Describing Motion

Questions

Q1.

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

(1)

	force	velocity
☒ **A**	scalar	scalar
☒ **B**	scalar	vector
☒ **C**	vector	scalar
☒ **D**	vector	vector

(Total for question = 1 mark)

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

(Total for question = 1 mark)

Q3.

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

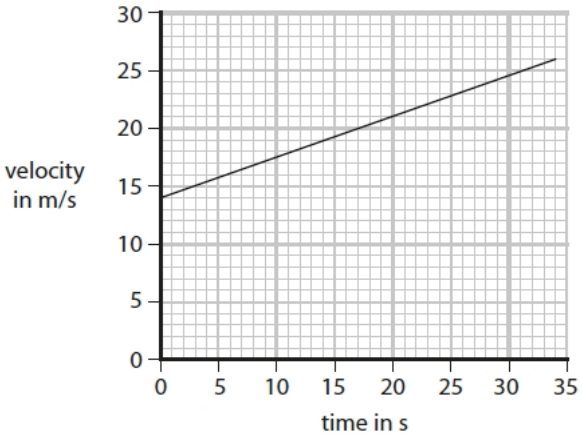


Figure 8

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

Give your answer to an appropriate number of significant figures.

(3)

acceleration = ... m/s^2

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

(3)

distance ..... m

(Total for question = 6 marks)

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.

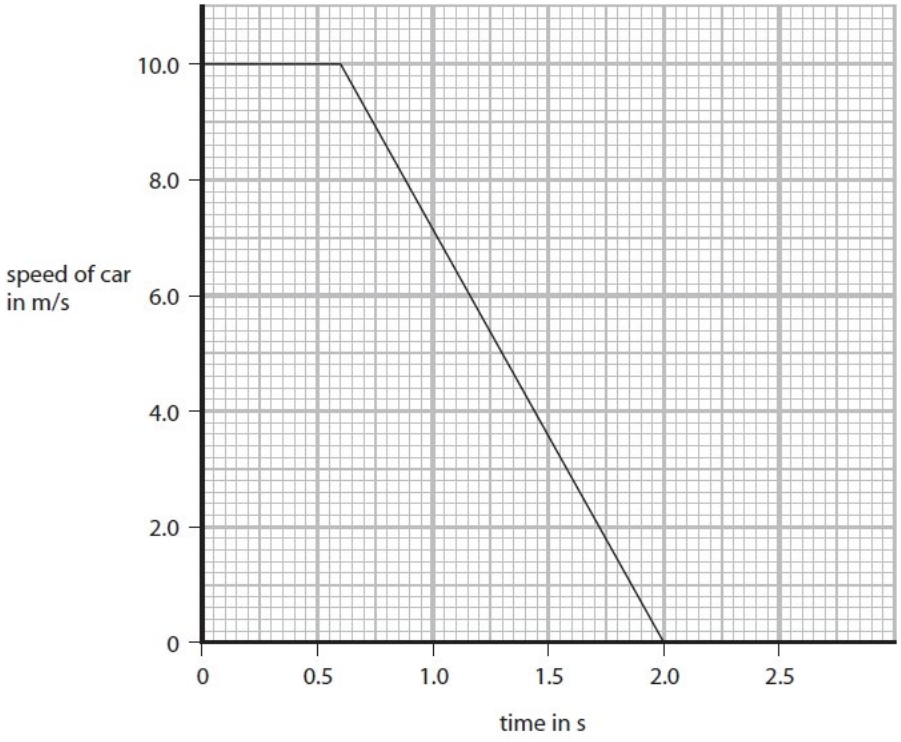


Figure 4

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

(2)

reaction time = ... s

(Total for question = 3 marks)

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/s^2

(Total for question = 3 marks)

Q6.

Quantities can be either scalar or vector.

Which of these is a vector quantity?

(1)

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

(Total for question = 1 mark)

Q7.

(1)

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

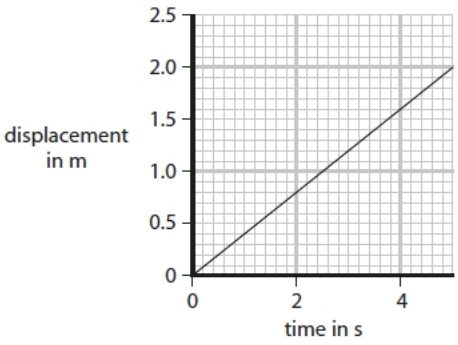
(Total for question = 1 mark)

Q8.

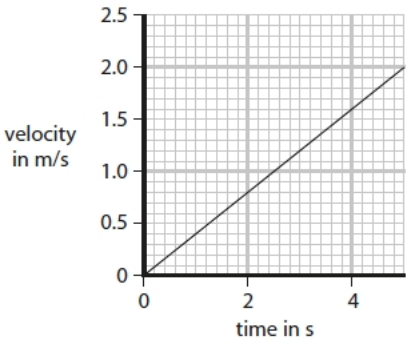
Which of these graphs represents an object moving with a constant velocity of 2 m/s?

(1)

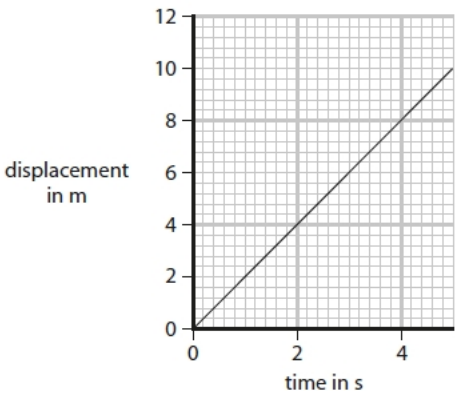
☒ **A**



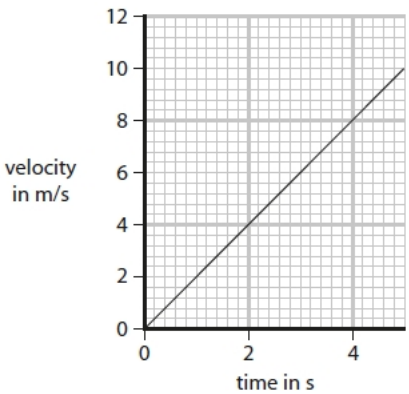
☒ **B**



☒ **C**



☒ **D**



(Total for question = 1 mark)

Q9.

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

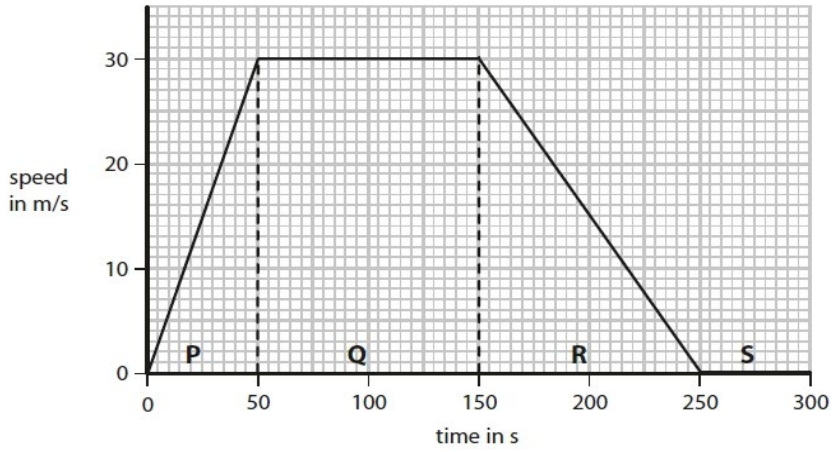


Figure 1

(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

distance travelled = average speed × time

(2)

distance travelled = ... m

(Total for question = 6 marks)

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

(Total for question = 1 mark)

Mark Scheme – Describing Motion

Q1.

Question Number	Answer	Mark
	D: vector vector **The only correct answer is D** ***A*** *'scalar scalar' is incorrect, both force and velocity are vectors* ***B*** *'scalar vector' is incorrect, with force being described incorrectly as a scalar* ***C*** *'vector scalar' is incorrect, with velocity being described incorrectly as a scalar*	**(1)** AO 1 1

Q2.

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

Q3.

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

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

Q4.

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

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

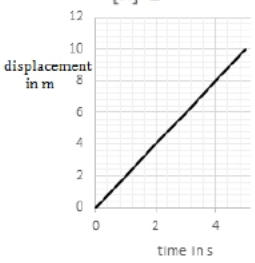
Q6.

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**

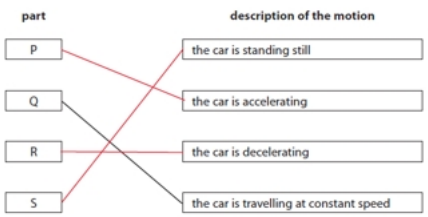
Q7.

Question number	Answer	Mark
	☒ **B** force Options A, C and D are all scalars.	**(1)**

Q8.

Question number	Answer	Mark
CS4	[x] **C**  A is not correct because it shows a constant velocity of 0.4 m/s B and D are not correct because they show constant acceleration.	**(1)** **AO3**

Q9.

Question Number	Answer	Mark
(i)	all three correct (2) one or two correct (1)  	**(2)**

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

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

Q10.

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