NCERT Solutions for Class 9 Science Chapter 4 Describing the Motion Around Us PDF Download (2026) + Important Questions

Physics ka darr ab khatam! Jab aap Class 9 Science mein aate ho, toh Physics ka sabse pehla aur sabse important chapter jo aapka base banata hai, woh hai Motion. The chapter **CBSE Class 9 Science Chapter 4: Describing the Motion Around Us** (often referred to simply as "Motion") aapko sikhata hai ki hamari aas-paas ki duniya move kaise karti hai.

Yeh chapter sirf school exams ke liye nahi, balki future mein JEE, NEET, ya kisi bhi competitive exam ke liye ek solid foundation hai. Is chapter mein derivations aur numericals dono hain, isliye concept clarity bahut zaroori hai.

In this comprehensive post, you will find the complete **NCERT Solutions for Class 9 Science Chapter 4**, highly expected **Board Exam Questions 2026**, aur ek free **NCERT PDF Download** resource. Let's make Physics your favorite subject!

CHAPTER OVERVIEW

Here is a quick snapshot of what you will master in this chapter:

Feature	**Details**
Chapter Name	Describing the Motion Around Us
Subject	Science (Physics)
Class	Class 9
Board	CBSE / NCERT (2026-27)

Important Topics	Distance vs Displacement, Velocity, Acceleration, Equations of Motion
Difficulty Level	Moderate to Hard (Requires numerical practice)
Exam Weightage	7 - 8 Marks (Very High)

LEARNING OBJECTIVES

After completing this chapter, students will be able to:

- Differentiate between states of rest and motion.
- Understand the fundamental difference between **Distance** and **Displacement**.
- Calculate speed, average speed, and velocity using mathematical formulas.
- Understand the concept of acceleration and retardation.
- Apply the three fundamental **Equations of Motion** to solve complex numerical problems.
- Describe uniform circular motion.

KEY CONCEPTS / DEFINITIONS / FORMULAS

Numericals solve karne se pehle, in terms aur formulas ko yaad rakhna bahut zaroori hai.

- **Distance:** The actual path length covered by an object. (Scalar quantity—only magnitude).
- **Displacement:** The shortest straight-line distance between the initial and final positions. (Vector quantity—magnitude + direction).
- **Uniform Motion:** When an object covers equal distances in equal intervals of time.
- **Acceleration:** The rate of change of velocity. If velocity decreases, it is called *retardation* (negative acceleration).
- **Uniform Circular Motion:** When an object moves in a circular path with uniform speed, its velocity changes continuously due to the change in direction.

Important Formulas:

- **Average Speed:**
  $$v_{av} = \frac{\text{Total Distance}}{\text{Total Time}}$$
- **Acceleration:**
  $$a = \frac{v - u}{t}$$
  (where v is final velocity, u is initial velocity, and t is time)

- **First Equation of Motion:**
  $$v = u + at$$
- **Second Equation of Motion:**
  $$s = ut + \frac{1}{2}at^2$$
- **Third Equation of Motion:**
  $$v^2 - u^2 = 2as$$

FULL NCERT SOLUTIONS

Here are the step-by-step **NCERT Solutions for Class 9 Science Chapter 4**. Har numerical ko step-by-step explain kiya gaya hai taaki exam mein aapke marks na katen.

Question 1: An athlete completes one round of a circular track of diameter 200 m in 40 s. What will be the distance covered and the displacement at the end of 2 minutes 20 s?

Answer:

Step 1: Given values

- Diameter of track = 200 m, so Radius (r) = 100 m
- Time taken for 1 round = 40 s
- Total time given = 2 minutes 20 seconds = $(2 \times 60) + 20$ = 140 s

Step 2: Calculate total rounds completed

- Number of rounds = Total time / Time for one round
- Number of rounds = $140 / 40$ = 3.5 rounds

Step 3: Calculate Distance covered

- Distance in 1 round (Circumference) = $2\pi r$ = $2 \times \frac{22}{7} \times 100$ = 628.57 m
- Distance in 3.5 rounds = 3.5×628.57 = 2200 m

Step 4: Calculate Displacement

- After 3 complete rounds, the athlete is back at the starting point (Displacement = 0).
- In the next 0.5 (half) round, the athlete reaches exactly the opposite side of the circular track.
- Displacement = Shortest straight line = Diameter of the track = 200 m.
- **Final Answer:** Distance = 2200 m, Displacement = 200 m.

Question 2: Joseph jogs from one end A to the other end B of a straight 300 m road in 2 minutes 30 seconds 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?

Answer:

(a) From A to B:

- Total distance = 300 m
- Total displacement = 300 m (since it's a straight line)
- Total time = 2 min 30 s = 150 s
- **Average Speed** = Distance / Time = $300 / 150$ = 2 m/s
- **Average Velocity** = Displacement / Time = $300 / 150$ = 2 m/s

(b) From A to C:

- Total distance = 300 m (A to B) + 100 m (B to C) = 400 m
- Total displacement = 300 m - 100 m = 200 m (A to C)
- Total time = 150 s + 60 s = 210 s
- **Average Speed** = Distance / Time = $400 / 210$ = 1.90 m/s
- **Average Velocity** = Displacement / Time = $200 / 210$ = 0.95 m/s

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

Answer:

Let the distance to the school be x km.

- Time taken to reach school (t_1) = Distance / Speed = $\frac{x}{20}$ hours
- Time taken to return (t_2) = Distance / Speed = $\frac{x}{30}$ hours
- Total Distance = $x + x$ = $2x$
- Total Time = $t_1 + t_2$ = $\frac{x}{20} + \frac{x}{30}$
- Taking LCM (60): Total Time = $\frac{3x + 2x}{60}$ = $\frac{5x}{60}$ = $\frac{x}{12}$ hours
- **Average Speed** = Total Distance / Total Time = $\frac{2x}{\frac{x}{12}}$ = $2x \times \frac{12}{x}$ = 24 km/h.

Question 4: A motorboat starting from rest on a lake accelerates in a straight line at a constant rate of 3.0 m/s² for 8.0 s. How far does the boat travel during this time?

Answer:

Given:

- Initial velocity (u) = 0 m/s (starts from rest)
- Acceleration (a) = 3.0 m/s²
- Time (t) = 8.0 s
- Distance (s) = ?

Using the Second Equation of Motion:

$$s = ut + \frac{1}{2}at^2$$
$$s = (0 \times 8) + \frac{1}{2} \times 3 \times (8)^2$$
$$s = 0 + \frac{1}{2} \times 3 \times 64$$
$$s = 3 \times 32$$
= 96 m.

- The boat travels a distance of 96 m.

Question 5: A stone is thrown in a vertically upward direction with a velocity of 5 m/s. If the acceleration of the stone during its motion is 10 m/s² in the downward direction, what will be the height attained by the stone and how much time will it take to reach there?

Answer:

Given:

- Initial velocity (u) = 5 m/s
- Final velocity at maximum height (v) = 0 m/s
- Acceleration (a) = -10 m/s² (negative because it opposes the upward motion)
- Height (s) = ?
- Time (t) = ?

To find Height (s):

Using the Third Equation of Motion:

$$v^2 - u^2 = 2as$$
$$(0)^2 - (5)^2 = 2 \times (-10) \times s$$
$$-25 = -20s$$
$$s = \frac{25}{20}$$
= 1.25 m.

To find Time (t):

Using the First Equation of Motion:

$$v = u + at$$
$$0 = 5 + (-10)t$$

$$10t = 5$$
$$t = \frac{5}{10}$$
= 0.5 s.

- The height attained is 1.25 m, and it takes 0.5 seconds to reach there.

EXTRA IMPORTANT QUESTIONS (BOARD STYLE 2026)

Sirf NCERT exercises kaafi nahi hain! Top score karne ke liye, practice these 15 handpicked questions.

Multiple Choice Questions (MCQs)

1. The numerical ratio of displacement to distance for a moving object is:

a) Always less than 1

b) Always equal to 1

c) Always more than 1

d) Equal to or less than 1

Answer: (d) (Difficulty: Medium)

2. A car accelerates uniformly from 18 km/h to 36 km/h in 5 seconds. The acceleration is:

a) 1 m/s²

b) 2 m/s²

c) 3 m/s²

d) 4 m/s²

Answer: (a) - Hint: First convert km/h to m/s by multiplying by $5/18$. (Difficulty: Medium)

3. Which of the following can sometimes be zero for a moving body?

i. Average velocity

ii. Distance travelled

iii. Average speed

iv. Displacement

a) Only (i)

b) (i) and (ii)

c) (i) and (iv)

d) Only (iv)

Answer: (c) (Difficulty: Hard)

4. The slope of a velocity-time graph gives:

a) Distance

b) Displacement

c) Acceleration

d) Speed

Answer: (c) Acceleration (Difficulty: Easy)

5. In uniform circular motion, what remains constant?

a) Velocity

b) Speed

c) Acceleration

d) Both speed and velocity

Answer: (b) Speed - Velocity changes continuously due to a change in direction. (Difficulty: Easy)

Short Answer Questions (2-3 Marks)

6. Distinguish between speed and velocity.

Answer: Speed is the distance covered per unit time (scalar quantity, always positive). Velocity is the displacement per unit time (vector quantity, can be positive, negative, or zero).

7. Can an object be accelerated if it is moving with constant speed? Justify.

Answer: Yes. In uniform circular motion, an object moves with constant speed but its direction changes continuously. Since velocity is a vector, a change in direction means a change in velocity, hence it is accelerated.

8. What does the odometer of an automobile measure?

Answer: The odometer measures the total distance traveled by the automobile. (Difficulty: Easy)

9. Under what condition(s) is the magnitude of average velocity of an object equal to its average speed?

Answer: The magnitude of average velocity equals average speed only when the object moves along a straight line continuously in one direction without turning back.

Long Answer Questions (5 Marks)

10. Derive the second equation of motion ($s = ut + \frac{1}{2}at^2$) graphically.

Answer: (Students must practice drawing the Velocity-Time graph for uniform acceleration).

The distance traveled (s) is given by the area enclosed by the velocity-time graph.

Area = Area of rectangle + Area of triangle

$s = (u \times t) + \frac{1}{2} \times (v - u) \times t$

Since $v - u = at$ (from first equation), substitute this into the equation:

$s = ut + \frac{1}{2} \times (at) \times t$

$s = ut + \frac{1}{2}at^2$. (Difficulty: Hard)

11. A train starting from rest attains a velocity of 72 km/h in 5 minutes. Assuming the acceleration is uniform, find (i) the acceleration and (ii) the distance traveled by the train for attaining this velocity.

Answer:

- $u = 0$
- $v = 72 \text{ km/h} = 72 \times \frac{5}{18} = 20 \text{ m/s}$
- $t = 5 \text{ min} = 300 \text{ s}$
- **(i) Acceleration:** $a = \frac{v - u}{t} = \frac{20 - 0}{300} = \frac{1}{15} \text{ m/s}^2$.
- **(ii) Distance (s):** Using $v^2 - u^2 = 2as \rightarrow (20)^2 - 0 = 2 \times \left(\frac{1}{15}\right) \times s \rightarrow 400 = \frac{2}{15}s \rightarrow s = \frac{400 \times 15}{2} = 3000 \text{ m} = 3 \text{ km}$. (Difficulty: Hard)

Case-Based Questions

12. Rahul drops a tennis ball from the roof of a 20 m high building. It falls freely under gravity ($g = 10 \text{ m/s}^2$).

a) What is the initial velocity of the ball? (Ans: 0 m/s because it is dropped)

b) What will be its final velocity just before touching the ground? (Ans: Using $v^2 - u^2 = 2gs \rightarrow v^2 - 0 = 2 \times 10 \times 20 \rightarrow v^2 = 400 \rightarrow v = 20 \text{ m/s}$)

c) How much time will it take to reach the ground? (Ans: Using $v = u + gt \rightarrow 20 = 0 + 10t \rightarrow t = 2 \text{ s}$) (Difficulty: Medium)

Assertion-Reason Questions

(Options: A- Both A & R are true and R is correct explanation. B- Both A & R are true but R is NOT correct explanation. C- A is true, R is false. D- A is false, R is true.)

13. Assertion (A): The displacement of an object can be zero even if the distance covered is not zero.

Reason (R): Displacement is the shortest distance between initial and final positions.

Answer: (A) Both are true, and R correctly explains A (e.g., returning to the starting point). (Difficulty: Easy)

14. Assertion (A): If the velocity of a body decreases with time, the acceleration is negative (retardation).

Reason (R): Acceleration is a scalar quantity.

Answer: (C) A is true, but R is false. Acceleration is a vector quantity. (Difficulty: Medium)

COMMON MISTAKES STUDENTS MAKE

Class 9 students normally in points par marks loose karte hain:

- **Unit Conversion:** Hamesha speed ko km/h se m/s mein convert karna bhool jate hain. **Memory Trick:** km/h ko m/s mein badalne ke liye directly $\frac{5}{18}$ se multiply karo.
- **Signs of Acceleration:** Agar gadi mein brake lag rahe hain (speed decrease ho rahi hai), toh acceleration (a) ki value hamesha negative ($-$) leni hoti hai. Positve lene se pura answer galat aayega!
- **Starting from Rest / Applying Brakes:**
    - "Starts from rest" means Initial velocity (u) = 0.
    - "Comes to a stop" or "brakes applied" means Final velocity (v) = 0.

EXAM PREPARATION TIPS

- **Step-by-Step Writing:** Numericals solve karte time hamesha sabse pehle "Given" values likho with correct units. Iske alag se marks hote hain.
- **Write the Formula:** Directly numbers put mat karo. Pehle equation of motion likho (e.g., $v = u + at$), phir values daalo.

- **Graphs:** Position-time aur velocity-time graphs draw karna seekho. Slope aur Area under graph ka concept exam mein definitely aayega.
- **Time Management:** Agar numerical mein atak jao, toh formula aur given likh kar space chod do aur agla question karo. End mein waapis aana.

FAQ SECTION

Q1: Is Chapter 4 Motion difficult for Class 9?

It can feel tricky initially because of the math involved, but once you memorize the three equations of motion and practice the signs ($+$ and $-$), it becomes the most scoring chapter in Physics!

Q2: How can I quickly convert km/h to m/s?

To convert km/h to m/s, simply multiply the value by $\frac{5}{18}$. To convert back from m/s to km/h, multiply by $\frac{18}{5}$.

Q3: Where can I get the NCERT PDF Download for Class 9 Science Chapter 4?

You can download the official NCERT textbook directly from ncert.nic.in, or save this detailed guide for quick revision!

Q4: What is the difference between average speed and average velocity?

Average speed is total distance divided by total time. Average velocity is total displacement divided by total time. If you run in a circle and return to the start, your average velocity is zero, but your average speed is not.

Q5: Will derivations of the equations of motion come in the 2026 Board Exams?

Yes, graphical derivations of all three equations of motion are highly important and are frequently asked as 5-mark long answer questions.

CONCLUSION

Physics ka pehla kadam aapne successfully le liya hai! **Describing the Motion Around Us** is all about practice. Numericals dekh kar ghabrana nahi hai—har question mein bas aapko identify karna hai ki u, v, a, t, aur s mein se kya diya hai aur kya nikalna hai.

Revise these concepts regularly, practice the graphs, and solve the **CBSE Class 9 Science Chapter 4** previous year questions. Save this page for your revision and get ready to score full marks in your 2026 science exams!

EXTRA SEO OPTIMIZATION (For Backend Use)

1. SEO Meta Title: NCERT Solutions for Class 9 Science Chapter 4 Motion PDF (2026)

2. SEO Meta Description: Get step-by-step NCERT Solutions for Class 9 Science Chapter 4 Describing the Motion Around Us. Free PDF download, 2026 board questions, and numerical tricks!

3. URL Slug: /ncert-solutions-class-9-science-chapter-4-motion

4. Suggested Tags: Class 9 Science Chapter 4, NCERT Solutions Motion Class 9, Physics Class 9, CBSE Class 9 Science Numericals, NCERT PDF Download, Important Questions 2026.

5. Suggested Internal Linking Ideas:

- Link to "Class 9 Science Chapter 5 Force and Laws of Motion Notes" in the conclusion.
- Link to "How to easily solve Physics Numericals Class 9" in the Exam Prep section.
  6. Suggested Featured Snippet Answer (For "What are the 3 equations of motion?"):
  "The three fundamental equations of motion are: 1) First Equation: $v = u + at$ (Velocity-Time relation). 2) Second Equation: $s = ut + 1/2\ at^2$ (Position-Time relation). 3) Third Equation: $v^2 - u^2 = 2as$ (Position-Velocity relation)."

7. JSON-LD FAQ Schema

JSON


```
{
  "@context": "https://schema.org",
  "@type": "FAQPage",
  "mainEntity": [{
    "@type": "Question",
    "name": "How can I quickly convert km/h to m/s?",
    "acceptedAnswer": {
      "@type": "Answer",
      "text": "To convert km/h to m/s, simply multiply the value by 5/18. To convert back from m/s to km/h, multiply by 18/5."
    }
  }, {
    "@type": "Question",
    "name": "What is the difference between average speed and average velocity?",
    "acceptedAnswer": {
      "@type": "Answer",
      "text": "Average speed is total distance divided by total time. Average velocity is total displacement divided by total time. If you run in a circle and return to the start, your average velocity is zero, but your average speed is not."
```

```
    }
  }, {
    "@type": "Question",
    "name": "Will derivations of the equations of motion come in the 2026 Board Exams?",
    "acceptedAnswer": {
      "@type": "Answer",
      "text": "Yes, graphical derivations of all three equations of motion are highly important and are frequently asked as 5-mark long answer questions."
    }
  }]
}
```

8. Breadcrumb Schema

JSON

```
{
  "@context": "https://schema.org",
  "@type": "BreadcrumbList",
  "itemListElement": [{
    "@type": "ListItem",
    "position": 1,
    "name": "Home",
    "item": "https://yourwebsite.com"
  },{
    "@type": "ListItem",
    "position": 2,
    "name": "Class 9",
    "item": "https://yourwebsite.com/class-9"
  },{
    "@type": "ListItem",
    "position": 3,
    "name": "Science",
    "item": "https://yourwebsite.com/class-9-science"
  },{
    "@type": "ListItem",
    "position": 4,
    "name": "Chapter 4 Describing the Motion Around Us"
  }]
}
```