

GCSE Physics

Worksheet: Speed

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Speed

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

A student measures the average speed of a toy car as it travels across the floor.

0 1 . 1

Name **two** measuring instruments the student needs.

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.....

[2 marks]

0 1 . 2

The car travels 2.0 m in 1.6 s.
Calculate the average speed of the car.
Use the equation:
average speed = distance travelled ÷ time taken

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.....

.....

.....

Average speed = m/s

[2 marks]

0 1 . 3

Suggest why the value calculated is an average speed.

.....

.....

[1 mark]

0 2

0 2 . 1

Which of these is a typical speed for a person walking?

Tick (✓) **one** box.

0.15 m/s

☐

1.5 m/s

☐

15 m/s

☐

150 m/s

☐

[1 mark]

0 2 . 2

Which of these is a typical value for the speed of sound in air?

Tick (✓) **one** box.

33 m/s

☐

330 m/s

☐

3300 m/s

☐

300 000 000 m/s

☐

[1 mark]

0 2 . 3

A cyclist rides at a constant speed of 6.0 m/s for 45 s.

Calculate the distance travelled by the cyclist.

Use the equation:

distance travelled = speed × time

.....

.....

.....

.....

Distance = m

[2 marks]

0 3

0 3 . 1

Which list correctly orders these from slowest to fastest?

Tick (✓) **one** box.

Light in a vacuum, sound in air, a car on a motorway, a person walking

☐

A person walking, a car on a motorway, sound in air, light in a vacuum

☐

Sound in air, a person walking, light in a vacuum, a car on a motorway

☐

A car on a motorway, a person walking, sound in air, light in a vacuum

☐

[1 mark]

0 3 . 2

Write down the equation that links distance travelled (s), average speed (v) and time taken (t), rearranged to give the time.

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.....

[1 mark]

0 3 . 3

A cyclist travels 600 m at a constant speed of 15 m/s.
Calculate the time taken.

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Time = s

[2 marks]

0 4

Table 1 gives the order of magnitude of some typical speeds.

Table 1

Motion	Typical speed
A person walking	1 m/s
Sound in air	3×10^2 m/s
Light in a vacuum	3×10^8 m/s

0 4 . 1

Estimate how many times faster sound travels through air than a person walks.

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.....

.....

Ratio = times faster

[1 mark]

0 4 . 2

Estimate how many times faster light travels than sound in air.

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Ratio = times faster

[2 marks]

0 4 . 3

At the start of a 100 m race, a starting pistol is fired. It makes a flash and a bang at the same time. A timekeeper stands at the finish line, 100 m from the pistol. Use Table 1 to estimate the time taken for the sound of the pistol to reach the timekeeper.

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Time = s

[2 marks]

0 4 . 4

The timekeeper starts a stopwatch on hearing the bang, instead of on seeing the flash.
Explain the effect on the recorded times, and state whether this is a random error or a systematic error.

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[2 marks]

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0 5

A road sign in France shows a speed limit of 90 km/h.

0 5 . 1

Convert this speed limit into metres per second.

Speed = m/s

[3 marks]

0 6

A high-speed train travels at a steady 200 km/h.

0 6 . 1

Convert this speed into metres per second.

Speed = m/s

[3 marks]

0 7

A cyclist rides along a flat, straight road, then up a hill, then freewheels down the other side.

0 7 . 1

Explain the difference between the cyclist’s average speed for the whole journey and the cyclist’s speed at one particular point. Describe how two light gates could be used to measure the cyclist’s speed at one particular point on the road.

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[6 marks]



END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Physics · Worksheet: Speed · 32 marks

Question 1 (5 marks)

01.1 [2 marks]

Answer: A tape measure (or metre rule) and a stopwatch.

- metre rule / tape measure / ruler (1)
- stopwatch / stopclock / timer (1)

Notes: Allow light gates and a data logger for the second mark.

01.2 [2 marks]

Answer: 1.25 m/s

- $v = 2.0 \div 1.6$ (1)
- 1.25 (m/s) (1)

Notes: Allow 1.3 m/s.

01.3 [1 mark]

Answer: The car's speed is not constant during the journey.

- the speed of the car changes / is not constant during the journey (e.g. it speeds up at the start and slows down at the end) (1)
-

Question 2 (4 marks)

02.1 [1 mark]

Correct: 1.5 m/s

02.2 [1 mark]

Correct: 330 m/s

02.3 [2 marks]

Answer: 270 m

- $s = 6.0 \times 45$ (1)
 - 270 (m) (1)
-

Question 3 (4 marks)

03.1 [1 mark]

Correct: A person walking, a car on a motorway, sound in air, light in a vacuum

03.2 [1 mark]

Answer: $t = \frac{s}{v}$

- $t = s \div v$ (1)

Notes: Allow time = distance $\div$ speed.

03.3 [2 marks]

Answer: 40 s

- $t = 600 \div 15$ (1)
 - 40 (s) (1)
-

Question 4 (7 marks)

04.1 [1 mark]

Answer: 300 times faster

- 300 (times faster) (1)

04.2 [2 marks]

Answer: 1×10^6

- $3 \times 10^8 \div 3 \times 10^2$ (1)
- $= 1 \times 10^6$ (one million times faster) (1)

04.3 [2 marks]

Answer: 0.33 s

- time = distance $\div$ speed = $100 \div 300$ (1)
- = 0.33 (s) (1)

Notes: Allow 0.3 s.

04.4 [2 marks]

Answer: The stopwatch starts about 0.3 s late, so every recorded time is about 0.3 s shorter than the true time. This is a systematic error, because it affects every time by the same amount in the same direction.

- the stopwatch starts (about 0.3 s) late, so every recorded time is (about 0.3 s) too short (1)
- systematic error — it affects every recorded time by the same amount, in the same direction (1)

Notes: Light from the flash arrives almost instantly, so starting on the flash avoids this error.

Question 5 (3 marks)

05.1 [3 marks]

Answer: 25 m/s

- $90 \text{ km/h} = 90\,000 \text{ m in } 3600 \text{ s}$ (1)
- $v = 90\,000 \div 3600$ (1)
- 25 (m/s) (1)

Notes: Allow $90 \div 3.6$ for the first two marks.

Question 6 (3 marks)

06.1 [3 marks]

Answer: 55.6 m/s

- $200 \text{ km/h} = 200\,000 \text{ m in } 3600 \text{ s}$ (1)
- $v = 200\,000 \div 3600$ (1)
- 55.6 (m/s) (1)

Notes: Allow $200 \div 3.6$ for the first two marks.

Question 7 (6 marks)

07.1 [6 marks]

Answer: Level-of-response answer: average speed is the total distance travelled divided by the total time taken; the cyclist's actual speed changes throughout the journey (slower uphill, faster freewheeling downhill), so the speed at a particular point can be very different from the average. To measure it, place two light gates a short, measured distance apart (e.g. 1.0 m) at that point, connected to a timer or data logger; the cyclist breaks each beam in turn, the time between them is recorded, and $\text{speed} = \text{distance} \div \text{time}$. Keeping the gates close together gives a value close to the speed at that point, and light gates avoid human reaction time.

Levels of response

- **Level 3 (5–6)** A detailed, coherent answer. Relevant points are accurate, linked in a logical sequence and use correct scientific terms.
- **Level 2 (3–4)** Several relevant points with some linking, but the answer has gaps, errors or lacks detail.
- **Level 1 (1–2)** Simple statements making one or two relevant points, with little or no linking.
- **No marks (0)** Nothing relevant or worthy of credit.

Indicative content

- average speed is the total distance travelled divided by the total time taken for the whole journey (a single overall value)
- the cyclist's speed changes during the journey (e.g. slower uphill, faster freewheeling downhill), so the speed at a particular point can be very different from the average speed
- place two light gates a short, measured distance apart (e.g. 1.0 m, measured with a tape measure) at the point of interest, connected to a timer / data logger
- the timer records the time between the cyclist breaking the first beam and breaking the second beam
- $\text{speed} = \text{distance between the gates} \div \text{time between the beams being broken}$
- the gates should be close together so that the speed hardly changes between them (giving a value close to the speed at that point); light gates avoid the human reaction time of a hand-operated stopwatch

Notes: Level 1 (1–2 marks): states the definition of average speed, or a basic idea of timing the cyclist over a distance. Level 2 (3–4 marks): explains why the speed at a point differs from the average, or describes the light-gate method, but not both clearly. Level 3 (5–6 marks): a clear explanation of the difference between the average speed and the speed at a point for this journey, and a detailed, workable light-gate method including how the speed is calculated.