

Motion & Force

Class 9 Physics — Combined Practice Worksheet

Covers: Chapter 4 (Describing Motion Around Us) & Chapter 6 (How Forces Affect Motion, up to Newton's Second Law) — 40 Questions

Section A: Multiple Choice Questions (1 mark each)

1. A body is moving with a uniform velocity of 15 m/s. Its acceleration is
 - (a) constant and non-zero
 - (b) zero
 - (c) increasing with time
 - (d) decreasing with time
2. The slope of a position-time graph gives the
 - (a) acceleration of the object
 - (b) distance travelled
 - (c) velocity of the object
 - (d) displacement of the object
3. The area enclosed between a velocity-time graph and the time axis, for a given time interval, gives the
 - (a) acceleration
 - (b) displacement
 - (c) net force
 - (d) average speed only
4. A car's velocity increases from 36 km/h to 54 km/h in 10 s. Its acceleration is
 - (a) 0.5 m/s^2
 - (b) 5 m/s^2
 - (c) 1.8 m/s^2
 - (d) 18 m/s^2
5. The SI unit of force is
 - (a) kilogram
 - (b) newton
 - (c) metre per second squared
 - (d) joule
6. If the net force acting on an object is zero, the object
 - (a) must always be at rest
 - (b) must always be moving
 - (c) is either at rest or moving with constant velocity
 - (d) must always be accelerating

7. For a fixed force, if the mass of an object is doubled, its acceleration
- (a) doubles
 - (b) becomes half
 - (c) remains the same
 - (d) becomes zero
8. The position-time graph of a stationary object is a straight line
- (a) inclined to the time axis
 - (b) parallel to the time axis
 - (c) parallel to the position axis
 - (d) passing through the origin at an angle
9. The force of friction on a moving object acts
- (a) in the direction of motion
 - (b) opposite to the direction of motion
 - (c) perpendicular to the direction of motion
 - (d) in a direction that keeps changing
10. If the magnitude of displacement of an object is equal to the total distance travelled by it in a given interval, the object
- (a) must have been at rest
 - (b) must have moved in one direction without turning back
 - (c) must have moved in a circle
 - (d) must have been accelerating throughout
11. One newton is equal to
- (a) 1 kg m/s
 - (b) 1 kg m/s^2
 - (c) $1 \text{ kg}^2 \text{ m/s}$
 - (d) $1 \text{ kg m}^2/\text{s}^2$
12. The velocity-time graph of an object moving with uniform (constant, non-zero) acceleration is a
- (a) curve
 - (b) straight line parallel to the time axis
 - (c) straight line inclined to the time axis
 - (d) straight line parallel to the velocity axis

Section B: Assertion–Reason (1 mark each)

Each question below has an Assertion (A) and a Reason (R). Choose the correct option:

- (A) Both A and R are true, and R is the correct explanation of A.
- (B) Both A and R are true, but R is *not* the correct explanation of A.
- (C) A is true but R is false.
- (D) A is false but R is true.

13. **Assertion:** A body can have zero velocity and still be accelerating.

Reason: Acceleration depends on the change in velocity, not on the velocity itself.

14. **Assertion:** The magnitude of average velocity of an object can be equal to its average speed.
Reason: This happens only when the object moves along a straight line without reversing its direction.
15. **Assertion:** A rider on a horse tends to fall forward when the horse stops suddenly.
Reason: The upper part of the rider's body continues to be in motion due to inertia while the lower part comes to rest along with the horse.
16. **Assertion:** Two equal and opposite forces acting simultaneously on the same object always result in zero net force.
Reason: Balanced forces do not change the state of rest or of uniform motion of an object.

Section C: Short Answer Questions (2 marks each)

17. Define displacement. How is it different from distance travelled?
18. A car travels 4 km due east from its starting point in 10 minutes, then returns along the same road to the starting point in the next 15 minutes. Find (i) the total distance travelled and (ii) the displacement of the car for this 25-minute trip.
19. What physical quantity is represented by (i) the slope of a velocity-time graph and (ii) the area enclosed by a velocity-time graph and the time axis?
20. State Newton's first law of motion. By what other name is it also known?
21. Give two examples from daily life where an object at rest is being acted upon by balanced forces.
22. A stone is dropped from a height and falls freely under gravity ($g = 10 \text{ m s}^{-2}$). Find its velocity after 2 seconds.
23. Write the SI units of (i) average speed, (ii) average velocity, and (iii) average acceleration.
24. A passenger standing in a bus tends to fall backward when the bus starts suddenly from rest. Explain why this happens.

Section D: Short Answer Questions (3 marks each)

25. A bus starting from rest moves with a uniform acceleration of 0.1 m/s^2 for 2 minutes. Find (i) the speed acquired and (ii) the distance travelled in this time.
26. Draw the position-time graph for (i) an object at rest, and (ii) an object moving with a constant velocity. Briefly explain what distinguishes the two graphs.
27. A car of mass 1200 kg moving with a velocity of 20 m/s is brought to rest by applying brakes uniformly in 4 seconds. Calculate the force applied by the brakes.
28. Distinguish between speed and velocity, giving one point of difference for each of: nature of quantity, sign, and what it measures.
29. State Newton's second law of motion. Using this law, derive the relation $F = ma$.
30. Give scientific reasons for each of the following:
- (a) A cricketer moves his hands backward while catching a fast-moving ball.
 - (b) It is more difficult to push a fully loaded trolley than an empty one.
 - (c) A person standing in a moving bus tends to fall forward when the bus suddenly stops.
31. A block of mass 5 kg lying on a table is acted upon by two horizontal forces of 8 N and 3 N in opposite directions. Find the net force on the block and its acceleration.

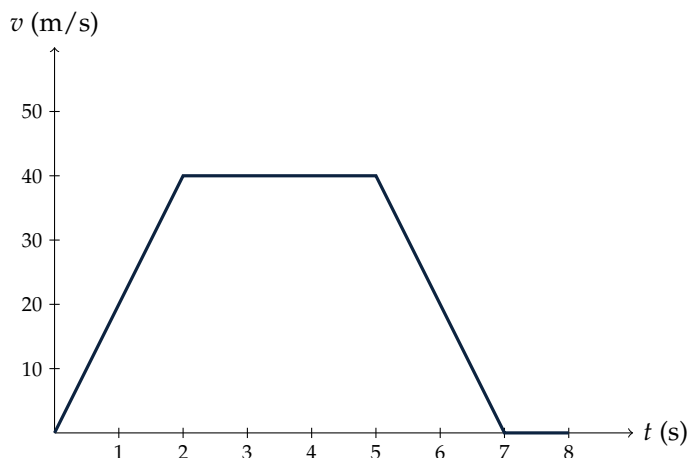
32. The velocities (in m/s) of a scooter at different instants of time (in s) are given below:

Time (s)	0	2	4	6	8	10
Velocity (m/s)	0	4	8	12	12	12

Plot the velocity-time graph for this data and use it to find the distance covered by the scooter in the first 10 seconds.

Section E: Long Answer / Graph-Based Questions (4–5 marks each)

33. Graphically derive the equation $v = u + at$ for an object moving with uniform acceleration, where the symbols carry their usual meaning.
34. Graphically derive the equation $s = ut + \frac{1}{2}at^2$ for an object moving with uniform acceleration, where the symbols carry their usual meaning.
35. Study the velocity-time graph of a car given below and answer the questions that follow.



- (a) What is the nature of motion during (i) 0–2 s, (ii) 2–5 s, and (iii) 5–7 s?
- (b) Calculate the acceleration of the car during 0–2 s.
- (c) Calculate the total distance travelled by the car in the first 5 seconds.
- (d) If the mass of the car is 1000 kg, find the force acting on the car during 5–7 s.
36. A car starts from rest and accelerates uniformly to a speed of 20 m/s in 5 s. It then moves at this constant speed for the next 10 s, and finally decelerates uniformly to rest in 4 s. Draw the velocity-time graph for this motion and use it to find the total distance travelled by the car.
37. The position-time graphs of two objects, P and Q, moving along parallel straight tracks in the same direction are shown below. Both start from the same point at $t = 0$, but P's graph is steeper than Q's throughout, and the two lines never cross after $t = 0$.
- (a) Which of the two objects, P or Q, has the greater velocity? Justify your answer.
- (b) Will the two objects ever be at the same position again after $t = 0$? Explain.
38. A train travelling at 36 km/h accelerates uniformly to 72 km/h in 20 s, then continues at this speed for the next 30 s, and finally decelerates uniformly to rest in 10 s. Draw the velocity-time graph for the motion and use it to find (i) the total distance travelled and (ii) the average speed for the entire journey.
39. A wooden block of mass 10 kg lies on a horizontal floor. The maximum force of friction between the block and the floor is 20 N.
- (a) Find the net force on the block and state whether it will move, if a horizontal force of 15 N is applied to it.
- (b) Find the net force and the resulting acceleration of the block if a horizontal force of 30 N is applied to it instead.
40. A ball is thrown vertically upward with an initial velocity of 20 m/s. Taking $g = 10 \text{ m s}^{-2}$ and ignoring air resistance, find:

- (a) the maximum height reached by the ball,
 - (b) the time taken to reach the maximum height,
 - (c) the velocity with which the ball returns to the point of projection.
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End of Worksheet — Simplified Education