Motion in a straight line

Objective : Learn to use one and more than one equations of motion to solve the problems

1. A car covers first half of the distance between two places at a speed of 40 kmph and the second half at a speed of 60 kmph. The average speed of the car is
   a) 100 kmph b) 48 kmph c) 50 kmph d) 25 kmph

2. Displacement of a body, as a function of time (t) , in seconds, is given by $x = 3 + 2t + \frac{1}{2}t^2$ in metres. Its acceleration is
   a) 0.25 ms^{-2} b) 0.5 ms^{-2} c) 0.75 ms^{-2} d) 1 ms^{-2}

3. A bus, starting from rest, accelerates uniformly and acquires a speed of 36 kmph in 10s. Acceleration of the bus is
   a) 1 ms^{-2} b) 2 ms^{-2} c) ½ ms^{-2} d) 3 ms^{-2}

4. Relation between velocity v and position x of a particle with moving with uniform acceleration in a straight, line is given by $v = \sqrt{196 - 16x}$ (in SI units). Its acceleration is
   a) 8 ms^{-2} b) -8 ms^{-2} c) 14 ms^{-2} d) -16 ms^{-2}

5. Displacement of a freely falling body in 6^{th} second is 53.9m. Its displacement in 8^{th} second will be
   a) 53.9 m b) 63.7 m c) 73.5 m d) 83.3 m

6. A car accelerates from rest with a uniform rate of 2 ms^{-2} for some time. Brakes are then applied to bring it to rest with a deceleration of 4 ms^{-2}. If the total time of travel is 15s, its maximum velocity is
   a) 72 kmph b) 56 kmph c) 60 kmph d) 50 kmph

7. A car, starting from rest, accelerates at a rate of 5 ms^{-2} and reaches a maximum velocity 20ms^{-1}. Then by the application of breaks it comes to rest with a deceleration of 8 ms^{-2}. The total time of journey is
   a) 2.50 s b) 4.82 s c) 6.25 s d) 6.50 s

8. The speed (v) of a body moving with uniform acceleration is tripled in covering a distance (S). When it covers additional distance S its speed would become
   a) 9 v b) 16 v c) $\sqrt{7v}$ d) $\sqrt{17v}$

9. Distance travelled by a body is given by $2S$ = (20 t + 5 t^2) m. Acceleration of the body is
   a) 2.5 ms^{-2} b) 5 ms^{-2} c) 10 ms^{-2} d) 0.5 ms^{-2}

10. A body travels 200 cm in the first two seconds and 220 cm in the next 4 seconds of its motion. Velocity of the body at the end of the 7^{th} second is
    a) 5 cm s^{-1} b) 10 cm s^{-1} c) 15 cm s^{-1} d) 20 cm s^{-1}

11. Displacement (x) from the origin, of a particle moving in one dimension with constant acceleration is related to time t by the equation $t = \sqrt{x} + 3$, where x is in metres and t is in seconds. Displacement of the particle at an instant when its velocity is zero will be
a) zero b) 12 m c) 6 m d) 18 m

12. An object projected up vertically with a velocity of 98 ms^{-1} reaches a point *X* in its path after 4 seconds. From the instant of projection, it crosses *X* again after
a) 4 s b) 8 s c) 12 s d) 16 s

13. A juggler throws clubs into air. He throws one, whenever the previous one reaches to its highest point. The height to which the clubs rise if he throws n clubs per second is
a) $\frac{g}{2n^2}$ b) $\frac{g}{n}$ c) $\frac{g}{2n}$ d) $\frac{n^2}{g}$

14. A stone is thrown vertically upward with an initial velocity u from the top of a tower, reaches the ground with a velocity $3u$. The height of the tower is
a) $3u^2/g$ b) $4u^2/g$ c) $6u^2/g$ d) $9u^2/g$

15. A body is thrown upwards with velocity 100 ms^{-1} and it travels 5 m in the last second of its upward journey. If the same body is thrown upward with velocity 200 ms^{-1}, the distance it will travel in the last second of upward journey is
a) 5 m b) 10 m c) 20 m d) 25 m

16. Average velocity of freely falling body is 7 ms^{-1}. It is released from a height equal to
a) 5 m b) 10 m c) 20 m d) None

17. A freely falling body crosses points A and B with velocities v and $2v$ respectively. The velocity of that body at C such that AB = BC will be
a) $\sqrt{3}\,v$ b) $\sqrt{4}\,v$ c) $\sqrt{5}\,v$ d) $\sqrt{7}\,v$

18. A body is allowed to fall freely from a height h. The time taken by the body to cover the first half of the height is t_1 and other half is t_2. Then $\frac{t_1}{t_2}$ is
a) 1:1 b) 2:1 c) $(\sqrt{2}+1):1$ d) $(\sqrt{2}-1):1$

19. A multi storied building has 30 floors of same height. A stone falling from the top is found to cover one storey in the first second. The number of storeys covered by the stone during the third second will be
a) 3 b) 4 c) 5 d) 6

20. From a building two balls A and B are thrown such that A is thrown upwards and B downwards (both vertically). If v_A and v_B are their respective velocities on reaching the ground, then
a) $v_B > v_A$ b) $v_A = v_B$
c) $v_A > v_B$ d) their velocities depend on their masses

21. A ball is released from the top of a tower of height h. it takes t seconds to reach the ground. At an instant of time $t/2$, the ball will be
    a) at $h/2$ meters from the ground
    b) at h /4 meters from the ground
    c) at h /$\sqrt{3}$ meters from the ground
    d) at 3 h /4 meters from the ground

22. Displacement of a particle is given by $x = 2+2t+5t^2$ m. Its displacement after 2s will be
    a) 22 m b) 10 m c) 26 m d) 18 m

23. Velocity of a freely falling body after t seconds is 49 ms^{-1}. Its velocity after (t + 2) seconds will be (g = 9.8 ms^{-2})
    a) 58.8 ms^{-1} b) 68.6 ms^{-1} c) 78.4 ms^{-1} d) 88.2 ms^{-1}

24. Displacement of a uniformly accelerated particle from rest in the 8^{th} second is 15 m and in 12^{th} second is 23 m. Acceleration of the particle is
    a) 1 ms^{-2} b) 2 ms^{-2} c) 9.8 ms^{-2} d) 10 ms^{-2}

25. A stone thrown vertically up from the ground reaches a maximum height of 50 m in 10 s. Time taken by the stone to reach the ground from maximum height is
    a) 5 s b) 10 s c) 20 s d) 25 s

Key

1. B
2. D
3. A
4. B
5. C
6. A
7. D
8. D
9. B
10. B
11. A
12. D
13. A
14. B
15. A
16. B
17. D
18. C
19. C
20. B
21. D
22. C
23. B
24. B
25. B