Motion in 1-D

DISTANCE, DISPLACEMENT, SPEED AND VELOCITY

1. The position x of a particle varies with time t as $x = 2 - 6t + t^2$. Its initial velocity is:
   (a) -3 m/s (b) -6 m/s (c) 2 m/s (d) 3 m/s
2. The position x of a particle varies with time (t) as $x = at^2 - bt^3$. The acceleration at time t of the particle will be equal to zero, where t is equal to:
   (a) 2a/3b (b) a/b (c) a/3b (d) Zero
3. The displacement of a body at any time t after starting is given by $x = 15t - 0.4t^2$. The velocity of the body will be 7 m/s after time:
   (a) 20 s (b) 15 s (c) 10 s (d) 5 s
4. The position x of a particle varies with time t as $x = 6 + 12t + 2t^2$ where x is in metre and t in seconds. The distance travelled by the particle in first five seconds is:
   (a) 116 m (b) 26 m (c) 10 m (d) 136 m
5. The displacement of a body at any time t after starting is given by $x = 16t - 4t^2$. The distance and displacement travelled by the particle in first four seconds are, respectively:
   (a) 32 m, 0 m (b) 32 m, 32 m (c) 24m, 16m (d) 16m, 0 m
6. A particle moves along a straight line such that its displacement at any time t is given by $x = t^3 - 3t^2 + 2t + 3$ metres. The velocity when the acceleration is zero is:
   (a) 2 m/s (b) -1 m/s (c) 4 m/s (d) -6 m/s
7. The displacement of a particle starting from rest (at t = 0) is given by $x = 3t^2 - t^3$. The time in seconds at which the particle will attain zero velocity again, is:
   (a) 4 s (b) 8 s (c) 12 s (d) 16 s
8. The velocity-time relation of an electron starting from rest is given by $v = kt$ where $k = 2\ m/s^2$. The distance traversed in 3 sec is:
   (a) 9 m (b) 16 m (c) 27 m (d) 36 m
9. The displacement x of a particle moving in one dimension under the action of constant force is related to time t by the equation $t = \sqrt{x} + 3$, where x is in metres and t is in seconds. Find the displacement of the particle when its velocity is zero:
   (a) Zero (b) 12 m (c) 6 m (d) 18 m
10. The acceleration of a particle varies with time as a = pt + q, where p and q are constants. What will be the velocity of the particle, which starts from rest, after the time t?
    (a) $pt + 2qt^2$ (b) $qt + \frac{1}{2}pt^2$ (c) $pt + qt^2$ (d) $qt + pt^2$
11. The displacement of a particle moving in a straight line depends on time (t) as: $x = at^3 + bt^2 + ct + d$, where a, b, c and d are constants. The ratio of its initial acceleration to its initial velocity depends:
    (a) Only on a (b) Only on a and b (c) Only on b and c (d) Only on a and d
12. A particle located at x = 0, at time t = 0, starts moving alone the positive x-direction with a velocity v that varies as $v = \alpha\sqrt{x}$. The displacement of the particle varies with time as:
    (a) t^3 (b) t^2 (c) t (d) $t^{1/2}$

13. The velocity of a particle moving in the positive direction of x-axis varies as $v = 5\sqrt{x}$. Assuming that at t = 0, x = 0, then the acceleration of particle at x = 1 m is:
    (a) 12.5 m/s^2 (b) 3.3 m/s^2 (c) 5.0 m/s^2 (d) 2.5 m/s^2
14. The acceleration of a particle is given by a = 2t^2. Find velocity at t = 3s if the initial velocity is zero:
    (a) 18 m/s (b) 10 m/s (c) 15 m/s (d) 8 m/s
15. A point moves in a straight line so that its displacement x m at time t sec is given by x^2 = 1 + t^2. Its acceleration in m/s^2 at a time t sec is:
    (a) $\frac{1}{x^3}$ (b) $\frac{t}{x^3}$ (c) $\frac{1}{x^3} - \frac{t}{x^2}$ (d) $\frac{1}{x} - \frac{1}{x^3}$
16. The relation between time t and distance x is t = ax^2 + bx where a and b are constants. The retardation is:
    (a) 2av^3 (b) 2bv^3 (c) 2abv^3 (d) 2b^{2}v^3
17. A car travels half the distance with constant speed of 40 kmph and the remaining half with a constant speed 60 kmph. The average speed of the car in kmph is:
    (a) 40 (b) 45 (c) 48 (d) 50
18. A particle moving along a straight line has a velocity v m/s, when it cleared a distance x metre. These two are connected by the relation $v = \sqrt{49 + x}$. When its velocity is 1 m/s, its acceleration (in m/s^2) is:
    (a) 1 (b) 2 (c) 4 (d) 0.5
19. The deceleration experienced by a moving motor boat after its engine is cut-off is given by dv/dt = -kv^3, where k is k constant. If v_0 is the magnitude of the velocity at cut off the magnitude of the velocity at a time t after the cut-off is:
    (a) $v_0/2$ (b) v_o (c) $v_0 e^{-kt}$ (d) $\frac{v_0}{\sqrt{2v_0^2kt+1}}$
20. Given that x is displacement at time t and p, q, r are constants. Which of the following represents the motion with constant non-zero acceleration?

    (a) x = pt^3 + qt^2 (b) x = pt (c) x = pt + qt^2 (d) x = pt + qt^2 + rt^3