

## PHYSICS NUMERICAL WORKSHEET ON MOTION

1. A man travels a distance of 1.5 m towards East, then 2.0 m towards South and finally 4.5 m towards East.
  - i. What is the total distance travelled?
  - ii. What is his resultant displacement?
2. A scooterist covers a distance of 3 kilometers in 5 minutes. Calculate his speed in :
  - a) centimetres per second (cm/s)
  - b) metres per second (m/s)
  - c) kilometers per hour (km/h)
3. The train 'A' travelled a distance of 120 km in 3 hours whereas another train travelled a distance of 180 km in 4 hours. Which train travelled faster?
4. A car travels 30 km at uniform speed of 40 km/h and the next 30 km at a uniform speed of 20 km/h. Find its average speed.
5. On a 120 km track, a train travels the first 30 km at a uniform speed of 30 km/h. How fast must the train travel the next 90 km so as to average 60 km/h for the entire trip?
6. A train travels at a speed of 60 km/h for 0.52 h, at 30 km/h for the next 0.24 h and then 70 km/h for the next 0.71 h. What is the average speed of the train?
7. A car travels a distance of 200 km from Delhi to Ambala towards North in 5 hours. Calculate
  - i. speed, and
  - ii. velocity, of the car for this journey.
8. A bus covers a distance of 250 km from Delhi to Jaipur towards West in 5 hours in the morning and returns to Delhi in the evening covering the same distance of 250 km in the same time of 5 hours. Find
  - a. average speed, and
  - b. average velocity, of the bus for the whole journey.
9. A driver decreases the speed of a car from 25 m/s to 10 m/s in 5 seconds. Find the acceleration of the car.
10. Change the speed of 6 m/s into km/h.
11. Bus X travels a distance of 360 km in 5 hours whereas bus Y travels a distance of 476 km in 7 hours. Which bus travels faster?
12. A train starting from Railway Station attains a speed of 21 m/s in one minute. Find its acceleration.
13. A snail covers a distance of 100 metres in 50 hours. Calculate the average speed of snail in km/h.
14. A tortoise moves a distance of 100 metres in 15 minutes. What is the average speed of tortoise in km/h?
15. If a sprinter runs a distance of 100 metres in 9.83 seconds, calculate his average speed in km/h.
16. A motorcyclist drives from place A to B with a uniform speed of  $30 \text{ km h}^{-1}$  and returns from place B to A with a uniform speed of  $20 \text{ km h}^{-1}$ . Find his average speed.

17. A motorcyclist starts from rest and reaches a speed of 6 m/s after travelling with uniform acceleration for 3 s. What is his acceleration?
18. An aircraft travelling at 600 km/h accelerates steadily at 10 km/h per second. Taking the speed of sound as 1100 km/h at the aircraft's altitude, how long will it take to reach the 'sound barrier'?
19. If a bus travelling at 20 m/s is subjected to a steady deceleration of  $5 \text{ m/s}^2$ , how long will it take to come to rest?
20. An ant travels a distance of 8 cm from P to Q and then moves a distance of 6 cm at right angles to PQ. Find its resultant displacement.
21. Convert a speed of 54 km/h into m/s.
22. The distance between Delhi and Agra is 200 km. A train travels the first 100 km at a speed of 50 km/h. How fast must the train travel the next 100 km, so as to average 70 km/h for the whole journey?
23. A train travels the first 15 km at a uniform speed of 30 km/h; the next 75 km at a uniform speed of 50 km/h; and the last 10 km at a uniform speed of 20 km/h. Calculate the average speed for the entire train journey.
24. A car is moving along a straight road at a steady speed. It travels 150 m in 5 seconds :
  - (a) What is its average speed?
  - (b) How far does it travel in 1 seconds?
  - (c) How far does it travel in 6 seconds?
  - (d) How long does it take to travel 240 m?
25. A particle is moving in a circular path of radius  $r$ . The displacement after half a circle would be :
  - (a) 0
  - (b)  $\pi r$
  - (c)  $2r$
  - (d)  $2\pi r$
26. 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
27. A body is moving along a circular path of radius  $R$ . What will be the distance travelled and displacement of the body when it completes half a revolution?
28. A body travels a distance of 3 km towards East, then 4 km towards North and finally 9 km towards East.
  - i. What is the total distance travelled?
  - ii. What is the resultant displacement?
29. A boy walks from his classroom to the bookshop along a straight corridor towards North. He covers a distance of 20 m in 25 seconds to reach the bookshop. After buying a book, he travels the same distance in the same time to reach back in the classroom. Find
  - (a) average speed, and
  - (b) average velocity, of the boy.
30. A car travels 100 km at a speed of 60 km/h and returns with a speed of 40 km/h. Calculate the average speed for the whole journey.
31. A ball hits a wall horizontally at  $6.0 \text{ m s}^{-1}$ . It rebounds horizontally at  $4.4 \text{ m s}^{-1}$ . The ball is in contact with the wall for 0.040 s. What is the acceleration of the ball?

32. A scooter acquires a velocity of 36 km per hour in 10 seconds just after the start. Calculate the acceleration of the scooter.
33. A moving train is brought to rest within 20 seconds by applying brakes. Find the initial velocity, if the retardation due to brakes is  $2 \text{ m s}^{-2}$ .
34. A body starts to slide over a horizontal surface with an initial velocity of 05 m/s. Due to friction, its velocity decreases at the rate of  $0.05 \text{ m/s}^2$  (acceleration,  $-0.05 \text{ m/s}^2$ ). How much time will it take for the body to stop?
35. A racing car has a uniform acceleration of  $4 \text{ m/s}^2$ . What distance will it cover in 10 seconds after the start?
36. A scooter moving at a speed of 10 m/s is stopped by applying brakes which produce a uniform acceleration of,  $-0.5 \text{ m/s}^2$ . How much distance will be covered by the scooter before it stops?
37. A car travelling at 20 km/h speeds up to 60 km/h in 6 seconds. What is its acceleration?
38. A bus increases its speed from 20 km/h to 50 km/h in 10 seconds. Its acceleration is :  
 (a)  $30 \text{ m/s}^2$  (b)  $3 \text{ m/s}^2$  (c)  $18 \text{ m/s}^2$  (d)  $0.83 \text{ m/s}^2$
39. A car is moving on a straight road with uniform acceleration. The following table gives the speed of the car at various instants of time :

Speed (m/s)	5	10	15	20	25	30
Time (s)	0	10	20	30	40	50

Draw the speed-time graph by choosing a convenient scale. Determine from it:

- (i) the acceleration of the car.
- (ii) the distance travelled by the car in 50 seconds.
40. A cyclist goes around a circular track once every 2 minutes. If the radius of the circular track is 105 metres, calculate his speed. (Given  $\pi = 22/7$ )
41. Find the initial velocity of a car which is stopped in 10 seconds by applying brakes. The retardation due to brakes is  $2.5 \text{ m/s}^2$
42. If a body starts from rest and accelerates at a constant rate of  $10 \text{ m/s}^2$ , how much distance will it cover in 2 s?
43. A motorcycle moving with a speed of 5 m/s is subjected to an acceleration of  $0.2 \text{ m/s}^2$ . Calculate the speed of the motorcycle after 10 seconds, and the distance travelled in this time.
44. A bus running at a speed of 18 km/h is stopped in 2.5 seconds by applying brakes. Calculate the retardation produced.
45. A train starting from rest moves with a uniform acceleration of  $0.2 \text{ m/s}^2$  for 5 minutes. Calculate the speed acquired and the distance travelled in this time.
46. A cheetah starts from rest, and accelerates at  $2 \text{ m/s}^2$  for 10 seconds. Calculate:  
 (a) the final velocity  
 (b) the distance travelled.
47. A train travelling at  $20 \text{ m s}^{-1}$  accelerates at  $0.5 \text{ m/s}^2$  for 30 s. How far will it travel in this time?

48. A cyclist is travelling at  $15 \text{ m s}^{-1}$ . She applies brakes so that she does not collide with a wall 18 m away. What deceleration must she have?
49. A body starting from rest travels with uniform acceleration. If it travels 100 m in 5 s, what is the value of acceleration?
50. A bus was moving with a speed of 54 km/h. On applying brakes it stopped in 8 seconds. Calculate the acceleration.
51. A train starting from stationery position and moving with uniform acceleration attains a speed of 36 km per hour in 10 minutes. Find its acceleration.
52. A car acquires a velocity of 72 km per hour in 10 seconds starting from rest. Find
- the acceleration,
  - the average velocity, and
  - the distance travelled in this time.
53. The tip of seconds' hand of a clock takes 60 seconds to move once on the circular dial of the clock. If the radius of the dial of the clock be 10.5 cm, calculate the speed of the tip of the seconds' hand of the clock. (Given  $\pi = 22/7$ )
54. A bus increases its speed from 36 km/h to 72 km/h in 10 seconds. Its acceleration is:
- (a)  $5 \text{ m/s}^2$  (b)  $2 \text{ m/s}^2$  (c)  $3.6 \text{ m/s}^2$  (d)  $1 \text{ m/s}^2$
55. A bus moving along a straight line at 20 m/s undergoes an acceleration of  $4 \text{ m/s}^2$ . After 2 seconds, its speed will be:
- (a) 8 m/s (b) 12 m/s (c) 16 m/s (d) 28 m/s
56. A car of mass 1000 kg is moving with a velocity of  $10 \text{ m s}^{-1}$ . If the velocity-time graph for this car is a horizontal line parallel to the time axis, then the velocity of the car at the end of 25 s will be:
- (a)  $25 \text{ m s}^{-1}$  (b)  $40 \text{ m s}^{-1}$  (c)  $10 \text{ m s}^{-1}$  (d)  $250 \text{ m s}^{-1}$
57. A motorcycle is being driven at a speed of 20 m/s when brakes are applied to bring it to rest in five seconds. The deceleration produced in this case will be:
- (a)  $+4 \text{ m/s}^2$  (b)  $-4 \text{ m/s}^2$  (c)  $+0.25 \text{ m/s}^2$  (d)  $-0.25 \text{ m/s}^2$
58. A body is moving uniformly in a straight line with a velocity of 5 m/s. Find graphically the distance covered by it in 5 seconds.
59. A car is moving on a straight road with uniform acceleration. The speed of the car varies with time as follows:
- |             |   |   |    |    |    |    |
|-------------|---|---|----|----|----|----|
| Time (s)    | 0 | 2 | 4  | 6  | 8  | 10 |
| Speed (m/s) | 4 | 8 | 12 | 16 | 20 | 24 |
- Draw the speed-time graph by choosing a convenient scale. From this graph:
- Calculate the acceleration of the car.
  - Calculate the distance travelled by the car in 10 seconds.
60. A car is travelling along the road at  $8 \text{ m s}^{-1}$ . It accelerates at  $1 \text{ m s}^{-2}$  for a distance of 18 m. How fast is it then travelling?
61. A car is travelling at 20 m/s along a road. A child runs out into the road 50 m ahead and the car driver steps on the brake pedal. What must be the car's deceleration be if the car is to stop just before it reaches the child?