YAKEEN NEET 2.0 2026

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Motion in a Straight Line

Assignment-03
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1. A body is moving with variable acceleration (a) along a straight line. The average acceleration of body in time interval t_1 to t_2 is

(1) $\frac{a[t_2+t_1]}{2}$ (2) $\frac{a[t_2-t_1]}{2}$

(3) $\frac{\int_{t_1}^{t_2} a\,dt}{t_2+t_1}$ (4) $\frac{\int_{t_1}^{t_2} a\,dt}{t_2-t_1}$

2. A particle moves in a straight line and its position x at time t is given by $x^2 = 2 + t$. Its acceleration is given by

(1) $\frac{-2}{x^3}$ (2) $-\frac{1}{4x^3}$

(3) $-\frac{1}{4x^2}$ (4) $\frac{1}{x^2}$

3. A particle moves a distance x in time t according to equation $x = (t + 5)^{-1}$. The acceleration of particle is proportional to **[2010]**

(1) (velocity)$^{3/2}$ (2) (distance)^2

(3) (distance)$^{-2}$ (4) (velocity)$^{2/3}$

4. If acceleration of object $a = 2x^{3/2}$ then find velocity at x where initial velocity at $x = 0$ is 4 m/s.

5. The relation between time t and distance x is $t = \alpha x^2 + \beta x$ where α and β are constants. The retardation is:

(1) $2\alpha v^3$ (2) $2\beta v^2$

(3) $2\alpha\beta v^2$ (4) $2\beta^3 v^3$

6. If $a = 3t^2 + 2t$, initial velocity is 5 m/s. Find the velocity at $t = 4$s. The motion is in straight line, a is acceleration in m/s^2 and t is time in seconds.

7. A particle in moving in a straight line such that its velocity is given by $v = 12t - 3t^2$, where v is in m/s and t is in seconds. If at $t = 0$, the particle is at the origin, find the displacement at $t = 3$s.

8. The deceleration experienced by a moving motorboat after its engine is shut-off is given by $dv/dt = -kv^3$, where k is a constant. If v_0 is the magnitude of the velocity at shut-off, find the velocity as a function of t.

9. The motion of a body is given by $dv/dt = 6 - 3v$, where v is in m/s. Find

(a) the velocity in terms of t and

(b) terminal velocity. The motion starts from rest.

10. A particle is moving in one dimension (along x axis) under the action of a variable force. It's initial position was 16 m right of origin. The variation of its position (x) with time (t) is given as $x = -3t^3 + 18t^2 + 16t$, where x is in m and t is in s. The velocity of the particle when its acceleration becomes zero is _____ m/s.

[1 Feb, 2024 (Shift-I)]

11. A particle moves in a straight line so that its displacement x at any time t is given by $x^2 = 1 + t^2$. Its acceleration at any time t is x^{-n} where n = _____ . **[6 April, 2024 (Shift-II)]**

12. The position of a particle as a function of time ts, is given by $x(t) = at + bt^2 - ct^3$ where a, b and c are constants. When the particle attains zero acceleration, then its velocity will be:

[9 April, 2019 (Shift-II)]

(1) $a + \frac{b^2}{4c}$ (2) $a + \frac{b^2}{c}$

(3) $a + \frac{b^2}{2c}$ (4) $a + \frac{b^2}{3c}$

13. A particle is moving with speed $v = b\sqrt{x}$ along positive x-axis. Calculate the speed of the particle at time $t = \tau$ (assume that the particle is at origin at $t = 0$) **[12 April, 2019 (Shift-II)]**

(1) $\frac{b^2\tau}{4}$ (2) $\frac{b^2\tau}{2}$

(3) $b^2\tau$ (4) $\frac{b^2\tau}{\sqrt{2}}$

14. The coordinates of a particle moving in a plane are given by $x(t) = a\cos(pt)$ and $y(t) = b\sin(pt)$ where a, b ($< a$) and p are positive constants of appropriate dimensions. Then, **[IIT-JEE 1999]**

(1) The path of the particle is an ellipse

(2) The velocity and acceleration of the particle are normal to each other at $t = \pi/2p$

(3) The acceleration of the particle is always directed towards a focus

(4) The distance traveled by the particle in time interval $t = 0$ to $t = \pi/2p$ is a

15. A particle moves along the x-axis and has its displacement x varying with time t according to the equation $x = c_0(t^2 - 2) + c(t - 2)^2$ where c_0 are constants of appropriate dimensions. Then, which of the following statements is correct?

[03 April, 2025 (Shift-II)]

(1) the acceleration of the particle is $2c_0$

(2) the acceleration of the particle is $2c$

(3) the initial velocity of the particle is $4c$

(4) the acceleration of the particle is $2(c + c_0)$

16. The relation between time t and distance x for a moving body is given as $t = mx^2 + nx$, where m and n are constants. The retardation of the motion is: (Where v stands for velocity)

[25 July, 2021 (Shift-II)]

(1) $2n^2v^2$ (2) $2mnv^3$

(3) $2mv^3$ (4) $2nv^3$

17. The instantaneous velocity of a particle moving in a straight line is given as $v = \alpha t + \beta t^2$, where α and β are constants. The distance travelled by the particle between 1s and 2s is: **[25 July, 2021 (Shift-II)]**

(1) $\frac{\alpha}{2} + \frac{\beta}{3}$

(2) $\frac{3}{2}\alpha + \frac{7}{3}\beta$

(3) $\frac{3}{2}\alpha + \frac{7}{2}\beta$

(4) $3\alpha + 7\beta$

18. The distance x covered by a particle in one dimensional motion varies with time t as $x^2 = at^2 + bt + c$. If the acceleration of the particle depends on x as x^{-n}, where n is an integer, the value of n is _____ .

[9 Jan, 2020 (Shift-1)]

19. The motion of a particle along a straight line is described by the equation: $x = 8 + 12t - t^3$, where x is in meter and t in second.

(i) the initial velocity of particle is 12 m/s.

(ii) the retardation of particle when velocity is zero is 12 m/s^2.

(iii) when acceleration is zero, displacement is 8 m.

(iv) the maximum velocity of particle is 12 m/s.

(1) (i), (ii)

(2) (ii), (iii)

(3) (i), (ii), (iii)

(4) All options are correct

20. The position x of a particle with respect to time t along the x-axis is given by $x = 9t^2 - t^3$ where x is in meter and t in second. What will be the position of this particle when it achieves maximum speed along the positive x direction.

[CBSE PMT 2007]

21. The deceleration experienced by a moving motor boat, after its engine is cut off, is given by $dv/dt = -kv^3$ where k is constant. If v_0 is the magnitude of the velocity at cut-off. The velocity v at a time t after the cut off will be

(1) $\frac{v_0}{\sqrt{1+2ktv_0^2}}$ (2) $\frac{v_0}{2k}$

(3) $\frac{v_0}{\sqrt{1+2kt}}$ (4) $\frac{v_0}{\sqrt{2kt}}$

22. An object moving with a speed of 6.25 m/s is decelerated at a rate given by $\frac{dv}{dt} = -2.5\sqrt{v}$, where v is the instantaneous speed. The time taken by the object to come to rest, would be **[AIEEE 2011]**

(1) 1 s (2) 2 s

(3) 4 s (4) 8 s

23. The distance covered by a particle varies with time as $x = \frac{k}{b}(1-e^{-bt})$. The speed of particle at time t is

(1) $k\,e^{-bt}$ (2) $kb\,e^{-bt}$

(3) $\left(\frac{k}{b^2}\right)e^{-bt}$ (4) $\left(\frac{k}{b}\right)e^{-bt}$

24. A particle, initially at rest, starts moving in a straight line with an acceleration $a = 6t + 4$ m/s^2. The distance covered by it in 3s is

(1) 15 m (2) 30 m

(3) 45 m (4) 60 m

25. A particle moves with an initial velocity v_0 and retardation αv, where v is its velocity at any time t.

(i) The particle will cover a total distance $\frac{v_0}{\alpha}$.

(ii) The particle will come to rest after time $\frac{1}{\alpha}$.

(iii) The particle will continue to move for a very long time.

(iv) The velocity of the particle will become $\frac{v_0}{2}$ after time $\frac{\ln 2}{\alpha}$.

(1) (i), (ii)

(2) (ii), (iii)

(3) (i), (iii), (iv)

(4) All

26. The motion of a body is given by the equation $dv/dt = 6 - 3v$; where v is in m/s. If the body was at rest at $t = 0$

(i) the terminal speed is 2 m/s.

(ii) the magnitude of the initial acceleration is 6 m/s^2.

(iii) The speed varies with time as $v = 2(1 - e^{-3t})$ m/s

(iv) The speed is 1 m/s, when the acceleration is half the initial value

(1) (i), (ii) (2) (ii), (iii), (iv)

(3) (i), (ii), (iii) (4) All