

Mark Scheme

Combined Science GCSE

Motion and Forces Test

(Levels 4-9)

	Answer	Marks															
1. (a)	Vector quantities have a size (magnitude) and a direction, (1) whereas a scalar quantity has a size but no direction. (1)	(2)															
1. (b)	<table border="1"> <thead> <tr> <th>Example</th><th>Scalar Quantity</th><th>Vector Quantity</th></tr> </thead> <tbody> <tr> <td>speed</td><td>✓</td><td></td></tr> <tr> <td>mass</td><td>✓</td><td></td></tr> <tr> <td>velocity</td><td></td><td>✓</td></tr> <tr> <td>acceleration</td><td></td><td>✓</td></tr> </tbody> </table>	Example	Scalar Quantity	Vector Quantity	speed	✓		mass	✓		velocity		✓	acceleration		✓	(4)
Example	Scalar Quantity	Vector Quantity															
speed	✓																
mass	✓																
velocity		✓															
acceleration		✓															

(Total for Question 1 = 6 marks)

	Answer	Marks
2. (a)		(4)
2. (b)	Any two from: fitness levels, age, wind direction/speed/resistance, angle of incline, type of terrain, any other valid suggestion.	(2)
2. (c)	speed (m/s) = distance (m) ÷ time (s)	(1)
2. (d)	distance travelled (m) = average speed (m/s) × time (s)	(1)
2. (e)	speed (m/s) = distance (m) ÷ time (s) = $75 \div 6 = 12.5$ m/s	(1)
2. (f)	time (s) = distance travelled (m) ÷ average speed (m/s) = $75 \div 15 = 5$ seconds.	(1)

(Total for Question 2 = 10 marks)

	Answer	Marks
3. (a)	The object is travelling at a steady speed.	(1)
3. (b)	The object is stationary for 5 hours.	(1)
3. (c)	The object is returning to its starting position.	(1)
3. (d)	$\text{speed (m/s)} = \text{distance(m)} \div \text{time (s)}$ $= 9 \div 4 = 2.25 \text{ km/h}$ (1 mark for correct answer, 1 mark for correct units)	(2)
3. (e)	Students should have sketched a curved line.	(1)

(Total for Question 3 = 6 marks)

	Answer	Marks
4. (a)	Any two from: Allows a constant speed, reduces friction, lifts up the glider.	(2)
4. (b)	$6.5 \div 0.27$ (1) = 24.07cm/s	(2)
4. (c)	$24.07 = 6.5 \div t$ (1 mark for correct rearranging of formula) 0.270s or 270 ms (1)	(2)

(Total for Question 4 = 6 marks)

	Answer	Marks
5. (a)	Thinking Distance Any two from: drugs, alcohol, distractions, speed of the vehicle. Stopping Distance Any two from: speed of vehicle, mass of vehicle, brake conditions (accept 'faulty' or 'worn' brakes), friction between tyres and roads (accept weather conditions or tyre conditions).	(4)
5. (b)	stopping distance = thinking distance + braking distance $39 = \text{thinking distance} + 25$ (1) thinking distance = $39 - 25 = 14\text{m}$ (1)	(2)

(Total for Question 5 = 6 marks)

	Answer	Marks
6. (a)	Momentum is the motion of a moving object.	(1)
6. (b)	momentum (kg m/s) = mass (kg) x velocity (m/s) (1 mark for correct equation, 1 mark for correct units) or $p = m \times v$	(2)
6. (c)	$p = m \times v = 150 = 54 \times \text{velocity}$ $v = p \div m = 150 \div 54 = 2.78 \text{ m/s}$ (1 mark for correctly rearranging formula, 1 mark for correct answer)	(2)

(Total for Question 6 = 5 marks)

	Answer	Marks
7. (a)	$F = m \times a$	(1)
7. (b)	$702 \times 14.2 = 9988.4\text{N}$	(2)
7. (c)	Velocity has both a speed and direction . If an object is travelling in a circle, it will be changing both its direction and its velocity and there will be a resultant force. The force that keeps something moving in a circle is known as centripetal force.	(3)

(Total for Question 7 = 6 marks)

Question	Answer	Marks
8. (a)	$a = \frac{v - u}{t}$ $a = \frac{15}{5} = 3\text{m/s}^2$ (1 mark for correct answer, 1 mark for correct units)	(3)
8. (b) (i)	Resultant force = $2500 - 1500 = 1000\text{N}$	(1)
8. (b) (ii)	Team B; they exert greater force.	(1)

(Total for Question 8 = 5 marks)

TOTAL FOR PAPER = 50 MARKS