hits the target. what was the horizontal distance of the aero plane from the target when the bomb was released ?

Ans. Horizontal distance = velocity a x time = 150 x t –[a]

$s = ut + \frac{1}{2} gt^2$

$500 = 0 + \frac{1}{2} \times 10 \times t^2$ or t = 10s

[a] gives Horizontal distance = = 150 x 10 = 1500m

## Very Long answer question (5 marks)

[17] Derive an expression to find the centripetal acceleration and hence centripetal force

[18]What is centripetal acceleration and centripetal force? Derive an expression for centripetal acceleration& centripetal force.

[19] Show that the path traced by a projectile is parabola. Derive the equations to find the [i]Maximum height[ii] time of flight[iii] time taken to reach maximum height[iv] horizontal range.

[20] State the parallelogram law of vector addition. Derive an expression for magnitude and direction of resultant of the two vectors.

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