

Reading journeys from motion graphs

Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Test answers (mark scheme)

Marks are shown for each part. Method marks are given when the working is clear, even if the final value is wrong, so always state which graph feature you used.

Level: Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** IGCSE 1.2

Question 1 Gradient meanings (2 marks)

- a. The **speed** of the object.
- b. The object is **stationary** (not moving).

Marking: 1 mark each.

Question 2 A short trip (3 marks)

- a. $15 \div 5 = \mathbf{3.0 \text{ m/s}}$.
- b. The line is horizontal, so the object is **stationary** at 15 m.
- c. $15 \div 3 = \mathbf{5.0 \text{ m/s}}$ back towards the start.

Marking: 1 mark each part.

Question 3 A velocity graph (3 marks)

- a. $a = 10 \div 5 = \mathbf{2.0 \text{ m/s}^2}$.
- b. Areas: $\frac{1}{2} \times 5 \times 10 = 25 \text{ m}$; $10 \times 10 = 100 \text{ m}$; $\frac{1}{2} \times 5 \times 10 = 25 \text{ m}$. Total = **150 m**.

Marking: 1 mark for (a); (b) 1 mark for splitting into three areas, 1 mark for 150 m.

Question 4 Units of area (2 marks)

The vertical axis is in m/s and the horizontal axis is in s. The area is height $\times$ width, so the units are $\text{m/s} \times \text{s} = \mathbf{m}$, which is a distance.

Marking: 1 mark for the two axis units, 1 mark for the multiplication giving metres.

Question 5 Speeding up then cruising (3 marks)

$v = a t = 3.0 \times 4.0 = \mathbf{12 \text{ m/s}}$. Distance 1 = $\frac{1}{2} \times 4.0 \times 12 = \mathbf{24 \text{ m}}$. Distance 2 = $12 \times 5.0 = 60 \text{ m}$. Total = $24 + 60 = \mathbf{84 \text{ m}}$.

Marking: 1 mark for 12 m/s, 1 mark for 24 m, 1 mark for 84 m.

Question 6 Compare two runners (2 marks)

P: $60 \div 10 = 6.0 \text{ m/s}$. Q: $45 \div 10 = 4.5 \text{ m/s}$. **Runner P** is faster because her line has the steeper gradient.

Marking: 1 mark for both speeds, 1 mark for the conclusion.

Question 7 Negative velocity (3 marks)

- a. $a = (-6.0 - 6.0) \div 6.0 = -2.0 \text{ m/s}^2$.
- b. The velocity passes through zero at **3.0 s**.
- c. The velocity changes sign there, so the glider **reverses direction**.

Marking: 1 mark each part.

Question 8 Average speed from points (2 marks)

Total distance 180 m in 50 s. Average speed = $180 \div 50 = 3.6 \text{ m/s}$.

Marking: 1 mark for $180 \text{ m} \div 50 \text{ s}$, 1 mark for 3.6 m/s .