S4 Physics – Lecture 1 Notes

Speed, Distance, and Time

Duration: 60 Minutes
Date: Sunday, 27 April 2025

Contents

1. Learning Objectives

- Describe motion using basic quantities: distance, speed, and time.

- Apply the formula $v = \frac{d}{t}$.

- Understand the difference between scalars and vectors.

- Solve average speed problems.

- Convert between different units (e.g., km/h to m/s).

Welcome to S4 Physics – Introduction

What is Physics? Physics is the science of the physical world. It helps us understand how and why things move, how energy flows, how light travels, and how the universe behaves — from tiny atoms to massive galaxies.

Why is Physics Important?

- Explains real-life situations: Why do we wear seatbelts? How does a phone work?

- Helps develop problem-solving and thinking skills.

- Foundation for many careers: Engineering, Medicine, Technology, Research.

What You'll Learn in S4 Physics:

- Motion, forces, speed, energy

- Light, sound, waves, radiation

- Electricity, heat, and the environment

- Real-world applications and scientific thinking

How This Class Will Work:

- One class per week (50–60 minutes)

- Visual explanations and real examples

- Interactive quizzes and regular homework

- Help available anytime during the week

Our Class Goals:

- Build understanding, not just memorization.

- Ask questions – every idea matters.

- Prepare confidently for National 5 exams.

> **Quote for Motivation:**
> "Physics helps us understand the world – from why a rainbow appears, to how rockets reach space.
> It's not about memorizing — it's about asking questions!"

2. What is Motion?

- Motion is a change in position over time.

- Examples: a car on the road, ball falling, spinning fan.

Types of Motion:

- **Linear:** Car on a road

- **Circular:** Fan blade or wheel
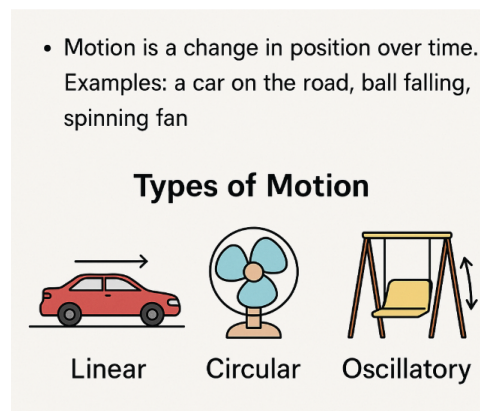
- **Oscillatory:** Swing, pendulum

Figure 1: Illustration of Motion and Its Types: Linear, Circular, Oscillatory

3. Scalars vs Vectors

- **Scalar:** Magnitude only (e.g., speed, time)

- **Vector:** Magnitude and direction (e.g., velocity, force)

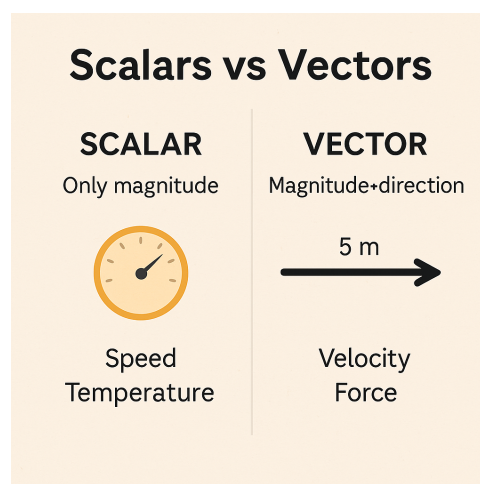| Scalar Quantities	Vector Quantities
Speed, Distance, Time	Velocity, Force, Acceleration

Figure 2: Scalars vs Vectors

4. Key Physical Quantities

- **Distance (d):** How far something moves — unit: metres (m).

- **Time (t):** How long it takes — unit: seconds (s).

- **Speed (v):** Rate of motion — unit: metres per second (m/s).

Formula Box

$$v = \frac{d}{t} \quad \text{or} \quad \text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

5. Worked Examples

- A car travels 200 m in 40 s. Speed?
  $v = \frac{200}{40} = 5 \text{ m/s}$

- A person cycles for 15 seconds at 6 m/s. Distance?
  $d = v \times t = 6 \times 15 = 90 \text{ m}$

6. Average Speed

$$\text{Average Speed} = \frac{\text{Total Distance}}{\text{Total Time}}$$

Example:
Distance 1 = 200 m in 40 s, Distance 2 = 100 m in 20 s
Total Distance = 300 m, Total Time = 60 s

$$v_{\text{avg}} = \frac{300}{60} = 5 \text{ m/s}$$

7. In-Class Practice Quiz

1. Calculate the speed: 300 m in 60 s

2. How far do you travel at 4 m/s for 25 s?

3. A car drives 150 m in 25 seconds. Find the speed.

Answers

- $v = \frac{300}{60} = 5 \text{ m/s}$

- $d = 4 \times 25 = 100 \text{ m}$

- $v = \frac{150}{25} = 6 \text{ m/s}$

8. Unit Conversion: km/h to m/s and m/s to km/h

Converting km/h to m/s

Formula:

$$\text{Speed (m/s)} = \frac{\text{Speed (km/h)} \times 1000}{3600} \quad \Rightarrow \quad \text{Divide by 3.6}$$

Example: 72 km/h $= \frac{72 \times 1000}{3600} = 20$ m/s

Converting m/s to km/h

Formula:

$$\text{Speed (km/h)} = \frac{\text{Speed (m/s)} \times 3600}{1000} \quad \Rightarrow \quad \text{Multiply by 3.6}$$

Example: 10 m/s $= 10 \times 3.6 = 36$ km/h

Tip:

- **From km/h to m/s:** Divide by 3.6
- **From m/s to km/h:** Multiply by 3.6

Did You Know?

The speed of light is about 300,000,000 m/s! Light from the Sun takes about 8 minutes to reach Earth.
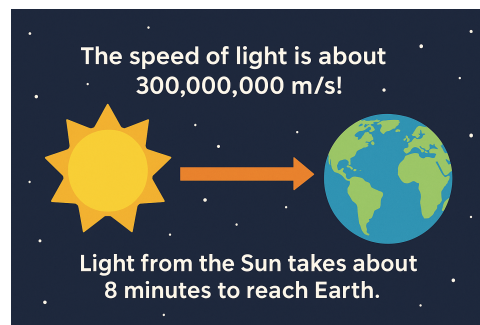

Figure 3: Speed of Light: It takes about 8 minutes for sunlight to reach Earth.

Wrap-Up Questions

- What is the formula for speed?
- Is speed a scalar or vector?
- How do you convert 54 km/h to m/s?

9. Homework Assignment

1. A person walks 500 m in 250 s. Find their speed.

2. A runner goes 800 m in 2 minutes. Find speed in m/s.

3. Convert 54 km/h to m/s.

4. You travel 300 m in 30 s, then 200 m in 50 s. Find your average speed.

5. Challenge: A train travels 1.5 km in 45 s. Find speed in m/s and km/h.

Next Class Preview

Topic: Acceleration, Velocity, and Motion Graphs