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Chapter 3 Motion in a Plane

Assignment 1

Class 11

DPP
DAILY PRACTICE PROBLEMS

CLASS : XITH **SUBJECT : PHYSICS**
DATE : **DPP NO. : 2**

Topic :- MOTION IN A PLANE

1. The angle of projection at which the horizontal range and maximum height of projectile are equal is
   a) 45° b) $\theta = \tan^{-1}(0.25)$
   c) $\theta = \tan^{-1} 4$ or ($\theta = 76°$) d) 60°

2. A body slides down a frictionless track which ends in a circular loop of diameter D. Then the minimum height h of the body in terms of D so that it may just complete the loop, is
   a) $h = \frac{5}{2}D$ b) $h = \frac{3}{2}D$ c) $h = \frac{5}{4}D$ d) $h = 2D$

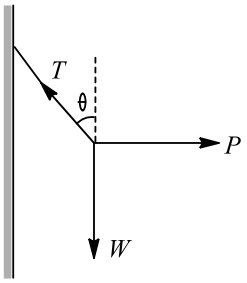
3. A force $\vec{F} = 2\hat{i} + 2\hat{j}$ N displaces a particle through $\vec{S} = 2\hat{i} + 2\hat{k}$ m in 16 s. The power developed by $\vec{F}$ is
   a) 0.25 J s^{-1} b) 25 J s^{-1} c) 225 J s^{-1} d) 450 J s^{-1}

4. A sphere of mass m is tied to end of a string of length l and rotated through the other end along a horizontal circular path with speed v. The work done in full horizontal circle is
   a) 0 b) $\left(\frac{mv^2}{l}\right).2\pi l$ c) $mg.2\pi$ d) $\left(\frac{mv^2}{l}\right).(l)$

5. Two projectile are thrown with the same initial velocity at angles α and $(90° - \alpha)$ with the horizontal. The maximum heights attained by them are h_1 and h_2 respectively. Then $\frac{h_1}{h_2}$ is equal
   a) $\sin^2 \alpha$ b) $\cos^2 \alpha$ c) $\tan^2 \alpha$ d) 1

6. A particle P is at the origin starts with velocity $\vec{v} = (2\hat{i} - 4\hat{j})\text{ms}^{-1}$ with constant acceleration $(3\hat{i} - 5\hat{j})\text{ms}^{-2}$. After travelling for 2 s, its distance from the origin is
   a) 10 m b) 10.2 m c) 9.8 m d) 11.7 m

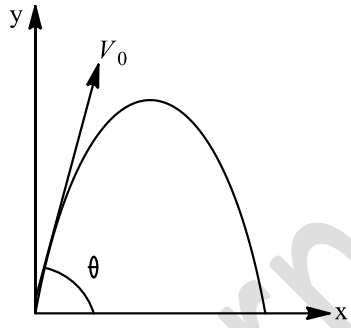
7. A small sphere is hung by a string fixed to a wall. The sphere is pushed away from the wall by a stick. The force acting on the sphere are shown in figure. Which of the following statements is wrong?



a) $P = W tan\theta$ b) $\vec{T} + \vec{P} + \vec{W} = 0$ c) $T^2 = P^2 + W^2$ d) $T = P + W$

8. A particle moves in a circle of radius 30cm. Its liner speed is given by $v = 2t$, where t is in second and v in ms^{-1}. Find out its, radial and tangential acceleration at $t = 3s$, respectively,
a) $220\ ms^{-2}, 50\ ms^{-2}$ b) $100\ ms^{-2}, 5\ ms^{-2}$ c) $120\ ms^{-2}, 2\ ms^{-2}$ d) $110\ ms^{-2}, 10\ ms^{-2}$

9. A small particle of mass m is projected at an angle θ with the x-axis with an initial velocity v_0 in the x-y plane as shown in the figure. At a time $t < \frac{v_0 \sin\theta}{g}$, the angular momentum of the particle is



a) $-mgv_0t^2 \cos\theta\ \hat{\mathbf{j}}$ b) $mgv_0t \cos\theta\ \hat{\mathbf{k}}$ c) $-\frac{1}{2}mgv_0t^2 \cos\theta\ \hat{\mathbf{k}}$ d) $\frac{1}{2}mgv_0t^2 \cos\theta\ \hat{\mathbf{i}}$

10. A body is thrown upward from the earth surface with velocity 5 m/s and from a planet surface with velocity 3 m/s. Both follow the same path. What is the projectile acceleration due to gravity on the planet
a) 2 m/s^2 b) 3.5 m/s^2 c) 4 m/s^2 d) 5 m/s^2

11. An unbanked curve has a radius of 60 m. The maximum speed at which the car make a turn is (Take $\mu = 0.75$)
a) 7 ms^{-1} b) 14 ms^{-1} c) 21 ms^{-1} d) 2.1 ms^{-1}

12. A fly wheel rotates about a fixed axis and slows down from 300 rpm to 100 rpm in 2 min. Then its angular retardation in rad/min^2 is
a) $\frac{100}{\pi}$ b) 100 c) $100\,\pi$ d) $200\,\pi$

13. A particle is projected with a velocity 200 ms^{-1} at an angle of 60°. At the highest point, it explodes into three particles of equal masses. One goes vertically upwards with a velocity 100 ms^{-1}, the second particle goes vertically downwards. What is the velocity of third particle?
a) 120 ms^{-1} making 60° angle with horizontal b) 200 ms^{-1} making 60° angle with horizontal
c) 300 ms^{-1} d) 200 ms^{-1}

14. A car is moving on a circular path and takes a turn. If R_1 and R_2 be the reactions on the inner and outer wheels respectively, then
a) $R_1 = R_2$ b) $R_1 < R_2$ c) $R_1 > R_2$ d) $R_1 \geq R_2$

15. If the vector $\vec{A} = 2\hat{i} + 4\hat{j}$ and $\vec{B} = 5\hat{i} + p\hat{j}$ are parallel to each other, the magnitude of $\vec{B}$ is
a) $5\sqrt{5}$ b) 10 c) 15 d) $2\sqrt{5}$

16. A body is revolving with a uniform speed v in a circle of radius r. The tangential acceleration is
a) $\frac{v}{r}$ b) $\frac{v^2}{r}$ c) Zero d) $\frac{v}{r^2}$

17. A bridge is in the form of a semi-circle of radius 40 m. The greatest speed with which a motor cycle can cross the bridge without leaving the ground at the highest point is ($g = 10\text{ms}^{-2}$) (frictional force is negligibly small)
a) 40 ms^{-1} b) 20 ms^{-1} c) 30 ms^{-1} d) 15 ms^{-1}

18. A car is moving with high velocity when it has a turn. A force acts on it outwardly because of
a) Centripetal force b) Centrifugal force c) Gravitational force d) All the above

19. If time of flight of a projectile is 10 seconds. Range is 500 $meters$. The maximum height attained by it will be
a) 125 m b) 50 m c) 100 m d) 150 m

20. A stone is projected with a velocity $20\sqrt{2}\text{ms}^{-1}$ at an angle of 45° to the horizontal. The average velocity of stone during its motion from starting point to its maximum height is ($g = 10\text{ms}^{-2}$)
a) $5\sqrt{5}$ ms^{-1} b) $10\sqrt{5}$ ms^{-1} c) 20 ms^{-1} d) $20\sqrt{5}$ ms^{-1}