

## CLASS NOTES

**Class : IX**

**Topic:**

**In-text Question.**

**Exercise Questions**

**Subject: Physics**

..... continued from the previous part of in-text question answer

**11. A train starting from a railway station and moving with uniform acceleration attains a speed of 40 km/hr in 10 minutes. Find its acceleration.**

**Ans:**

$$\text{Initial speed } u = 0 \text{ ms}^{-1}$$

$$\text{Final speed } v = 40 \text{ km h}^{-1} = 40 \times \frac{1000}{60 \times 60} = 11.11 \text{ ms}^{-1}$$

$$\text{Acceleration } a = \frac{v - u}{t} = \frac{11.11 - 0}{10 \times 60} = 1.85 \times 10^{-2} \text{ ms}^{-2}$$

**12. What is the nature of the d – t graphs for uniform and non uniform motion of an object?**

**Ans:** The d – t graph is a straight line for uniform motion and curved line for non uniform motion.

**13. What can you say about the motion of an object whose d – t graph is a straight line parallel to the time axis?**

**Ans:** If the d – t graph is a straight line parallel to the time axis it mean that distance of the object remains constant. Therefore object is not moving and it is at rest.

**14. What can you say about the motion of an object whose speed time graph is a straight line parallel to the time axis?**

**Ans:** It means that speed is constant or there is no acceleration.

**15. What is the quantity which is measured by the area occupied below the v – t graph?**

**Ans:** It is the distance travelled by the body.

**16. A bus starting from rest moves with a uniform acceleration of 0.1 m/s<sup>2</sup> for 2 minutes. Find:**

**a) The speed acquired and**

**b) The distance travelled.**

$$\text{Acceleration } a = 0.1 \text{ ms}^{-2}, \text{ time } t = 2 \text{ minutes} = 2 \times 60 = 120 \text{ s}$$

$$\text{Final speed } v = ?, \text{ the distance travelled } s = ?.$$

**(a)** Using first equation of motion,  $v = u + at = 0 + 0.1 \times 120 = 12 \text{ ms}^{-1}$

**(b)** Using second equation of motion,  $s = ut + \frac{1}{2}at^2 = 0 + \frac{1}{2} \times 0.1 \times (120)^2 = 720 \text{ m}$

**17. A train is travelling at a speed of 90 km/hr. brakes are applied so as to produce a uniform acceleration of – 0.5 m/s<sup>2</sup>. Find how far the train will go before it is brought to rest?**

**Ans:**

$$\text{Given, initial speed } u = 90 \text{ km h}^{-1} = 90 \times \frac{1000}{60 \times 60} = 25 \text{ ms}^{-1},$$

$$\text{acceleration } a = -0.5 \text{ ms}^{-2}, \text{ final speed } v = 0, \text{ the distance travelled } s = ?.$$

Using third equation of motion,  $v^2 = u^2 + 2as$   
 $0 = (25)^2 - 2 \times 0.5 s$

or

$$s = (25)^2 = 625 \text{ m}$$

18. A trolley, while going down an inclined plane, has an acceleration of  $2 \text{ cm/s}^2$ . What will be its velocity 3 sec after the start?

Ans:

Given, initial speed  $u = 0 \text{ ms}^{-1}$ ,

acceleration  $a = 2 \text{ cm s}^{-2}$ , time  $t = 3 \text{ s}$ ,

final speed  $v = ?$

Using first equation of motion,  $v = u + at = 0 + 2 \times 3 = 6 \text{ cm s}^{-1}$

19. A racing car has a uniform acceleration of  $4 \text{ m/s}^2$ . What distance will it cover in 10 s after the start?

Ans:

Given, initial speed  $u = 0 \text{ ms}^{-1}$ ,

acceleration  $a = 4 \text{ ms}^{-2}$ , time  $t = 10 \text{ s}$ ,

the distance travelled  $s = ?$

Using second equation of motion,  $s = ut + \frac{1}{2}at^2 = 0 + \frac{1}{2} \times 4 \times (10)^2 = 200 \text{ m}$

20. A stone is thrown in a vertically upward direction with a velocity of  $5 \text{ m/s}$ . If the acceleration of the stone during its motion is  $10 \text{ m/s}^2$  in the downward direction, what will be the height attained by the stone and how much time will it take to reach there?

Ans:

Given, initial speed  $u = 5 \text{ ms}^{-1}$ ,

acceleration  $a = 10 \text{ ms}^{-2}$  (downward), time  $t = ?$ ,  $h = ?$

At the highest point final speed  $v = 0$

(a) Using third equation of motion,  $v^2 = u^2 + 2as$

$$0 = (5)^2 - 2 \times 10 h$$

or  $20h = 25$

or  $h = \frac{25}{20} = 1.25 \text{ m}$

(b) Using first equation of motion,  $v = u + at$

$$0 = 5 - 10t$$

or  $10t = 5$

or  $t = \frac{5}{10} = 0.5 \text{ s}$

## Exercise Questions and Answers:

1. An athlete completes one round of a circular track of diameter  $200 \text{ m}$  in  $40 \text{ sec}$ . What will be the distance covered and the displacement at the end of  $2 \text{ min } 20 \text{ sec}$ ?

Ans:

Time for one round =  $40 \text{ Sec}$ .

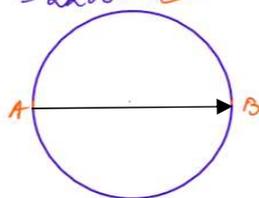
Total time =  $2 \text{ min } 20 \text{ s} = 140 \text{ Sec}$ .

$$\therefore \text{No. of rounds} = \frac{140}{40} = 3.5$$

$$\begin{aligned} \therefore \text{Distance covered in } 3.5 \text{ round} &= 2\pi r \times 3.5 \\ &= 2 \times \frac{22}{7} \times 100 \times \frac{7}{2} \\ &= 2200 \text{ m} \end{aligned}$$

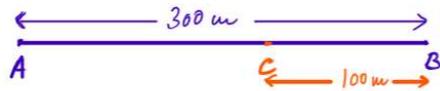
After completing  $3.5$  round, the athlete will reach the other end (say B).

$$\therefore \text{Displacement} = AB = 2r = 200 \text{ m}$$



2. Joseph jogs from one end A to the other end B of a straight 300 m road in 2 min 30 sec and then turns around and jogs 100 m back to point C in another 1 minute. What are Joseph's average speeds and velocities in jogging (a) from A to B and (b) from A to C?

Ans:



(a) Total distance from A to B = 300 m  
 Time taken  $t = 2 \text{ min } 30 \text{ s} = 150 \text{ s}$   
 $\therefore$  Avg. Speed =  $\frac{300}{150} = 2 \text{ m/s}$   
 Displacement (from A to B) = 300 m  
 Again the time taken = 150 s.  
 $\therefore$  Avg. velocity =  $\frac{300}{150} = 2 \text{ m/s}$

(b) Total distance from A to C = AB + BC  
 $= 300 + 100 = 400 \text{ m}$   
 Total time taken = 2 min 30 s + 1 min  
 $= 150 + 60 = 210 \text{ s}$   
 Avg. Speed =  $\frac{400}{210} = 1.9 \text{ m/s}$   
 Displacement from A to C = AB - BC  
 $= 300 - 100 = 200 \text{ m}$   
 Total time = 150 + 60 = 210 s  
 $\therefore$  Avg. velocity =  $\frac{200}{210} = 0.95 \text{ m/s}$

3. Abdul, while driving to school, computes the average speed for his trip to be 20 km/hr. on his return trip along the same route, there is less traffic and the average speed is 30 km/hr. What is the average speed for Abdul's trip?

Ans:

Let,  $x$  be the distance of the school and the time to reach the school is =  $t_1$   
 $\therefore t_1 = \frac{\text{Distance}}{\text{Avg. speed}} = \frac{x}{20} \text{ s}$   
 Similarly, the time taken in return trip =  $t_2$   
 $\therefore t_2 = \frac{\text{Distance}}{\text{Avg. speed}} = \frac{x}{30}$   
 $\therefore$  Total time taken,  $t = t_1 + t_2 = \frac{x}{20} + \frac{x}{30} = \frac{x}{12} \text{ s}$   
 Also the total distance =  $x + x = 2x$   
 $\therefore$  Average speed =  $\frac{\text{Total distance}}{\text{Total time}} = \frac{2x}{(\frac{x}{12})} = 24 \text{ km/hr}$

4. A motorboat starting from rest on a lake accelerates in a straight line at a constant rate of 3 m/s<sup>2</sup> for 8 sec. how far does the boat travel during this time?

Ans:

Here,  $u = 0 \text{ m/s}$   
 acceleration  $a = 3 \text{ m/s}^2$ ,  $t = 8 \text{ s}$   
 $\therefore$  The distance travelled  $s = ?$   
 From 2nd eq<sup>n</sup> of motion, we get  
 $s = ut + \frac{1}{2}at^2$   
 $= 0 + \frac{1}{2} \times 3 \times 8^2$   
 $= 96 \text{ m}$

5. It will be discussed later.

6. It will be discussed later.

7. A ball is gently dropped from a height of 20 m. If its velocity increases uniformly at the rate of  $10 \text{ m/s}^2$ , with what velocity will it strike the ground? After what time will it strike the ground?

Ans:

Given, acceleration  $a = 10 \text{ m/s}^2$ ,  $h = 20 \text{ m}$   
For a ball dropped freely  $u = 0$ ;  $t = ?$ ;  $v = ?$

(a) We know,  $v^2 = u^2 + 2as$   
 $= 0 + 2 \times 10 \times 20$   
 $= 400$   
 $\therefore v = 20 \text{ m/s}$

(b)  $v = u + at$   
or,  $20 = 0 + 10 \times t$   
 $\therefore t = \frac{20}{10} = 2 \text{ Sec}$

8. It will be discussed later.

9. State which of the following stimulations are possible and give an example for each of these:

a) An object with a constant acceleration but with zero velocity,

b) An object moving in a certain direction with an acceleration in the perpendicular direction.

Ans: a) An object with a constant acceleration but with zero velocity is possible as in case of freely falling body. When a body is just about to fall from rest, its initial velocity is zero while it is being acted upon by a constant acceleration due to gravity.

b) An object moving in a certain direction with an acceleration in the perpendicular direction is possible. For example, in a circular motion the acceleration acts along the radius and velocity at any instant is directed along the tangent i.e. in the perpendicular direction.

10. An artificial satellite is moving in a circular orbit of radius 42250 km. Calculate its speed if it takes 24 hours to revolve around the earth.

Ans:

Given, radius  $r = 42250 \text{ km}$   
Time  $t = 24 \text{ h} = 24 \times 60 \times 60 \text{ sec}$   
 $\therefore \text{Speed, } v = \frac{\text{Distance}}{\text{Time}} = \frac{2\pi r}{T}$   
 $= \frac{2 \times 3.14 \times 42250}{24 \times 60 \times 60}$   
 $= 3.07 \text{ km/Sec.}$

**\*\*Content prepared absolutely from home\*\***