QUESTIONS FROM COMPETITIVE EXAMS

3.1 Introduction

(MHT-CET 2018)

1. Which of the following is one dimensional motion?
   a) landing of an aircraft
   b) earth revolving around the sun
   c) motion of a wheel of moving train
   d) train running on a straight track

(MHT-CET 2019)

2. A particle is performing a uniform circular motion along the circumference of a circle of radius 'R' and 'T' is the periodic time. In the time 'T/4' its displacement and distance covered are respectively

   a) $\sqrt{2}$ R, $\frac{\pi R}{4}$ b) $\frac{\pi R}{4}$, $\sqrt{2}$ R c) $\sqrt{2}$ R, π R d) $\sqrt{2}$ R, $\frac{\pi R}{2}$

3. Out of the following examples of motion, in which situations the body can be considered approximately as a point object ?
   i) a railway carriage moving without jerks between two stations.
   ii) a monkey sitting on top of a man cycling smoothly on a circular track.
   iii) a spinning cricket ball that turns sharply on hitting the ground.
   iv) a tumbling beaker that has slipped off the edge of a table.
   a) 'i' and 'iii' b) 'i' and 'iv' c) 'i' and 'ii' d) 'i', 'ii' and 'iii'

(MHT-CET 2022)

4. A particle is performing a uniform circular motion along a circle of radius 'R'. In half the period of revolution, its displacement and distance covered are respectively

   a) 2 R, 2 π R b) 2R, πR c) $\sqrt{2R}$, 2π R d) R, πR

3.2 Rectilinear Motion

(MHT-CET 2020)

5. A vehicle moving with 15 km/hr comes to rest by covering 5 m distance by applying brakes. If the same vehicle moves at 45 km/hr, then by applying brakes, it will come to rest by covering a distance
   a) 60 m b) 15 m c) 45 m d) 30 m

6. A moving body is covering distances which are proportional to square of the time. Then the acceleration of the body is
   a) constant but not zero
   b) increasing
   c) zero
   d) decreasing

7. A particle is moving along the circular path of radius 'r' with velocity 'v'. The magnitude of average acceleration after half revolution is

   a) $\frac{3v^2}{\pi r}$ b) $\frac{3v^2}{2\pi r}$ c) $\frac{2v^2}{\pi r}$ d) $\frac{v^2}{\pi r}$

(MHT-CET 2021)

8. A body starts falling from height 'h' and travels a distance h/2 during last second of its motion, then time of flight in seconds is

   a) $(2+\sqrt{3})$ b) $(\sqrt{2}-1)$ c) $(2+\sqrt{2})$ d) $(\sqrt{2}+\sqrt{3})$

9. A car travelling at a speed 'U' m/s, stops within a distance 'S', when the brakes are applied. If the car is travelling at '2 U' m/s then the stopping distance is

a) more than 'S' b) less than 'S'

c) equal to 'S' d) zero

10. A stone is projected vertically upwards with velocity 'v'. Another stone of same mass is projected at an angle of 60° with the vertical with the same speed (v). The ratio of their potential energies at the highest points of their journey, is

a) 1 : 1 b) 4 : 1 c) 3 : 2 d) 2 : 1

(MHT-CET 2022)

11. A body covers half of its distance with speed 'u' and the other half with a speed 'v', then average speed of the body is

a) $\frac{2uv}{u+v}$ b) $\frac{u+v}{2uv}$ c) $\frac{u+v}{2}$ d) $\frac{u-v}{2}$

12. A ball is dropped from a tower of height 'h'. The total distance covered by it in last second of its motion is equal to the distance covered by it in first 3 seconds. The value of 'h' is

a) 200 m b) 125 m c) 100 m d) 80 m

3.3 Motion in Two Dimensions

(MHT-CET 2021)

13. A student is throwing balls vertically upwards such that he throws the 2nd ball when the 1st ball reaches maximum height. If he throws balls at an interval of 3 seconds, the maximum height of the balls is

a) 45 m b) 35 m c) 25 m d) 30 m

14. Two bodies A and B are projected with same velocity. If bodies A and B are projected at angles of 30° and 60° with the horizontal respectively, the ratio of maximum height reached by the body A to that of body B is

a) 1 : 2 b) 2 : 1 c) 3 : 1 d) 1 : 3

15. A bomb is dropped by an aeroplane flying horizontally with a velocity 200 km/hr and at a height of 980 m. At the time of dropping the bomb, the distance of the aeroplane from the target on the ground to hit directly is

a) $\frac{\sqrt{2}\times10^4}{9}$ m b) $\frac{10^4}{9}$ m c) $\frac{10^4}{9\sqrt{2}}$ d) $\frac{10^4}{18}$ m

16. A body at rest falls through a height 'h' with velocity 'v'. If it has to fall down further for its velocity to become three times, the distance travelled in that interval is

a) 8 h b) 6 h c) 4 h d) 12 h

17. A projectile is thrown with an initial velocity $(a\hat{i} + b\hat{j})$ m/s, where $\hat{i}$ and $\hat{j}$ are unit vectors along horizontal and vertical directions respectively. If the range of the projectile is twice the maximum height reached by it, then

a) b = 2a b) b = 4a c) b = $\frac{a}{2}$ d) b = a

(MHT-CET 2022)

18. A projectile thrown from the ground has initial speed 'u' and its direction makes an angle 'θ' with the horizontal. If at maximum height from ground, the speed of projectile is half its initial speed of projection, then the maximum height reached by the projectile is

a) $\frac{2u^2}{g}$ b) $\frac{u^2}{4g}$ c) $\frac{3u^2}{8g}$ d) $\frac{u^2}{g}$

19. A shell is fired at an angle of 30° to the horizontal with velocity 196 m/s. The time of flight is

a) 10 s b) 20 s c) 6.5 s d) 16.5 s

20. The equation of the trajectory of a ball projected at an angle 'θ' with the horizontal, is given as $y = \sqrt{3}\ x - \frac{gx^2}{2}$. The initial velocity of the ball is

a) 3 m/s b) 2 m/s c) 1 m/s d) 5 m/s

21. Two projectiles A and B are projected with velocities $\sqrt{2}$ v and v respectively. They have the same range. If A is thrown at angle of 15° with the horizontal, the angle of projection of B with horizontal will be

a) 90° b) 60° c) 30° d) 45°

3.4 Uniform Circular Motion

(MHT-CET 2005)

22. Angular velocity of hour hand of a watch is

a) $\frac{\pi}{43200}$ rad s^{-1} b) $\frac{\pi}{30}$ rad s^{-1} c) $\frac{\pi}{21600}$ rad s^{-1} d) $\frac{\pi}{1800}$ rad s^{-1}

(MHT-CET 2006)

23. An electric fan has blades of length of 30 cm as measured from the axis of rotation. If the fan is rotating at 1200 rpm, the acceleration of a point on the tip of the blade is about

a) 1600 ms^{-2} b) 4750 ms^{-2} c) 2370 ms^{-2} d) 5055 ms^{-2}

(MHT-CET 2011)

24. 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) 14 ms^{-1} b) 3 ms^{-1} c) 3.92 ms^{-1} d) 5 ms^{-1}

(MHT-CET 2014)

25. The difference between angular speeds of minute hand and second hand of a clock is

a) $\frac{59\pi}{900}$ rad/s b) $\frac{59\pi}{1800}$ rad/s c) $\frac{59\pi}{2400}$ rad/s d) $\frac{59\pi}{3600}$ rad/s

(MHT-CET 2016)

26. Angular speed of hour hand of a clock in degree per second is

a) $\frac{1}{30}$ b) $\frac{1}{60}$ c) $\frac{1}{120}$ d) $\frac{1}{720}$

36. The angular displacement of body performing circular motion is given by $\theta = 5 \sin \frac{\pi t}{6}$. The angular velocity of the body at t = 3 seconds will be

a) 5 rad/s b) 1 rad/s
c) 2.5 rad/s d) zero rad/s

37. A body of mass 'm' is moving with speed 'V' along a circular path of radius 'r'. Now the speed is reduced to $\frac{V}{2}$ and radius is increased to '3r'. For this change, initial centripetal force needs to be

a) increased by $\frac{7}{12}$ times b) increased by $\frac{10}{12}$ times
c) decreased by $\frac{11}{12}$ times d) decreased by $\frac{1}{12}$ times

38. At any instant, for a body performing uniform circular motion, velocity vector and acceleration vector are

a) in opposite directions b) along the same direction
c) normal to each other d) make an angle of 45° with each other

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39. An aeroplane flies 400 m north and 300 m south and then flies 1200 upwards, then net displacement is

a) 1200 m b) 1300 m c) 1400 m d) 1500 m

40. A cyclist moving on a circular track of radius 20 m completes half revolution in 20 s. His average speed and average velocity are

a) 3.14 m/s; 2 m/s b) 3.17 m/s; 1 m/s c) 6.34 m/s, 4 m/s d) 6.34 m/s, 2 m/s

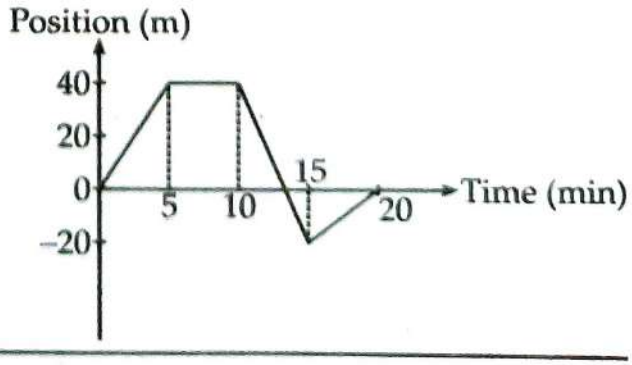
41. A body covers one third of the distance with velocity v_1, the second one third of the distance with a velocity v_2 and the remaining distance with a velocity v_3. The average velocity is

a) $\frac{v_1 + v_2 + v_3}{3}$ b) $\frac{v_1 v_2 v_3}{v_1 + v_2}$
c) $\frac{3 v_1 v_2 v_3}{v_1 v_2 + v_2 v_3 + v_3 v_1}$ d) $\frac{v_1 v_2 + v_2 v_3 + v_3 v_1}{3}$

42. A body covers first one third of the distance with a velocity 20 m/s, the second one-third distance with a velocity 30 m/s and the last one-third distance with a velocity 40 ms^{-1}. The average velocity is nearly

a) 28 ms^{-1} b) 38 ms^{-1} c) 18 ms^{-1} d) 8 ms^{-1}

43. A body begins to walk eastward along a sheet in front of his house and the graph of his position from home is shown in the fig. His average speed for the whole time interval is equal to



a) 8 m/min b) 6 m/min
c) $\frac{8}{3}$ m/min d) 2 m/min