Written to the specification from Speca's own topic maps, then independently rechecked for accuracy. These are original practice questions, not past-paper questions. Spotted a mistake? Tell us at hello@speca.co.uk.

SPECA

GCSE Combined Science (AQA Trilogy) · Physics

Forces and Motion · Mark Scheme

For use with the Tiered Worksheet. Marking points are indicative, not exhaustive: award equivalent correct answers.

Section A: Foundation (Q1 to 17)

1) Distance: how far an object moves, a scalar quantity (1); displacement: the straight-line distance AND direction from start to finish, a vector quantity (1) [2]

2) $s = v \times t$, so $v = s \div t = 400 \div 80$ (1) = 5 m/s (1) [2]

3) About 1.5 m/s (1) [1]

4) Velocity is speed in a given direction (1); it is a vector quantity, whereas speed is a scalar quantity with no direction (1) [2]

5) The object's speed (1) [1]

6) $a = \Delta v \div t = (22 - 4) \div 6 = 18 \div 6$ (1) = 3 m/s² (1) [2]

7) The object's acceleration (1) [1]

8) About 9.8 m/s² (1) [1]

9) As speed increases, air resistance (drag) increases (1); this reduces the resultant force and therefore the acceleration (1); once air resistance equals weight, the resultant force is zero and the object falls at a constant (terminal) velocity (1) [3]

10) If the resultant force on an object is zero, a stationary object stays stationary and a moving object continues at the same velocity (1); at steady speed, the driving force forward and the resistive forces backward are equal, giving a resultant force of zero (1), so velocity stays constant (1) [3]

11) Acceleration is proportional to resultant force and inversely proportional to mass (1); $F = m \times a = 1200 \times 3$ (1) = 3600 N (1) [3]

12) When two objects interact, the forces each exerts on the other are equal and opposite (1); e.g. a swimmer pushes backward on the water, and the water pushes the swimmer forward with an equal and opposite force (1) [2]

13) Stopping distance = thinking distance (travelled during the driver's reaction time) + braking distance (travelled under the braking force) (1 mark for each correctly explained part) [2]

14) Any two of: tiredness, drugs, alcohol, distractions (1 mark each, max 2) [2]

15) Any two of: wet or icy road conditions, worn/faulty brakes, worn or under-inflated tyres (1 mark each, max 2) [2]

16) Applying the brakes does work via friction between the brakes and the wheel (1); this reduces the vehicle's kinetic energy while raising the temperature of the brakes (1) [2]

17) A greater speed needs a greater braking force to stop in the same distance (1), and greater braking force means greater deceleration (1); large decelerations risk the brakes overheating and/or loss of control of the vehicle (1) [3]

Section B: Higher (Q18 to 24)

18) Velocity is a vector, so it includes direction as well as speed (1); in circular motion the direction is constantly changing even though speed stays the same, so velocity is constantly changing (e.g. a point on a spinning wheel) (1) [2]

Free from speca.co.uk/gcse-science-questions-by-topic. Original questions written by Speca, not past papers.
Speca is not affiliated with, endorsed by, or sponsored by AQA.

19) Draw a tangent to the curve at that point (1); measure the gradient of the tangent, that gradient gives the speed at that instant (1) [2]

20) The distance travelled is equal to the area enclosed under the velocity-time graph (1); this is the area of a triangle: ½ × base × height = ½ × 10 × 20 (1) = 100 m (1) [3]

21) Inertia: an object's tendency to continue in its state of rest or uniform motion (1); inertial mass: a measure of how hard it is to change an object's velocity, expressed as the ratio of force to acceleration (1) [2]

22) p = m × v = 900 × 15 (1) = 13,500 kg m/s (1) [2]

23) In a closed system, the total momentum before an event is equal to the total momentum after the event (1); momentum is conserved provided no external force acts (1) [2]

24) Momentum before = (2 × 6) + (4 × 0) = 12 kg m/s (1); momentum after = momentum before, and total mass after = 6 kg, so v = 12 ÷ 6 (1) = 2 m/s (1) [3]

Total: 34 marks (Section A) + 16 marks (Section B) = 50 marks

Speca is an independent product and is not affiliated with, endorsed by, or sponsored by AQA. This mark scheme is originally authored by Speca and is not an AQA document.

Free from speca.co.uk/gcse-science-questions-by-topic. Original questions written by Speca, not past papers.
Speca is not affiliated with, endorsed by, or sponsored by AQA.