

NEET PHYSICS 2018-19 - Chennai

Periodic Test : 020

Test ID : 020

Number of questions: 150

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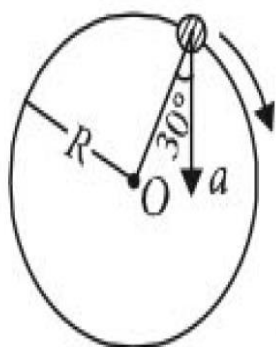
Name: _____

Time: 3HRS

ID No: _____

Negative Marks : 4 marks for correct attempt & 1 mark deducted for every wrong attempt.

- The x and y coordinates of the particle at any time are $x = 5t - 2t^2$ and $y = 10t$ respectively, where x and y are in metres and t in seconds. The acceleration of the particle at $t = 2$ s is
 - 5 m s^{-2}
 - -4 m s^{-2}
 - -8 m s^{-2}
 - 0
- In the given figure, $a = 15 \text{ m s}^{-2}$ represents the total acceleration of a particle moving in the clockwise direction in a circle of radius $R = 2.5 \text{ m}$ at a given instant of time. The speed of the particle is



- 4.5 m s^{-1}
 - 5.0 m s^{-1}
 - 5.7 m s^{-1}
 - 6.2 m s^{-1}
- If the magnitude of sum of two vectors is equal to the magnitude of difference of the two vectors, the angle between these vectors is
 - 45°

- 180°
 - 0°
 - 90°
- A particle moves so that its position vector is given by $\vec{r} = \cos\omega t \hat{x} + \sin\omega t \hat{y}$, where ω is a constant. Which of the following is true?
 - Velocity is perpendicular to \vec{r} and acceleration is directed towards the origin.
 - Velocity is perpendicular to \vec{r} and acceleration is directed away from the origin.
 - Velocity and acceleration both are perpendicular to \vec{r}
 - Velocity and acceleration both are parallel to \vec{r}
 - If vectors $\vec{A} = \cos\omega t \hat{i} + \sin(\omega t) \hat{j}$ and $\vec{B} = \cos(\omega t/2) \hat{i} + \sin(\omega t/2) \hat{j}$ are functions of time, then the value of t at which they are orthogonal to each other is
 - $t = \pi/\omega$
 - $t = 0$
 - $t = \pi/4\omega$
 - $t = \pi/2\omega$
 - The position vector of a particle \vec{R} as a function of time is given by $\vec{R} = 4\sin(2\pi t)\hat{i} + 4\cos(2\pi t)\hat{j}$ Where R is in meters, t is in seconds and \hat{i} and \hat{j} denote unit vectors along x-and y-directions, respectively.

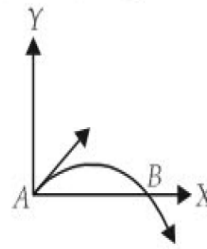
Which one of the following statements is wrong for the motion of particle?

- (a) Magnitude of the velocity of particle is 8 meter/second.
- (b) Path of the particle is a circle of radius 4 meter.
- (c) Acceleration vector is along \vec{R}
- (d) Magnitude of acceleration vector is V^2/R , where v is the velocity of particle.

7. A ship A is moving Westwards with a speed of 10 km h^{-1} and a ship B 100 km South of A, is moving Northwards with a speed of 10 km h^{-1} . The time after which the distance between them becomes shortest, is
- (a) $5\sqrt{2} \text{ h}$
 - (b) $10\sqrt{2} \text{ h}$
 - (c) 0 h
 - (d) 5 h
8. A projectile is fired from the surface of the earth with a velocity of 5 m s^{-1} and angle θ with the horizontal. Another projectile fired from another planet with a velocity of 3 m s^{-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 (in m s^{-2}) is (Given $g = 9.8 \text{ m s}^{-2}$)
- (a) 3.5
 - (b) 5.9
 - (c) 16.3
 - (d) 110.8
9. A particle is moving such that its position coordinates (x, y) are (2 m, 3 m) at time $t = 0$, (6 m, 7 m) at time $t = 2 \text{ s}$ and (13 m, 14 m) at time $t = 5 \text{ s}$. Average velocity vector (\vec{v}_{av}) from $t = 0$ to $t = 5 \text{ s}$ is
- (a) $1/5(13\hat{i}+15\hat{j})$
 - (b) $7/3(\hat{i}+\hat{j})$
 - (c) $2(\hat{i}+\hat{j})$

(d) $11/5(\hat{i}+\hat{j})$

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



- (a) $2\hat{i} - 3\hat{j}$
- (b) $2\hat{i} + 3\hat{j}$
- (c) $-2\hat{i} - 3\hat{j}$
- (d) $-2\hat{i} + 3\hat{j}$

11. Vectors \vec{A} , \vec{B} and \vec{C} are such that $\vec{A} \cdot \vec{B} = 0$ and $\vec{A} \cdot \vec{C} = 0$. Then the vector parallel to \vec{A} is
- (a) $\vec{A} \times \vec{B}$
 - (b) $\vec{B} + \vec{C}$
 - (c) $\vec{B} \times \vec{C}$
 - (d) \vec{B} and \vec{C}
12. The horizontal range and the maximum height of a projectile are equal. The angle of projection of the projectile is
- (a) $\theta = \tan^{-1}(1/4)$
 - (b) $\theta = \tan^{-1}(4)$
 - (c) $\theta = \tan^{-1}(2)$
 - (d) $\theta = 45^\circ$
13. A particle has initial velocity $(2\vec{i} + 3\vec{j})$ and acceleration $(0.3\vec{i} + 0.27\vec{j})$. The magnitude of velocity after seconds, will be
- (a) $9\sqrt{2}$ units
 - (b) $5\sqrt{2}$ units
 - (c) 5 units
 - (d) 9 units
14. A particle moves in a circle of radius 5 cm with constant speed and time period $0.2\pi \text{ s}$. The acceleration of the particle is

- (a) 15 m/s^2
- (b) 25 m/s^2
- (c) 36 m/s^2
- (d) 5 m/s^2

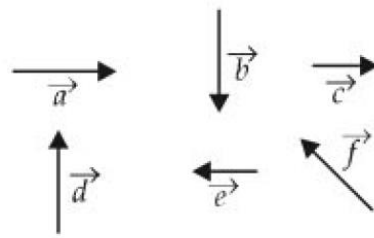
15. A missile is fired for maximum range with an initial velocity of 20 m/s . If $g = 10 \text{ m/s}^2$, the range of the missile is
- (a) 40 m
 - (b) 50 m
 - (c) 60 m
 - (d) 20 m

16. A body is moving with velocity 30 m/s towards east. After 10 seconds its velocity becomes 40 m/s towards north. The average acceleration of the body is
- (a) 1 m/s^2
 - (b) 7 m/s^2
 - (c) $\sqrt{7} \text{ m/s}^2$
 - (d) 5 m/s^2

17. A projectile is fired at an angle of 45° with the horizontal. Elevation angle of the projectile at its highest point as seen from the point of projection, is
- (a) 45°
 - (b) 60°
 - (c) $\tan^{-1}(1/2)$
 - (d) $\tan^{-1}(\sqrt{3}/2)$

18. A particle has initial velocity $(3\hat{i} + 4\hat{j})$ and has acceleration $(0.4\hat{i} + 0.3\hat{j})$. its speed after 10 s is
- (a) 7 units
 - (b) $7\sqrt{2}$ units
 - (c) 8.5 units
 - (d) 10 units

19. Six vectors, \vec{a} through \vec{f} have the magnitudes and directions indicated in the figure. Which IV the following Dstatements is true?

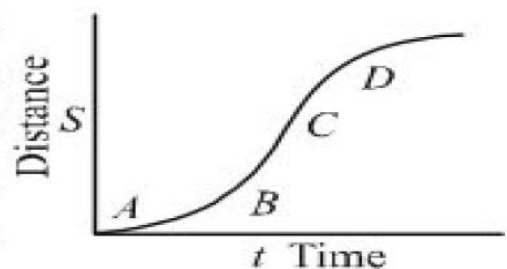


- (a) $\vec{b} + \vec{c} = \vec{f}$
- (b) $\vec{d} + \vec{c} = \vec{f}$
- (c) $\vec{d} + \vec{e} = \vec{f}$
- (d) $\vec{b} + \vec{e} = \vec{f}$

20. The speed of a projectile at its maximum height is half of its initial speed. The angle of projection is
- (a) 60°
 - (b) 15°
 - (c) 30°
 - (d) 45°

21. A particle moves in x-y plane according to rule $x = a \sin \omega t$ and $y = a \cos \omega t$. The particle follows
- (a) an elliptical path
 - (b) a circular path
 - (c) a parabolic path
 - (d) a straight line path inclined equally to x and y-axes

22. A particle shows distance - time curve as given in this figure. The maximum instantaneous velocity of the particle is around the point



- (a) D
- (b) A
- (c) B
- (d) C

23. A particle of mass m is projected with velocity v making an angle of 45° with the horizontal. When the particle lands on the level ground the magnitude of the change in its momentum will be
- $mv\sqrt{2}$
 - zero
 - $2mv$
 - $mv/\sqrt{2}$
24. \vec{A} and \vec{B} are two vectors and θ is the angle between them, if $|\vec{A} \times \vec{B}| = \sqrt{3} (\vec{A} \cdot \vec{B})$ the value of θ is
- 45°
 - 30°
 - 90°
 - 60°
25. A particle starting from the origin $(0, 0)$ moves in a straight line in the (x, y) plane. Its coordinates at a later time are $(\sqrt{3}, 3)$. The path of the particle makes with the x -axis an angle of
- 45°
 - 60°
 - 0°
 - 30° .
26. If $|\vec{A} \times \vec{B}| = |\vec{A}| + |\vec{B}|$ then angle between A and B will be
- 90°
 - 120°
 - 0°
 - 60° .
27. Two particles having mass M and m are moving in a circular path having radius R and r . If their time period are same then the ratio of angular velocity will be
- r/R
 - R/r
 - 1
 - $\sqrt{R/r}$
28. The width of river is 1 km. The velocity of boat is 5 km/hr. The boat covered the width of river in shortest time 15 min. Then the velocity of river stream is
- 3 km/hr
 - 4 km/hr
 - $\sqrt{29}$ km/hr
 - $\sqrt{41}$ km/hr
29. 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
- time of flight
 - range of projectile
 - maximum height acquired
 - all of them.
30. A man is slipping on a frictionless inclined plane and a bag falls down from the same height. Then the velocity of both is related as
- $v_B > v_m$
 - $v_B < v_m$
 - $v_B = v_m$
 - v_B and v_m can't be related.
31. A 500 kg car takes a round turn of radius 50 m with a velocity of 36 km/hr. The centripetal force is
- 1000 N
 - 750 N
 - 250 N
 - 1200 N
32. A person aiming to reach exactly opposite point on the bank of a stream is swimming with a speed of 0.5 m/s at an angle of 120° with the direction of flow of water. The speed of water in the stream, is
- 0.25 m/s
 - 0.5 m/s
 - 1.0 m/s
 - 0.433 m/s

33. Two racing cars of masses m_1 and m_2 are moving in circles of radii r_1 and r_2 respectively. Their speeds are such that each makes a complete circle in the same time t . The ratio of the angular speeds of the first to the second car is

- (a) $r_1 : r_2$
- (b) $m_1 : m_2$
- (c) 1 : 1
- (d) $m_1 m_2 : r_1 r_2$.

34. If a unit vector is represented by $0.5\hat{i} - 0.8\hat{j} + c\hat{k}$ then the value of c is

- (a) $\sqrt{0.01}$
- (b) $\sqrt{0.11}$
- (c) 1
- (d) $\sqrt{0.39}$

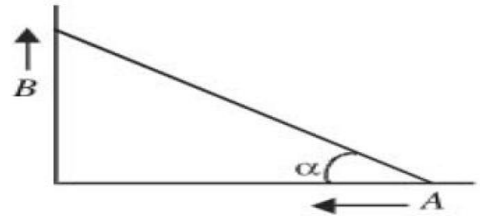
35. What is the value linear velocity, if $\vec{r} = 3\hat{i} - 4\hat{j} + \hat{k}$ and $\omega = 5\hat{i} - 6\hat{j} + 6\hat{k}$?

- (a) $4\hat{i} - 13\hat{j} + 6\hat{k}$
- (b) $18\hat{i} + 13\hat{j} - 2\hat{k}$
- (c) $6\hat{i} + 2\hat{j} - 3\hat{k}$
- (d) $6\hat{i} - 2\hat{j} + 8\hat{k}$

36. Two particles A and B are connected by a rigid rod AB. The rod slides along perpendicular rails as shown here. The velocity of A to the left is 10 m/s. What is the velocity of B when angle $\alpha = 60^\circ$?

- (a) 10 m/s
- (b) 9.8 m/s
- (c) 5.8 m/s
- (d) 17.3 m/s.

37. A ball of mass 0.25 kg attached to the end of a string of length 1.96 m is moving in a horizontal circle. The string will break if the tension is more than 25 N. What is the maximum speed with which the ball can be moved?



- (a) 5 m/s
- (b) 3 m/s
- (c) 14 m/s
- (d) 3.92 m/s.

38. Identify the vector quantity among the following

- (a) distance
- (b) angular momentum
- (c) heat
- (d) energy.

39. A body is whirled in a horizontal circle of radius 20 cm. It has an angular velocity of 10 rad/s. What is its linear velocity at any point on circular path?

- (a) 20 m/s
- (b) $\sqrt{2}$ m/s
- (c) 10 m/s
- (d) 2 m/s.

40. The position vector of a particle is $\vec{r} = (a \cos \omega t)\hat{i} + (a \sin \omega t)\hat{j}$. The velocity of the particle is

- (a) directed towards the origin
- (b) directed away from the origin
- (c) parallel to the position vector
- (d) perpendicular to the position vector.

41. The angular speed of a flywheel making 120 revolutions/minute is

- (a) 4π rad/s
- (b) $4\pi^2$ rad/s
- (c) π rad/s
- (d) 2π rad/s.

42. The angle between the two vectors

- $\vec{A} = 3\hat{i} + 4\hat{j} + 5\hat{k}$ and $\vec{B} = 3\hat{i} + 4\hat{j} - 5\hat{k}$ will be
- (a) 90°

- (b) 180°
 (c) zero
 (d) 45° .
43. A boat is sent across a river with a velocity of 8 km h^{-1} . If the resultant velocity of boat is 10 km h^{-1} , then velocity of river is
 (a) 12.8 km h^{-1}
 (b) 6 km h^{-1}
 (c) 8 km h^{-1}
 (d) 10 km h^{-1}
44. If a body A of mass M is thrown with velocity v at an angle of 30° to the horizontal and another body B of the same mass is thrown with the same speed at an angle of 60° to the horizontal. the ratio of horizontal range of A to B will be
 (a) 1 : 3
 (b) 1 : 1
 (c) $1 : \sqrt{3}$
 (d) $\sqrt{3} : 1$
45. The resultant of $\vec{A} \times \vec{0}$ will be
 (a) zero
 (b) A
 (c) zero vector
 (d) unit vector.
46. An electric fan has length 30 cm measured from the axis of rotation. If the fan is rotating at 120 rpm, the acceleration of a point on the tip of the blade is
 (a) 1600 m s^{-2}
 (b) 47.4 m s^{-2}
 (c) 23.7 m s^{-2}
 (d) 50.55 m s^{-2}
47. The maximum range of a gun of horizontal terrain is 16 km. If $g = 10 \text{ ms}^{-2}$, then muzzle velocity of a shell must be
 (a) 160 m s^{-1}
 (b) $200\sqrt{2} \text{ m s}^{-1}$
 (c) 400 m s^{-1}
 (d) 800 m s^{-1}
48. A bus is moving on a straight road towards north with a uniform speed of 50 km/hour then it turns left through 90° . if the speed remains unchanged after turning, the increase in the velocity of bus in the turning process is
 (a) 70.7 km/hr along south-west direction
 (b) zero
 (c) 5 km/hr along west
 (d) 70.7 along north-west direction
49. The magnitude of vectors \vec{A}, \vec{B} and \vec{C} are 3, 4 and 5 units respectively. If $\vec{A} + \vec{B} = \vec{C}$, the angle between \vec{A} and \vec{B} is
 (a) $\pi/2$
 (b) $\cos^{-1}(0.6)$
 (c) $\tan^{-1}(7/5)$
 (d) $\pi/4$.
50. A train of 150 metre length is going towards north direction at a speed of 10 m/s. A parrot flies at the speed of 5 m/s towards south direction parallel to the railways track. The time taken by the parrot to cross the train is
 (a) 12 sec
 (b) 8 sec
 (c) 15 sec
 (d) 10 sec.