

Describing Motion

Total marks: 24

Q1.

Which row of the table is correct for both force and velocity?

(1)

	force	velocity
<input type="checkbox"/> A	scalar	scalar
<input type="checkbox"/> B	scalar	vector
<input type="checkbox"/> C	vector	scalar
<input type="checkbox"/> D	vector	vector

Q2.

Which of these statements is true for a vector quantity?

(1)

- A** It has size only
- B** It has direction only
- C** It has direction and size
- D** It does not have direction or size

Q3.

Figure 8 is a velocity/time graph showing a 34 s part of a train's journey.

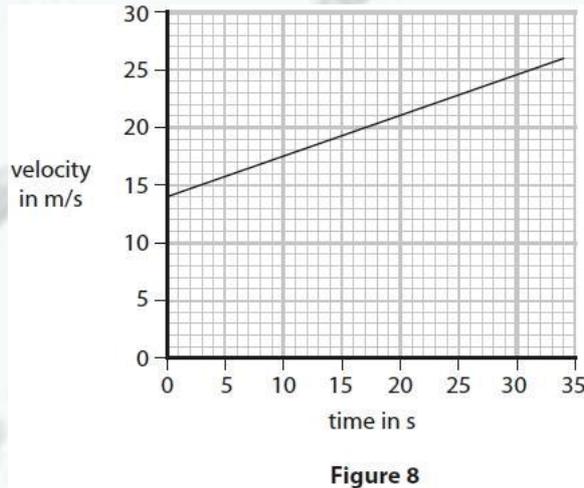


Figure 8

(i) Calculate the acceleration of the train in the 34 s.

Give your answer to an appropriate number of significant figures.

(3)

acceleration = m/s²

(ii) Calculate the distance the train travels in the 34 s.

(3)

distance m

Q4.

A car is travelling at 10 m/s.

The driver sees a danger and stops the car.

(i) The stopping distance for the car would be smaller if the car

(1)

- A** had more passengers
- B** had worn tyres
- C** needed new brakes
- D** was travelling more slowly

Figure 4 shows a speed-time graph for the driver stopping the car.

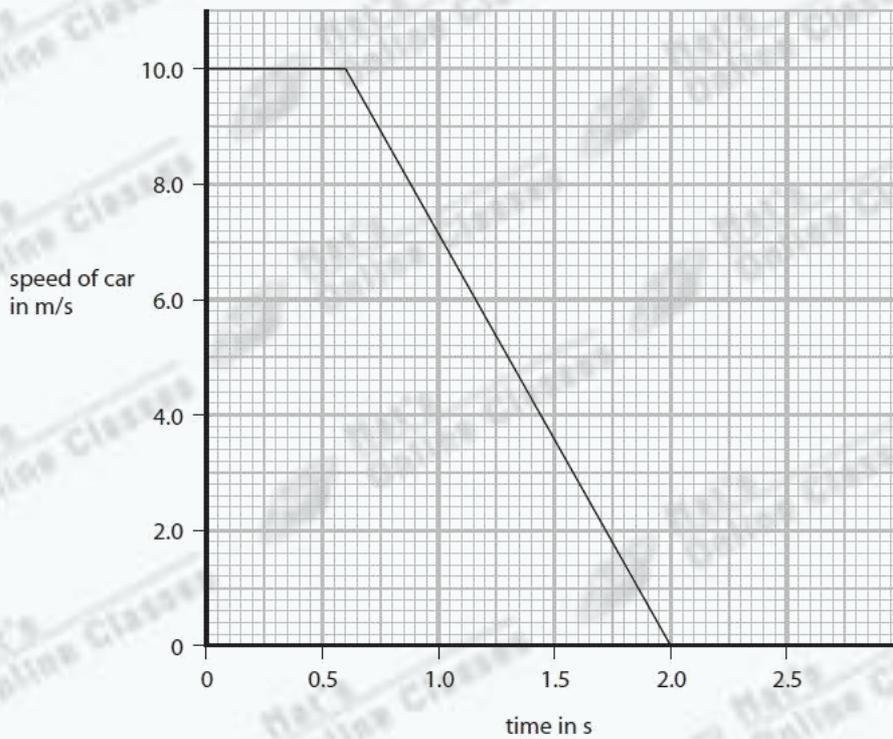


Figure 4

(ii) Use the graph to find the driver's reaction time.

(2)

reaction time = s

Q5.

A car travelling at 15 m/s comes to rest in a distance of 14 m when the brakes are applied.

Calculate the deceleration of the car.

Use an equation selected from the list of equations at the end of this paper.

(3)

deceleration = m/s²

Q6.

Quantities can be either scalar or vector.

Which of these is a vector quantity?

(1)

- A** mass
- B** force
- C** energy
- D** distance

Q7.

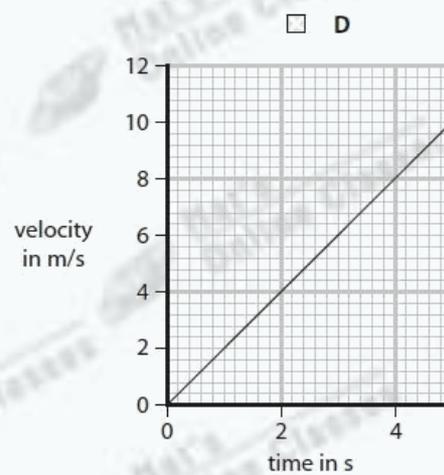
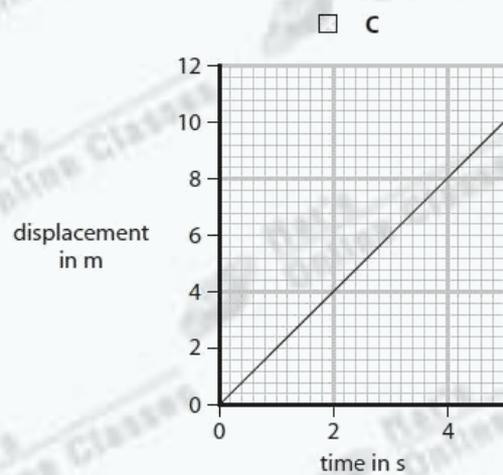
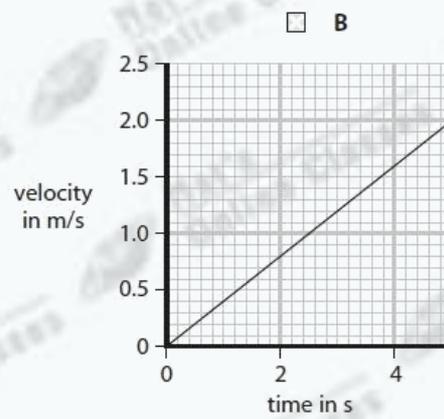
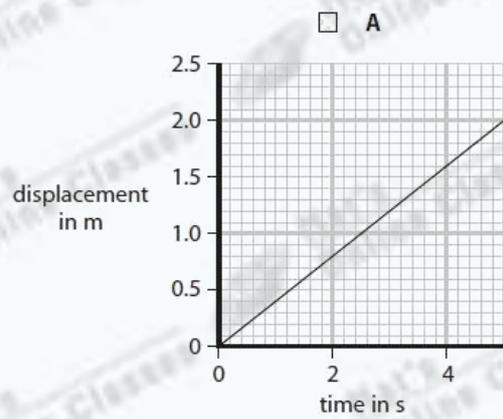
- A energy
- B force
- C mass
- D work

(1)

Q8.

Which of these graphs represents an object moving with a constant velocity of 2 m/s?

(1)



Q9.

Figure 1 shows a speed/time graph for a car.

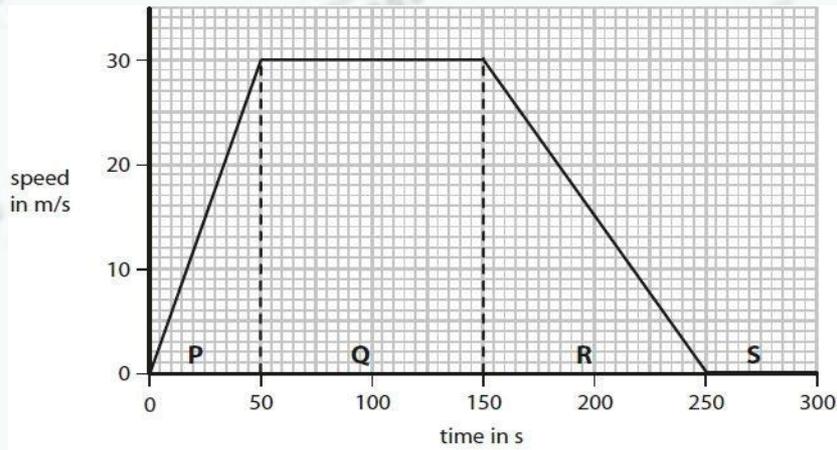


Figure 1

(i) The graph in Figure 1 is divided into four parts, **P**, **Q**, **R** and **S**.

Draw a line from the letter for each **part** to the correct **description of the motion** during that part.

One line has been drawn for you.

(2)

part	description of the motion
P	the car is standing still
Q	the car is accelerating
R	the car is decelerating
S	the car is travelling at constant speed

(ii) In two parts of the graph in Figure 1 the forces are balanced.

State the letters of the two parts of the graph where the horizontal forces acting on the car are balanced.

(2)

part and part

(iii) Calculate the distance travelled by the car in

part Q. Use the equation

$$\text{distance travelled} = \text{average speed} \times \text{time}$$

(2)

distance travelled = m

Q10.

Which of these speeds would be normal for a person walking?

(1)

- A 0.1 m/s
- B 1.0 m/s
- C 10 m/s
- D 100 m/s

Mark Scheme

Q1.

Question Number	Answer	Mark			
	<table border="1"> <tr> <td>D</td> <td>vector</td> <td>vector</td> </tr> </table> <p>The only correct answer is D</p> <p>A 'scalar scalar' is incorrect, both force and velocity are vectors</p> <p>B 'scalar vector' is incorrect, with force being described incorrectly as a scalar</p> <p>C 'vector scalar' is incorrect, with velocity being described incorrectly as a scalar</p>	D	vector	vector	(1) AO 1 1
D	vector	vector			

Q2.

Question number	Answer	Mark
	<p>C It has direction and size</p> <p>Option C is the only correct combination for a vector quantity</p>	(1) AO1

Q3.

Question number	Answer	Additional guidance	Mark
(i) CS4	<p>attempt to use correct data from graph or equation (1)</p> <p>substitution (1)</p> $(a =) \frac{26 - 14}{34}$ <p>evaluation to 2 sf (1)</p> <p>0.35 (m/s²)</p>	<p>quoting $a = \frac{(\Delta)v}{t}$</p> <p>or $a =$ gradient (of line)</p> <p>0.3529... scores mp1 and mp2</p> <p>$\frac{26}{34}$ scores mp1</p> <p>independent mark</p> <p>award full marks for correct answer without working.</p>	(3) AO2

Question number	Answer	Additional guidance	Mark
(ii) CS4	<p>attempt to calculate area under the line (1)</p> <p>calculates EITHER area of triangle OR area of rectangle (1)</p> <p>204 (m) or 476 (m)</p> <p>evaluation (1) 680 (m)</p>	<p>accept count squares use of $v^2 - u^2 = 2ax$</p> <p>$x = \frac{v^2 - u^2}{2a}$</p> <p>allow ecf from b(i)</p> <p>award full marks for correct answer without working</p> <p>award 1 mark for final answer 408 (m)</p>	(3) AO2

Q4.

Question number	Answer	Additional guidance	Mark
(i)	<p>D travelling more slowly</p> <p>A is incorrect, more passengers would increase the stopping distance</p> <p>B is incorrect, worn tyres would increase the stopping distance</p> <p>C is incorrect, if the car needed new brakes this would increase the stopping distance</p>		(1) AO1

Question number	Answer	Additional guidance	Mark
(ii)	<p>identification of horizontal line as reaction time (1)</p> <p>evaluation (1) 0.6 (s)</p>	<p>award full marks for correct answer without working</p> <p>0.7 scores 1 mark</p>	(2) AO3

Q5.

Question Number	Answer	Additional guidance	Mark
	rearrangement (1) $a = \frac{(v^2 - u^2)}{2x}$ substitution (1) $a = \frac{(-)15^2}{2 \times 14}$ evaluation (1) deceleration = 8(.04) (m/s ²)	rearrangement and substitution in either order 225/28 for 2 marks accept - 8(.04) award full marks for the correct answer with no working	(3) AO 2 1

Q6.

Question number	Answer	Additional guidance	Mark
	B force A is incorrect, mass is a scalar quantity C is incorrect, energy is a scalar quantity D is incorrect, distance is a scalar quantity		(1) AO1

Q7.

Question number	Answer	Mark
	<input checked="" type="checkbox"/> B force Options A, C and D are all scalars.	(1)

Q8.

Question number	Answer	Mark
CS4	<p>[x] C</p> <p>A is not correct because it shows a constant velocity of 0.4 m/s</p> <p>B and D are not correct because they show constant acceleration.</p>	(1) A03

Q9.

Question Number	Answer	Mark
(i)	<p>all three correct (2) one or two correct (1)</p>	(2)

Question Number	Answer	Additional guidance	Mark
(ii)	<p>Q and S</p> <p>Q (1) (and) S (1)</p> <p>OR</p> <p>S (1) (and) Q (1)</p>	<p>in either order</p> <p>maximum of 1 mark if 3 letters given</p> <p>no marks if 4 or more letters given</p>	(2)

Question Number	Answer	Additional guidance	Mark
(iii)	substitution (1) (distance =) 30×100 evaluation (1) 3000 (m)	for 1 st mp accept 100×30 OR $(30 \times 50) \times 2$ award full marks for the correct answer without working allow 1 mark for EITHER 30×50 OR 30×150 OR 30×250	(2)

Q10.

Question Number	Answer	Mark
	B 1.0 m/s The only correct answer is B <i>A 0.1 m/s is incorrect, being 1 metre every 10s, insect crawling pace</i> <i>C 10 m/s is incorrect, being an Olympic sprinter's pace, much too fast for 'walking'</i> <i>D 100 m/s is incorrect, being a very fast sport's car's pace</i>	(1) AO 1 1