

How fast and how quickly speeding up

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

Marks are shown for each part. Method marks are awarded even when the final value is wrong, provided your working is clear, so always show the formula and the substitution.

Level: Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** IGCSE 1.2, HS-PS2-1

Question 1 Scalars and vectors (2 marks)

- a. Displacement is a **vector**.
- b. Speed is a **scalar**.

Marking: 1 mark each.

Question 2 Jogger's speed (3 marks)

(a) $1.8 \text{ km} = 1800 \text{ m}$ and $12 \text{ min} = 720 \text{ s}$.

(b) $v = 1800 \div 720 = \mathbf{2.5 \text{ m/s}}$.

Marking: 1 mark for both conversions, 1 mark for distance $\div$ time, 1 mark for 2.5 m/s.

Question 3 Acceleration of a bike (3 marks)

$a = (v - u) \div t = (24 - 6.0) \div 4.5 = 18 \div 4.5 = \mathbf{4.0 \text{ m/s}^2}$.

Marking: 1 mark for the formula, 1 mark for the substitution, 1 mark for the answer with the unit.

Question 4 Across a field (3 marks)

(a) $40 + 30 = \mathbf{70 \text{ m}}$.

(b) $d^2 = 40^2 + 30^2 = 1600 + 900 = 2500$, so $d = \mathbf{50 \text{ m}}$.

Marking: 1 mark for (a); 1 mark for Pythagoras, 1 mark for 50 m.

Question 5 Bus braking (2 marks)

$a = (0 - 15) \div 6.0 = \mathbf{-2.5 \text{ m/s}^2}$. The negative sign means the bus is slowing down (decelerating).

Marking: 1 mark for the value, 1 mark for the meaning of the sign.

Question 6 Acceleration at steady speed (2 marks)

Acceleration is a change in velocity. The speed is constant but the direction keeps changing, so the velocity changes and the car **is accelerating**.

Marking: 1 mark for velocity includes direction, 1 mark for direction changes.

Question 7 Final velocity (3 marks)

$$v = u + a t = 2.0 + 0.50 \times 12 = 2.0 + 6.0 = \mathbf{8.0 \text{ m/s.}}$$

Marking: 1 mark for the equation, 1 mark for the substitution, 1 mark for 8.0 m/s.

Question 8 Average speed of a run (2 marks)

Total distance 300 m; total time $20 + 30 = 50$ s. Speed = $300 \div 50 = \mathbf{6.0 \text{ m/s.}}$

Marking: 1 mark for total distance and time, 1 mark for the answer.