

PARTICLES IN MOTION

Multiple Choice Questions from past AP Exams

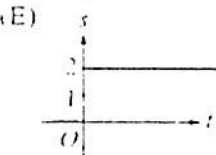
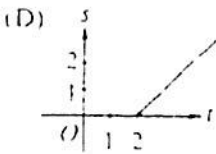
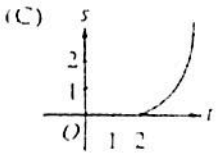
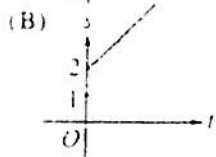
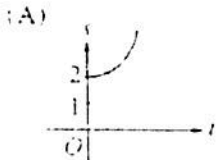
- The position of a particle moving along a straight line at any time t is given by $s(t) = t^2 + 4t + 4$. What is the acceleration of the particle when $t = 4$?
(A) 0 (B) 2 (C) 4 (D) 8 (E) 12
- The velocity of a particle moving on a line at time t is $v = 3t^{\frac{1}{2}} + 5t^{\frac{3}{2}}$ meters per second. How many meters did the particle travel from $t = 0$ to $t = 4$?
(A) 32 (B) 40 (C) 64 (D) 80 (E) 184
- If the position of a particle on the x -axis at time t is $-5t^2$, then the average velocity of the particle for $0 \leq t \leq 3$ is
(A) -45 (B) -30 (C) -15 (D) -10 (E) -5
- A particle with velocity at any time t given by $v(t) = e^t$ moves in a straight line. How far does the particle move from $t = 0$ to $t = 2$?
(A) $e^2 - 1$ (B) $e - 1$ (C) $2e$ (D) e^2 (E) $\frac{e^3}{3}$
- A particle moves along the x -axis so that at any time $t \geq 0$ its position is given by $x(t) = t^3 - 3t^2 - 9t + 1$. For what values of t is the particle at rest?
(A) No values (B) 1 only (C) 3 only (D) 5 only (E) 1 and 3
- A particle travels in a straight line with a constant acceleration of 3 meters per second per second. If the velocity of the particle is 10 meters per second at time 2 seconds, how far does the particle travel during the time interval when its velocity increases from 4 meters per second to 10 meters per second?
(A) 20 m (B) 14 m (C) 7 m (D) 6 m (E) 3 m
- The acceleration of a particle moving along the x -axis at time t is given by $a(t) = 6t - 2$. If the velocity is 25 when $t = 3$ and the position is 10 when $t = 1$, then the position $x(t) =$
(A) $9t^2 + 1$
(B) $3t^2 - 2t + 4$
(C) $t^3 - t^2 + 4t + 6$
(D) $t^3 - t^2 + 9t - 20$
(E) $36t^3 - 4t^2 - 77t + 55$
- The position of a particle moving along the x -axis is $x(t) = \sin(2t) - \cos(3t)$ for time $t \geq 0$. When $t = \pi$, the acceleration of the particle is
(A) 9 (B) $\frac{1}{9}$ (C) 0 (D) $-\frac{1}{9}$ (E) -9

9. A particle moves along a line so that at time t , where $0 \leq t \leq \pi$, its position is given by $s(t) = -4 \cos t - \frac{t^2}{2} - 10$. What is the velocity of the particle when its acceleration is zero?
- (A) -5.19 (B) 0.74 (C) 1.32 (D) 2.55 (E) 8.13
10. A particle moves along the x -axis so that at any time $t \geq 0$ the acceleration of the particle is $a(t) = e^{-2t}$. If at $t = 0$ the velocity of the particle is $\frac{5}{2}$ and its position is $\frac{17}{4}$, then its position at any time $t > 0$ is $x(t) =$
- (A) $-\frac{e^{-2t}}{2} - 3$
 (B) $\frac{e^{-2t}}{4} + 4$
 (C) $4e^{-2t} + \frac{9}{2}t + \frac{1}{4}$
 (D) $\frac{e^{-2t}}{2} - 3t + \frac{15}{4}$
 (E) $\frac{e^{-2t}}{4} + 3t + 4$
11. At time $t \geq 0$, the acceleration of a particle moving on the x -axis is $a(t) = t + \sin t$. At $t = 0$, the velocity of the particle is -2 . For what value of t will the velocity of the particle be zero?
- (A) 1.02 (B) 1.48 (C) 1.85 (D) 2.81 (E) 3.14
12. A particle moves along the x -axis so that its acceleration at any time t is $a(t) = 2t - 7$. If the initial velocity of the particle is 6, at what time t during the interval $0 \leq t \leq 4$ is the particle farthest to the right?
- (A) 0 (B) 1 (C) 2 (D) 3 (E) 4
13. The position of an object attached to a spring is given by $y(t) = \frac{1}{6} \cos(5t) - \frac{1}{4} \sin(5t)$, where t is time in seconds. In the first 4 seconds, how many times is the velocity of the object equal to 0?
- (A) Zero
 (B) Three
 (C) Five
 (D) Six
 (E) Seven
14. A particle moves along the x -axis so that its position at time t is given by $x(t) = t^2 - 6t + 5$. For what value of t is the velocity of the particle zero?
- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

15. The maximum acceleration attained on the interval $0 \leq t \leq 3$ by the particle whose velocity is given by $v(t) = t^3 - 3t^2 + 12t + 4$ is

- (A) 9 (B) 12 (C) 14 (D) 21 (E) 40

16. A particle starts from rest at the point $(2, 0)$ and moves along the x -axis with a constant positive acceleration for time $t \geq 0$. Which of the following could be the graph of the distance $s(t)$ of the particle from the origin as a function of time t ?



1. B 2. D 3. C 4. A 5. C 6. B 7. C 8. E 9. D* 10. E
 11. B* 12. B 13. D* 14. C 15. D 16. A*