7 Motion

A. MULTIPLE CHOICE QUESTIONS

Select and write the most appropriate option out of the four options.

1. A body is thrown vertically upward with velocity u, the greatest height h to which it will rise is
   (a) u/g
   (b) $u^2/2g$
   (c) u^2/g
   (d) $u/2g$

2. The magnitude of the displacement of an object is always
   (a) greater than the distance travelled
   (b) equal to the distance travelled
   (c) less than the distance travelled
   (d) less than or equal to the distance travelled

3. A boy running around a circular track of radius 7 m returns back to the starting point after completing two rounds. The distance covered by the boy and the displacement is
   (a) 44 m distance and 88 m displacement
   (b) 44 m distance and zero displacement
   (c) 88 m distance and zero displacement
   (d) none of these

4. The speedometer of a car measures
   (a) average speed
   (b) instantaneous speed
   (c) acceleration
   (d) none of these

5. Retardation of a body is expressed in
   (a) m
   (b) ms^{-1}
   (c) $-ms^{-2}$
   (d) ms^{-2}

6. One of the following is not a vector quantity. This one is
   (a) displacement
   (b) speed
   (c) acceleration
   (d) velocity

7. Which of the following could not be a unit of acceleration?
   (a) km/s^2
   (b) cms^{-2}
   (c) km/s
   (d) m/s^2

8. Which of the following statement is correct regarding velocity and speed of a moving body?
   (a) velocity of a moving body is always higher than its speed.
   (b) speed of a moving body is always higher than its velocity.
   (c) speed of a moving body is its velocity in a given direction.
   (d) velocity of a moving body is its speed in a given direction.

9. In which of the following cases of motion, the distance moved and the magnitude of displacment are equal?
   (a) If the car is moving on a straight road.
   (b) If the car is moving on a circular road
   (c) If the pendulum is moving to and fro
   (d) If a planet is moving around the sun.

10. A boy is sitting on a merry-go round which is moving with a constant speed of x ms^{-1}. This means that the boy is
    (a) at rest
    (b) moving with no acceleration
    (c) in accelerated motion
    (d) moving with uniform velocity

11. Odometer of automobiles records
    (a) average speed
    (b) instantaneous speed
    (c) distance travelled
    (d) acceleration

12. If the displacement-time graph of a particle is parallel to the time axis, the velocity of the particle is
    (a) unity
    (b) infinity
    (c) zero
    (d) none of these

13. The slope of velocity-time graph gives
    (a) the distance
    (b) the displacement
    (c) the acceleration
    (d) the speed

14. On a velocity-time graph, a horizontal straight line corresponds to motion at
    (a) constant velocity   (b) zero velocity   (c) increasing velocity   (d) decreasing velocity

15. The speed of a moving object is determined to be 0.06 m/s. This speed is equal to
    (a) 2.16 km/h   (b) 1.08 km/h   (c) 0.216 km/h   (d) 0.0216 km/h

16. A bus moving along a straight line at 20 m/s undergoes an acceleration of 4 m/s². After 2 seconds, its speed will be
    (a) 8 m/s   (b) 12 m/s   (c) 16 m/s   (d) 28 m/s

17. A car of mass 1000 kg is moving with a velocity of 10 ms⁻¹. If the velocity-time graph for this car is a horizontal line parallel to the time axis, then the velocity of car at the end of 25 s will be
    (a) 25 ms⁻¹   (b) 40 ms⁻¹   (c) 10 ms⁻¹   (d) 250 ms⁻¹

18. The area under a speed-time graph represents a physical quantity which has the unit of
    (a) m   (b) m²   (c) ms⁻¹   (d) ms⁻²

19. Which one of the following is most likely not a case of uniform circular motion?
    (a) motion of the earth around the sun   (b) motion of a toy train on a circular track
    (c) motion of a racing car on a circular track   (d) motion of hour hand on the dial of a clock

20. If the displacement of an object is proportional to the square of time, then the object is moving with
    (a) uniform velocity   (b) uniform acceleration
    (c) increasing acceleration   (d) decreasing acceleration

B. ASSERTION-REASON BASED QUESTIONS

Following question consist of two statements — Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option (a), (b), (c) and (d) as given below:

(a) Both, Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A).

(b) Both, Assertion (A) and Reason (R) are true, and Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true, but Reason (R) is false.

(d) Assertion (A) is false, but Reason (R) is true.

1. **Assertion (A)** : In some situations, motion is inferred through indirect evidences.
   Reason (R) : We infer the motion of air by observing the movement of dust particles and leaves of trees.

2. **Assertion (A)** : The displacement of the moving body can be zero.
   Reason (R) : When a body moves a certain distance then it comes back to the initial position in such case, initial and final position coincide, i.e., displacement = 0.

3. **Assertion (A)** : The distance-time graph for a body having non-uniform motion is a straight line.
   Reason (R) : In an accelarated motion, the speed of the body increases with time.

4. **Assertion (A)** : Speed can never be negative.
   Reason (R) : Speed is a scalar quantity because it has magnitude only but no specified direction. Thus, the speed can be zero or positive.

5. **Assertion (A)** : In uniform circular motion, the speed of the body moving in the circular path is constant but the velocity is not constant.
   Reason (R) : In uniform circular motion, the direction of motion is continuously changing. Thus, the velocity of a body changes.

6. **Assertion (A)** : Distance has no specified direction.
   Reason (R) : Distance is a vector quantity.

7. **Assertion (A)** : The distance travelled by a body may be greater or equal to the magnitude of its displacement.
   Reason (R) : The distance can never be less than the displacement.

8. **Assertion (A)** : The distance-time graph for uniform motion is a curved line.
   Reason (R) : A body has a uniform motion if it travels equal distances in equal intervals of time.

9. **Assertion (A)** : Speed is always positive

   Reason (R) : Velocity can be positive or negative.

10. **Assertion (A)** : The distance moved and the magnitude of displacement can be equal.

    Reason (R) : If an object is moving on a statright road, then the distance moved and magnitude of displacement will be equal.

C. SOURCE-BASED/CASE-BASED QUESTIONS

1. Distance and displacement are the terms commonly used to describe the position of moving body from its reference point. Apparently, distance travelled by an object and the displacement appear to have the same meaning, but in physics, these two words have different meanings.

   Distance is the length of actual path covered by a moving body irrespective of the direction in which the body travels. But the shortest (straight line) distance between the initial position and final position of the body, along with direction, is known as its displacement.

   It is clear that distance travelled refers to the actual length of the indirect path (only magnitude) whereas displacement refers to the straight line path between initial position and final position of the body, along with direction.

   (i) Distance is a

   (a) scalar quantity   (b) vector quantity   (c) either (a) or (b)   (d) none of these

   (ii) Displacement has

   (a) magnitude only   (b) direction only   (c) both (a) and (b)   (d) none of these

   For question numbers 1(iii) and 1(iv).

   Suppose a boy starts moving from his home place A and travels a distance of 3 km to meet his friend living at place B. Then both friends travel another 4 km from B to reach their school at C as shown in the figure, then the first boy goes along the path ABC.

   (iii) The distance travelled by the first boy is

   (a) 3 km   (b) 4 km

   (c) 5 km   (d) 7 km

   (iv) The displacement for the first boy is

   (a) 3 km   (b) 4 km

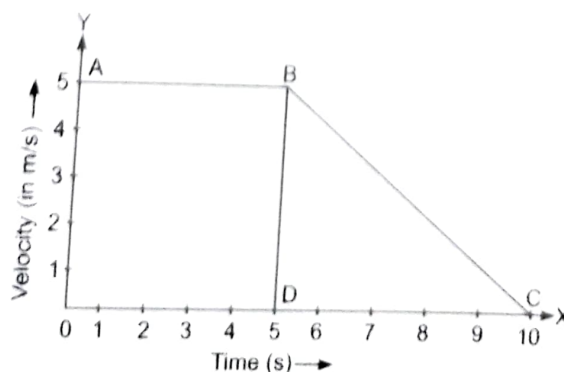   (c) 5 km   (d) 7 km

   (v) Displacement for a moving body may be

   (a) positive   (b) negative   (c) zero   (d) all of these

2. A cylist is cycling at a uniform velocity 5 m/s for 5 seconds. He then stops paddling and the cycle comes to rest in next 5 seconds as shown in the graph below.
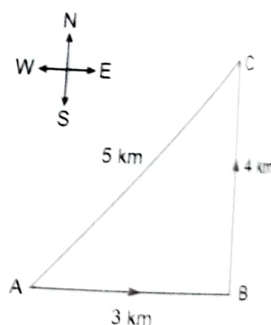

   (i) From the graph, the average retardation of the graph is

   (a) 2 m/s^2 (b) 1.5 m/s^2 (c) 1 m/s^2 (d) 0.5 m/s^2

(ii) The distance covered with uniform velocity is

(a) 20 m   (b) 25 m   (c) 30 m   (d) 35 m

(iii) The distance covered with variable velocity is

(a) 25 m   (b) 15 m   (c) 12.5 m   (d) 10 m

(iv) The average velocity of the cylist is

(a) 3.75 m/s   (b) 4 m/s   (c) 4.75 m/s   (d) 5 m/s

(v) The slope of the speed-time graph represents :

(a) acceleration at that point   (b) retardation at that point

(c) either (a) or (b)   (d) velocity at that point