FREEDOM INTERNATIONAL SCHOOL

WORKSHEET- MCQ

PHYSICS

MOTION IN A STRAIGHT LINE

SOLUTIONS

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1. A car travels from A to B at a speed of 20 km/h and returns at a speed of 30 km/h. The average speed of the car for the whole journey is
   (a) 5 km/h (b) 24 km/h (c) 25 km/h (d) 50 km/h

   Ans: (b) 24 km/h

   $v = \frac{2V_1V_2}{V_1+V_2}$

   $v = \frac{2\times20\times30}{20+30}$

   $\Rightarrow v = 24$ km/h

2. A particle moves along the x-axis with a position given by the equation x(t)= 5+3t, where x is in metres, and t is in seconds. The positive direction is east. Which of the following statements about the particle is false?
   (a) The particle is east of the origin at t=0 (b) The particle is at rest at t=0
   (c) The particle's velocity is constant (d) The particle's acceleration is zero

   Ans: (b) The particle is at rest at t=0

3. The displacement of a particle moving in straight line is given by $x=2t^2+t+5$, where x is expressed in metres and t in seconds. The acceleration at t=2 s is
   (a) 4 m/s^2 (b) 10 m/s^2 (c) 8 m/s^2 (d) 15 m/s^2

   Ans: (a) 4 m/s^2

4. If a ball is thrown vertically upwards with 40 m/s, its velocity after 2 s will be
   (a) 10 m/s (b) 30 m/s (c) 20 m/s (d) 40 m/s

   Ans: (c) 20 m/s

   $v=v_0+at$ $\quad v = 40 + (-10)t$

   $a= -10$ m/s^2 $\quad = 40 - 10 * 2 = 20\text{m/s}$

5. A stone released with zero velocity from top of the tower reaches the ground in 4 s. The height of the tower is about
   (a) 20 m (b) 80 m (c) 40 m (d) 160 m

   Ans: (b) 80 m

   $h = \frac{1}{2}gt^2 = \frac{1}{2} \times 10 \times 4^2 = 80m$

6. A body A is thrown up vertically from the ground with a velocity v_0 and another body B is simultaneously dropped from a height H. They meet at a height H/2, if v_0 is equal to

(a) $\sqrt{2gH}$ (b) $\sqrt{gH}$ (c) ½$\sqrt{gH}$ (d) $\sqrt{\frac{2g}{H}}$

Ans: (b) $\sqrt{gH}$

For body A, $s = ut + \frac{1}{2}at^2$

$$\Rightarrow \quad \frac{H}{2} = v_o t - \frac{1}{2}gt^2$$

For body B, $-\frac{H}{2} = 0 + -\frac{1}{2}gt^2$

$$\Rightarrow \quad v_o t - \frac{1}{2}gt^2 = \frac{1}{2}gt^2$$

$$\Rightarrow \quad t = \frac{v_0}{g}$$

$$\therefore \quad \frac{H}{2} = v_0 \times \frac{v_0}{g} - \frac{1}{2}g\frac{v_0^2}{g^2}$$

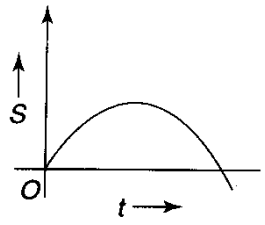
$$\Rightarrow \quad \frac{H}{2} = \frac{v_0^2}{g} - \frac{v_0^2}{2g} = \frac{v_0^2}{2g}$$

$$\Rightarrow \quad v_0 = \sqrt{gH}$$

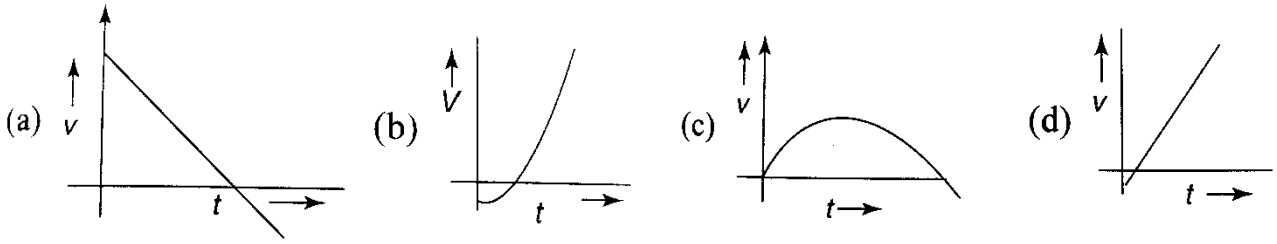
7. Velocity-time curve for a body projected vertically upwards is
(a) ellipse (b) hyperbola (c) parabola (d) straight line

Ans: (d) straight line

8. The graph of displacement vs time is



The corresponding velocity-time graph will be



Ans: (a)

9. A particle moves along a straight line OX. At a time t (in seconds) the distance x (in metres) of the particle from O is given by $x= 40+12t-t^3$. How long would the particle travel before coming to rest?
(a) 16 m (b) 24 m (c) 40 m (d) 56 m

Ans: (d) 56 m

$$v = \frac{d}{dt}\left(40 + 12t - t^3\right) = 0 + 12 - 3t^2$$

When, v=0; t=2s

At t=2s; $x= 40+12x2-2^3 = 56$ m

10. Two bodies A (of mass 1 kg) and B (of mass 3 kg) are dropped from heights of 16 m and 25 m, respectively. The ratio of the times taken by them to reach the ground is
(a) 4/5 (b) 5/4 (c) 12/5 (d) 5/12

Ans: (a) 4/5

$$h = ut + \frac{1}{2}gt^2$$

or $$h = 0 + \frac{1}{2}gt^2$$

$$\therefore \quad \frac{h_1}{h_2} = \left(\frac{t_1}{t_2}\right)^2$$

Given, $h_1 = 16$ m, $h_2 = 25$ m

$$\therefore \quad \frac{t_1}{t_2} = \sqrt{\frac{h_1}{h_2}} = \sqrt{\frac{16}{25}} = \frac{4}{5}$$

For questions 11 to 15, two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the options as given below.

A. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
C. Assertion is true but Reason is false.
D. Both Assertion and Reason are false.

11. **Assertion:** A body can have acceleration even if its velocity is zero at that instant of time.
Reason: The body will be momentarily at rest when it reverses its direction of motion.
Ans: A
12. **Assertion**: Displacement of a body may be zero, when distance travelled by it is not zero.
Reason: The displacement is the longer distance between the initial and final positions.
Ans: C
13. **Assertion:** Two balls of different masses are thrown vertically upward with the same speed. They will pass through their point of projection in the downward direction with the same speed.
Reason: The maximum height and downward velocity attained at the point of projection are independent of the mass of the ball.
Ans: A
14. **Assertion:** The speed of a body can be negative.
Reason: If the body is moving in the opposite direction of positive motion, then its speed is negative.
Ans: D

15. **Assertion:** The equation of motion can be applied only if acceleration is along the direction of velocity and is constant.
    Reason: If the acceleration of a body is constant then its motion is known as uniform motion.
    Ans: D