14. Two particles start moving from the same point along the same straight line. The first moves with constant velocity v and the second with constant acceleration a. During the time that elapses before the second catches the first, the greatest distance between the particles is

(a) $\frac{v^2}{a}$ (b) $\frac{v^2}{2a}$

(c) $\frac{2v^2}{a}$ (d) $\frac{v^2}{4a}$

15. A particle is released from rest from a tower of height $3h$. The ratio of times to fall equal heights h, *i.e.*, $t_1 : t_2 : t_3$ is

(a) $\sqrt{3} : \sqrt{2} : 1$ (b) $3 : 2 : 1$

(c) $9 : 4 : 1$ (d) $1 : (\sqrt{2} - 1) : (\sqrt{3} - \sqrt{2})$

16. A ball is dropped from the roof of a tower of height h. The total distance covered by it in the last second of its motion is equal to the distance covered by it in first three seconds. The value of h in metre is $(g = 10\,m/s^2)$

(a) 125 (b) 200

(c) 100 (d) 80

17. Ball A is dropped from the top of a building. At the same instant ball B is thrown vertically upwards from the ground. When the balls collide, they are moving in opposite directions and the speed of A is twice the speed of B. At what fraction of the height of the building did the collision occurs ?

(a) 1/3 (b) 2/3

(c) 1/4 (d) 2/5

18. A juggler maintains four balls in motion, making each of them to rise a height of 20 m from his hand. What time interval should he maintain, for the proper distance between them ? $(g = 10\,m/s^2)$

(a) 3 s (b) $\frac{3}{2}$ s

(c) 1 s (d) 2 s

19. A glass wind screen whose inclination with the vertical can be changed is mounted on a car. The car moves horizontally with a speed of 2 m/s. At what angle α with the vertical should the wind screen be placed so that the rain drops falling vertically downwards with velocity 6 m/s strike the wind screen perpendicularly ?

(a) $\tan^{-1}(1/3)$ (b) $\tan^{-1}(3)$

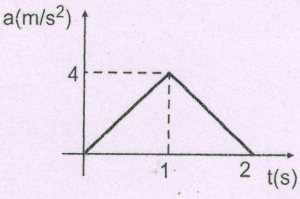
(c) $\cos^{-1}(3)$ (d) $\sin^{-1}(1/3)$

20. A swimmer crosses a flowing stream of width ω to and fro in time t_1. The time taken to cover the same distance up and down the stream is t_2. If t_3 is the time the swimmer would take to swim a distance 2ω in still water, then

(a) $t_1^2 = t_2 t_3$ (b) $t_2^2 = t_1 t_3$

(c) $t_3^2 = t_1 t_2$ (d) $t_3 = t_1 + t_2$

21. The acceleration time graph of a particle moving in a straight line is as shown in figure. The velocity of the particle at time $t = 0$ is 2 m/s. The velocity after 2 s will be



(a) 6 m/s (b) 4 m/s

(c) 2 m/s (d) 8 m/s

22. There are two values of time for which a projectile is at the same height. The sum of these two times is equal to

(a) $3T/2$ (b) $4T/3$

(c) $3T/4$ (d) T

(T = time of flight of the projectile)

23. A person walks up a stationary escalator in time t_1. If he remains stationary on the escalator, then it can take him up in time t_2. How much time would it take him to walk up the moving escalator ?

(a) $\frac{t_1 + t_2}{2}$ (b) $\sqrt{t_1 t_2}$

(c) $\frac{t_1 t_2}{t_1 + t_2}$ (d) $t_1 + t_2$

24. A point mass starts moving in straight line with constant acceleration a from rest at $t = 0$. At time $t = 2$ s, the acceleration changes the sign, remaining the same in magnitude. The mass returns to the initial position at time $t = t_0$ after start of motion. Here, t_0 is

(a) 4 s

(b) $(4 + 2\sqrt{2})$ s

(c) $(2 + 2\sqrt{2})$ s

(d) $(4 + 4\sqrt{2})$ s

25. A particle of mass m is projected from the ground with initial linear momentum p (magnitude) such that to have maximum possible range. Its minimum kinetic energy will be

(a) $\frac{p^2}{2m}$ (b) $\frac{p^2}{4m}$

(c) $\frac{p^2}{m}$ (d) None of these

26. In a car race, car A takes t_0 time less to finish than car B and passes the finishing point with a velocity v_0 more than car B. The cars start from rest and travel with constant accelerations a_1 and a_2. Then the ratio $\frac{v_0}{t_0}$ is equal to

(a) $\frac{a_1^2}{a_2}$ (b) $\frac{a_1 + a_2}{2}$

(c) $\sqrt{a_1 a_2}$ (d) $\frac{a_2^2}{a_1}$