	INDIAN SCHOOL AL WADI AL KABIR	
Class: XI	**Department: Science 2022 – 23** **Subject: Physics**	**Date of submission: 24.08.2022**
Worksheet No:02 WITH ANSWERS	**Topic: CH-4-MOTION IN A PLANE**	**Note:** **A4 FILE FORMAT**

OBJECTIVE TYPE QUESTIONS

1) 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 range will be maximum b) Their maximum height will be the same. C) Their landing velocity will be the same. d) Their time of flight will be the same.

Answer - a

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?

a) 1.5km b) 3.0km c) 6.0km d) 0.75km

Answer – b

3) The maximum range of a gun along horizontal is 16km. What is the muzzle velocity of the shell?

a) 400m/s b) 200m/s c) 800m/s d) 256m/s

Answer – a (Hint- Rmax = u^2/g)

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

a) π rad/s b) 2πrad/s c) 4π rad/s d) $4\pi^2$ rad/s

Answer- c

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?

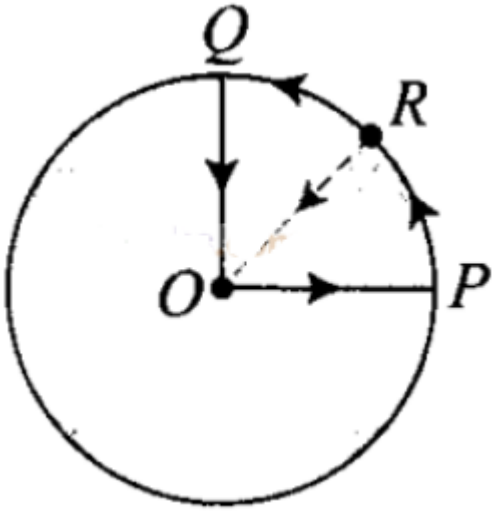
a) 10m/s b) 2 m/s c) 20 m/s d) √2 m/s

Answer - b

Very Short answer type questions (1 mark)

1) A cyclist starts from centre O of a circular park of radius 1km and moves along the path OPRQO. If he maintains constant speed of 10m/s, what is his acceleration at point R in magnitude and direction?

A cyclist starts from centre O of a circular park of radius 1 km and moves along the path OPRQO as shown in figure. If he maintains constant speed of 10 ms^{-1}, what is his acceleration at point R in magnitude and direction?



The centripetal acceleration at R is given by the relation, $a_c = \frac{v^2}{r}$

$$\Rightarrow \quad a_c = \frac{(10)^2}{1000} = \frac{100}{10^3} = 0.1 \text{ m/s}^2 \text{ along } RO.$$

2) Two balls of different masses are thrown vertically upward with same initial velocity. Height attained by them are h_1 and h_2 respectively. What is h_1/h_2? (Ans: 1/1, because the height attained by the projectile is not dependent on the masses.)

3) A helicopter is flying south at a speed of 60km/hr. A bird is moving with the same speed towards east. Find the relative velocity of the helicopter with respect to the bird?

4) Is uniform circular motion a case of uniform motion? Why?

5) What is the angle between velocity and acceleration at the peak point of the projectile motion? (Ans: 90°).

Short Answer type question (2marks)

6) What is the angular velocity of the hour hand of a clock ?

(Ans : $\omega = 2\pi/12 = \pi/6$ rad h^{-1})

7) Rain is falling vertically with a speed of 20m/s. A woman rides a bicycle with a speed of 12m/s in the north-south direction. What is the relative velocity of rain with respect to women?

8) 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]

9) Show that when the horizontal range is maximum, height attained by the body is one fourth the maximum range in the projectile motion. (Ans: Horizontal range $R=\frac{u^2 \sin 2\theta}{g}$; for maximum range $\theta=45°$, $R_{max}=\frac{u^2}{g}$ and Height $H = \frac{u^2 \sin^2\theta}{2g}$; For $\theta=45°$ $H = \frac{u^2}{4g} = \frac{1}{4}$ of the Rmax.)

10) A gunman always keeps his gun slightly tilted above the line of sight while shooting. Why?

Short answer questions (3marks)

11) A fighter plane flying horizontally at an altitude of 2 km with a speed of 200m/s passes directly overhead an anti air craft gun. At what angle from the vertical should the gun be fixed for the shell with muzzle speed 400m/s to hit the plane ?[g=l0m/s^2]Ans. 30^0

12) A body is projected at an angle θ with the horizontal. Derive an expression for its horizontal range. Show that there are two angles θ_1 and θ_2 projections for the same horizontal range.

13) Two forces 80N and 60N act on a body at an angle of $60°$. Find the magnitude and direction of the resultant force.

14) A stone tied to the end of a string of length 100cm is whirled in a horizontal circle with constant speed. If the stone makes 10 revolutions in 20 seconds, calculate the magnitude and direction of the acceleration.

$\omega = 2\pi f = 2\pi \times 10/20 = \pi$ $a = r\omega^2$

15) State the parallelogram law of vector addition. Derive an expression for magnitude and direction of resultant of the two vectors.

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?[1500m]

Long answer question (5 marks)

17) What is centripetal acceleration and centripetal force? Derive an expression for centripetal acceleration& centripetal force.

18) 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.

19) What is angular velocity and angular acceleration? Establish a relation with

a) Angular velocity and linear velocity
b) Angular acceleration and linear acceleration
20) 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. (Ans-10m, 5.8s, 2.9s,69.3m)

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