New Document 1

Name: _____

Class: _____

Date: _____

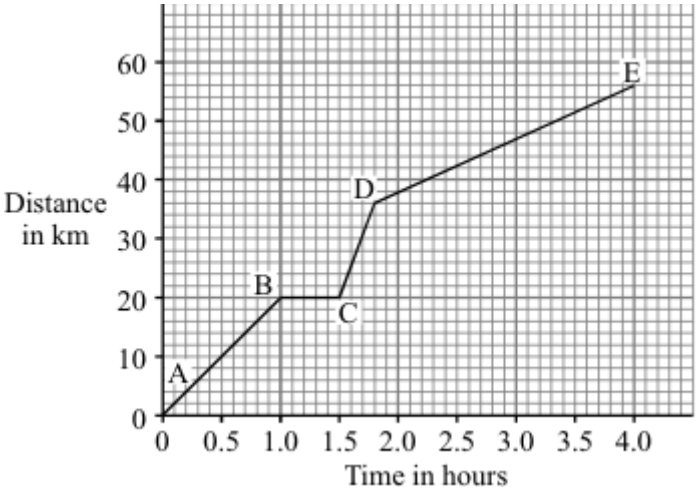
Time: **125 minutes**

Marks: **125 marks**

Comments:

Q1.

A cyclist goes on a long ride. The graph shows how the distance travelled changes with time during the ride.



(i) Between which **two** points on the graph was the cyclist moving at the fastest speed?

_____

(1)

(ii) State **one** way cyclists can reduce the air resistance acting on them.

_____

_____

(1)

(iii) How long did the cyclist stop and rest?

_____

(1)

(iv) Write down the equation which links distance, speed and time.

_____

(1)

(v) Calculate, in km/hr, the average speed of the cyclist while moving.

_____

_____

_____

_____

Average speed = _____ km/hr

(3)

(Total 7 marks)

Q2.

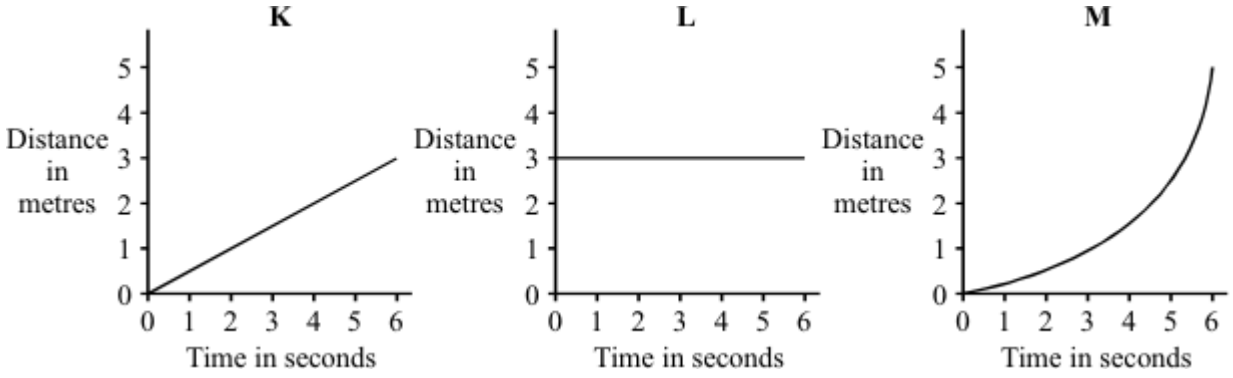
(a) A shopping trolley is being pushed at a constant speed. The arrows represent the horizontal forces on the trolley.

(i) How big is force **P** compared to force **F**?

_____

(1)

(ii) Which **one** of the distance-time graphs, **K**, **L** or **M**, shows the motion of the trolley? Draw a circle around your answer.



(1)

(b) Complete the sentence by crossing out the **two** words in the box that are wrong.

Acceleration is the rate of change of

energy. speed. velocity.

(1)

(c) Three trolleys, **A**, **B** and **C**, are pushed using the same size force. The force causes each trolley to accelerate.

Which trolley will have the smallest acceleration?

_____

Give a reason for your answer.

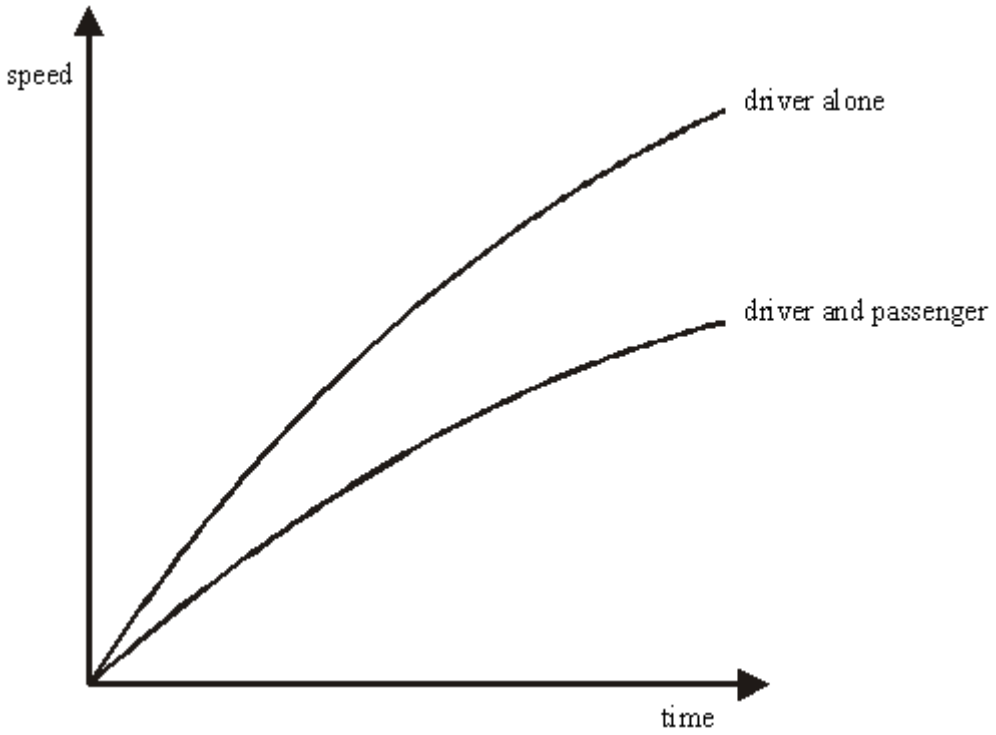
_____

(2)

(Total 5 marks)

Q3.

(a) When a car is driven efficiently the engine gives a constant forward pull on the car as the car accelerates to its maximum speed. During this time frictional forces and air resistance oppose the forward motion of the car. The sketch graphs below show how the car's speed increases when only the driver is in the car, and when the driver has a passenger in the car.



(i) How does the acceleration of the car change with time?

_____

_____

(1)

(ii) What conclusion can be made about the resultant (net) forward force on the car as its speed increases?

_____

_____

(1)

(ii) On the graph, draw a line to show how you would expect the car's speed to vary if it carried three passengers.

(1)

(b) The manufacturer of a family car gave the following information.

Mass of car 950g

The car will accelerate from 0 to 33 m/s in 11 seconds.

(i) Calculate the acceleration of the car during the 11 seconds.

_____

_____

_____

Answer _____

(2)

(ii) Calculate the force needed to produce this acceleration.

_____

_____

_____

Answer _____ N

(2)

(iii) The manufacturer of the car claims a top speed of 110 miles per hour. Explain why there must be a top speed for any car.

_____

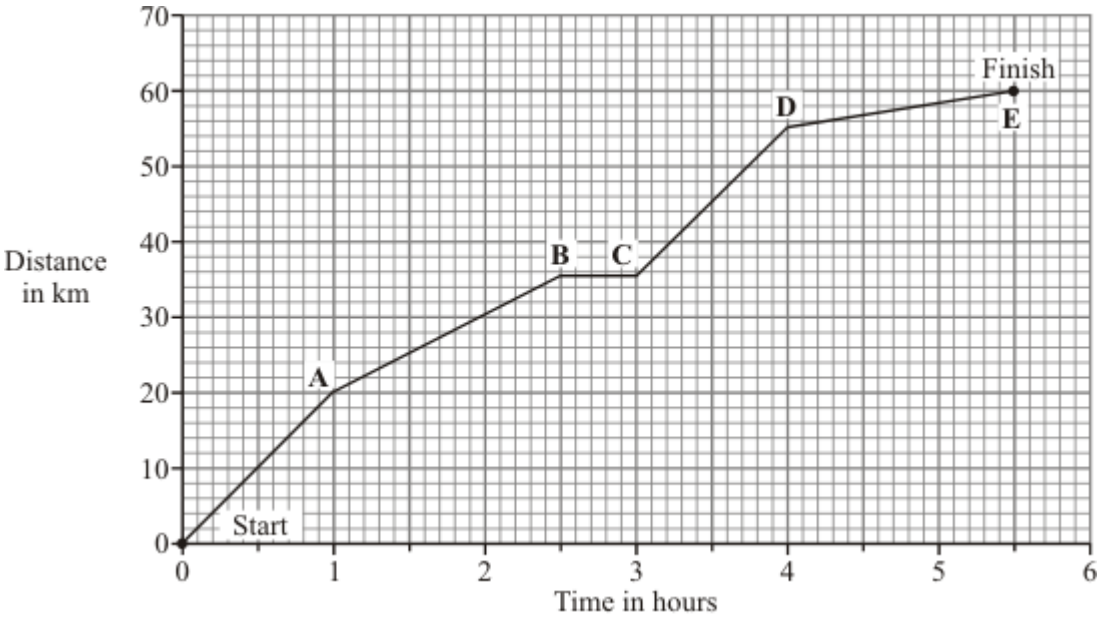
_____

(2)

(Total 9 marks)

Q4.

A horse and rider take part in a long distance race. The graph shows how far the horse and rider travel during the race.



(a) What was the distance of the race?

distance = _____ km

(1)

(b) How long did it take the horse and rider to complete the race?

_____

(1)

(c) What distance did the horse and rider travel in the first 2 hours of the race?

distance = _____ km

(1)

(d) How long did the horse and rider stop and rest during the race?

_____

(1)

(e) Not counting the time it was resting, between which two points was the horse moving the slowest?

_____ and _____

Give a reason for your answer.

_____

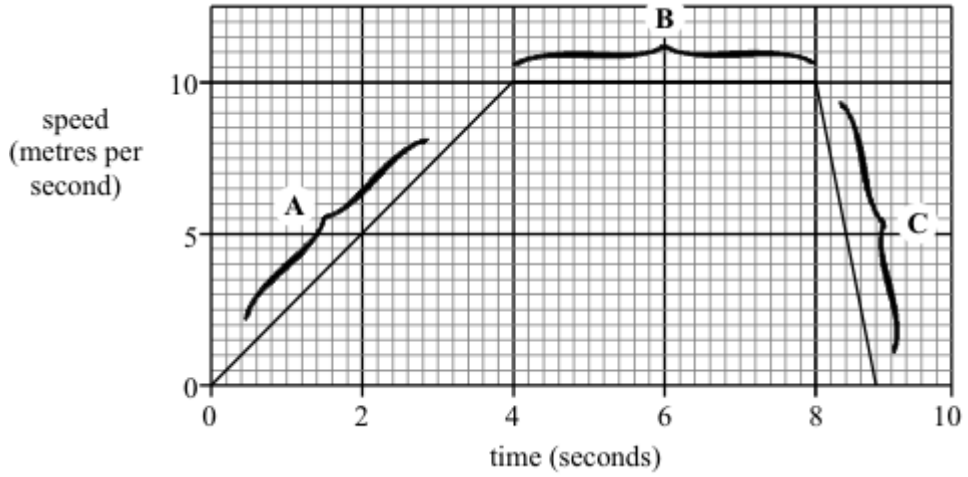
_____

(2)

(Total 6 marks)

Q5.

The graph shows the speed of a runner during an indoor 60 metres race.



(a) Choose words from this list to complete the sentences below.

moving at a steady speed **slowing down**

speeding up **stopped**

Part **A** of the graph shows that the runner is _____

Part **B** of the graph shows that the runner is _____

Part **C** of the graph shows that the runner is _____

(3)

(b) Calculate the acceleration of the runner during the first four seconds.
(Show your working.)

_____

_____

_____

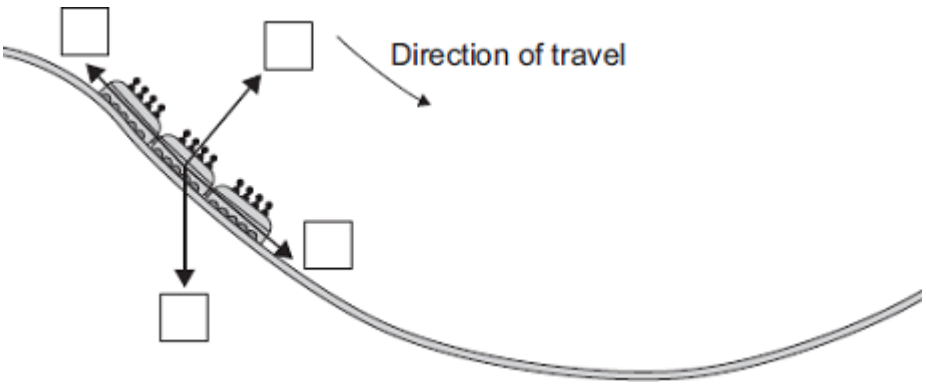
(3)

(Total 6 marks)

Q6.

The diagram shows the passenger train on part of a rollercoaster ride.

(a) Which arrow shows the direction of the resultant force acting on the passenger train?
Put a tick (✓) in the box next to your choice.



(1)

(b) For part of the ride, the maximum gravitational field strength acting on the passengers seems 3 times bigger than normal.

Normal gravitational field strength = 10 N/kg

(i) Calculate the maximum gravitational field strength that seems to act on the passengers during the ride.

_____

_____

Maximum gravitational field strength = _____ N/kg

(1)

(ii) One of the passengers has a mass of 75 kg.

Calculate the maximum weight this passenger seems to have during the ride.

Show clearly how you work out your answer.

_____

_____

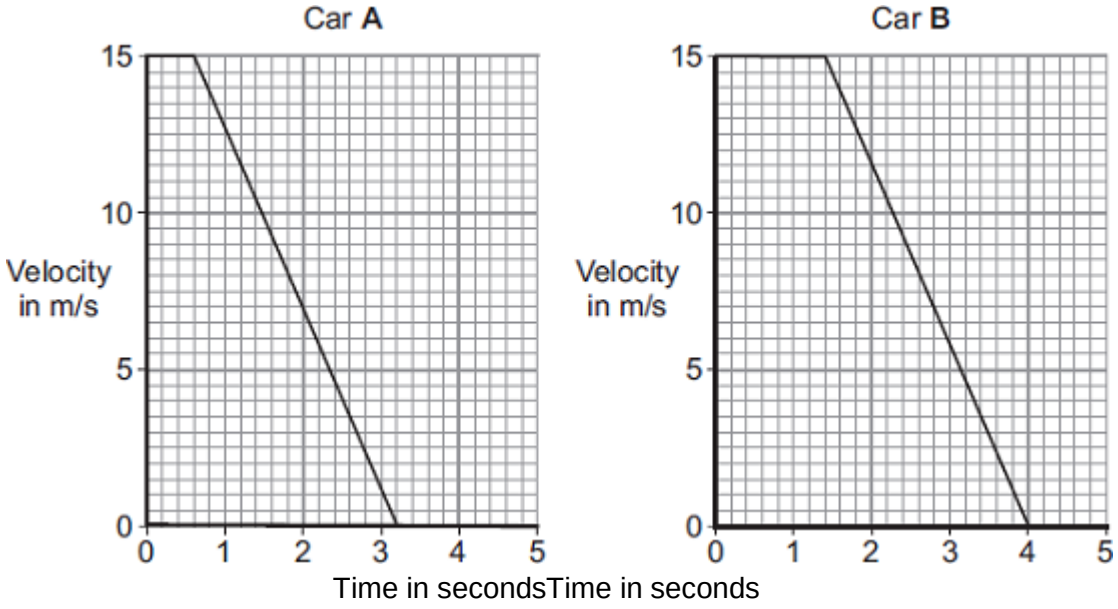
Maximum weight = _____ N

(2)

(Total 4 marks)

Q7.

(a) The graphs show how the velocity of two cars, **A** and **B**, change from the moment the car drivers see an obstacle blocking the road.



One of the car drivers has been drinking alcohol. The other driver is wide awake and alert.

(i) How does a comparison of the two graphs suggest that the driver of car **B** is the one who has been drinking alcohol?

_____

_____

(1)

(ii) How do the graphs show that the two cars have the same deceleration?

_____

_____

(1)

(iii) Use the graphs to calculate how much further car **B** travels before stopping compared to car **A**.

Show clearly how you work out your answer.

_____

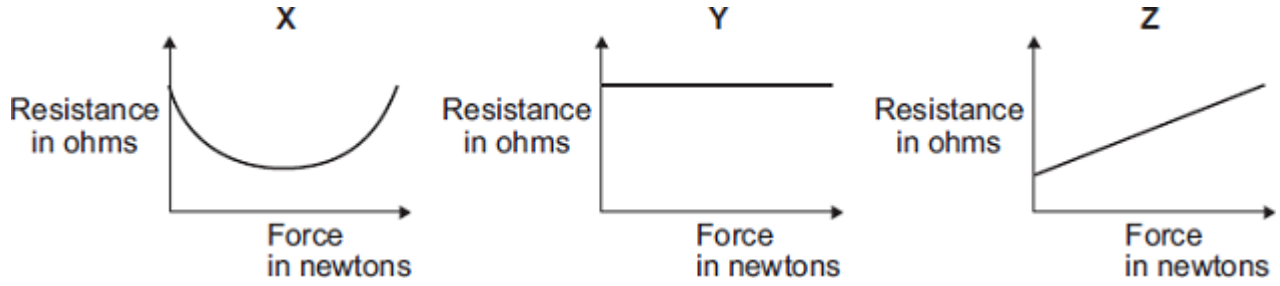
_____

_____

Additional stopping distance = _____ m

(3)

(b) In a crash-test laboratory, scientists use sensors to measure the forces exerted in collisions. The graphs show how the electrical resistance of 3 experimental types of sensor, **X**, **Y**, and **Z**, change with the force applied to the sensor.



Which of the sensors, **X**, **Y** or **Z**, would be the best one to use as a force sensor?

_____

Give a reason for your answer.

_____

_____

_____

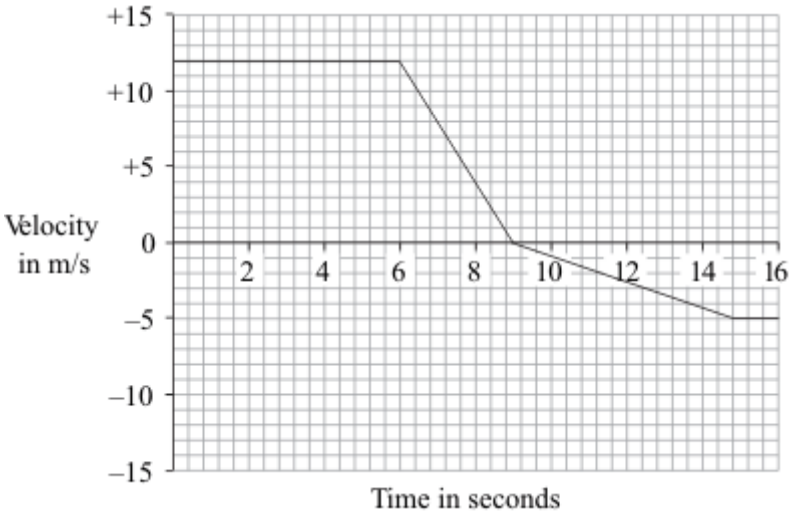
_____

(2)

(Total 7 marks)

Q8.

A car is driven along a straight road. The graph shows how the velocity of the car changes during part of the journey.



(a) Use the graph to calculate the deceleration of the car between 6 and 9 seconds.

Show clearly how you work out your answer and give the unit.

_____

_____

_____

Deceleration = _____

(3)

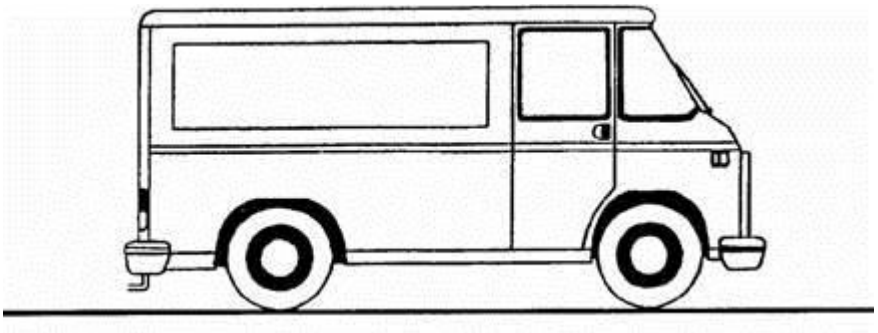
(b) At what time did the car change direction?

_____ seconds

(1)

(Total 4 marks)

Q9.



(a) The van shown above has a fault and leaks one drop of oil every second.

The diagram below shows the oil drops left on the road as the van moves from **W** to **Z**.

Describe the motion of the van as it moves from:

W to **X** _____

X to **Y** _____

Y to **Z** _____

(3)

(b) The van was driven for 20 seconds at a speed of 30m/s.

Calculate the distance travelled.

Distance _____ m

(2)

(c) The van was travelling at 30m/s. It slowed to a stop in 12 seconds.

Calculate the van's acceleration.

Acceleration _____ m/s^2

(3)

(d) The driver and passenger wear seatbelts. Seatbelts reduce the risk of injury.

Explain how seatbelts reduce the risk of injury.

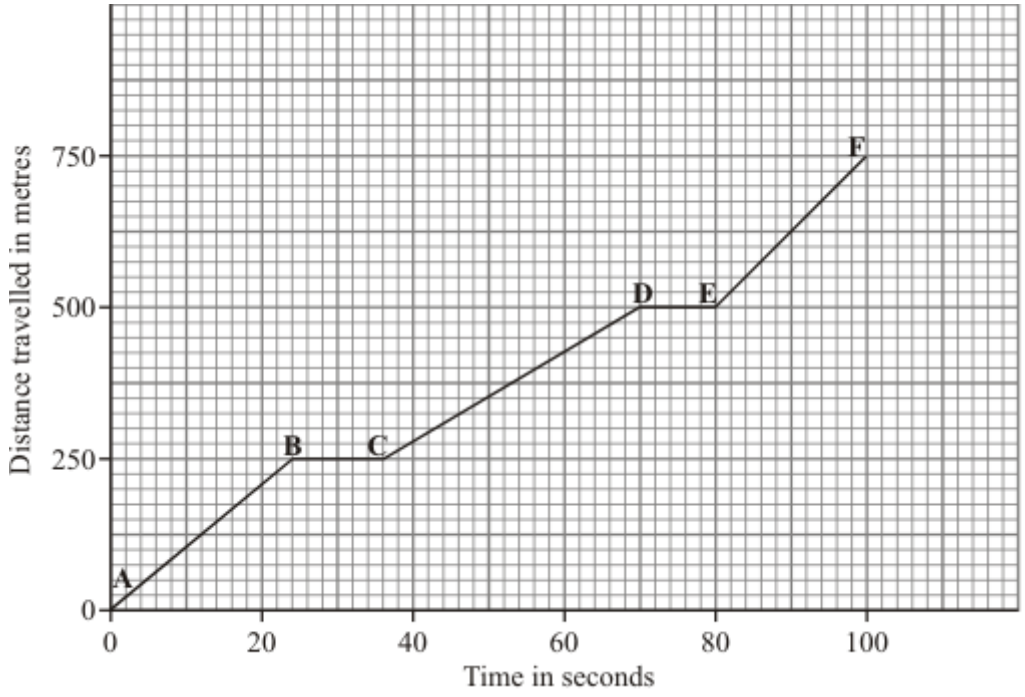
(4)

(Total 12 marks)

Q10.

This question is about a car travelling through a town.

(a) The graph shows how far the car travelled and how long it took.



(i) Between which points was the car travelling fastest? Tick (✓) your answer.

Points	Tick (✓)
A – B	
B – C	
C – D	
D – E	
E – F	

(1)

(ii) Between which points was the car stationary?

_____

_____

(1)

(b) Complete the sentences by writing the correct words in the spaces.

When a car has to stop, the **overall** stopping distance is greater if:

- the car is poorly maintained;
- there are adverse weather conditions;

- the car is travelling _____ ;
- the driver's reactions are _____ .

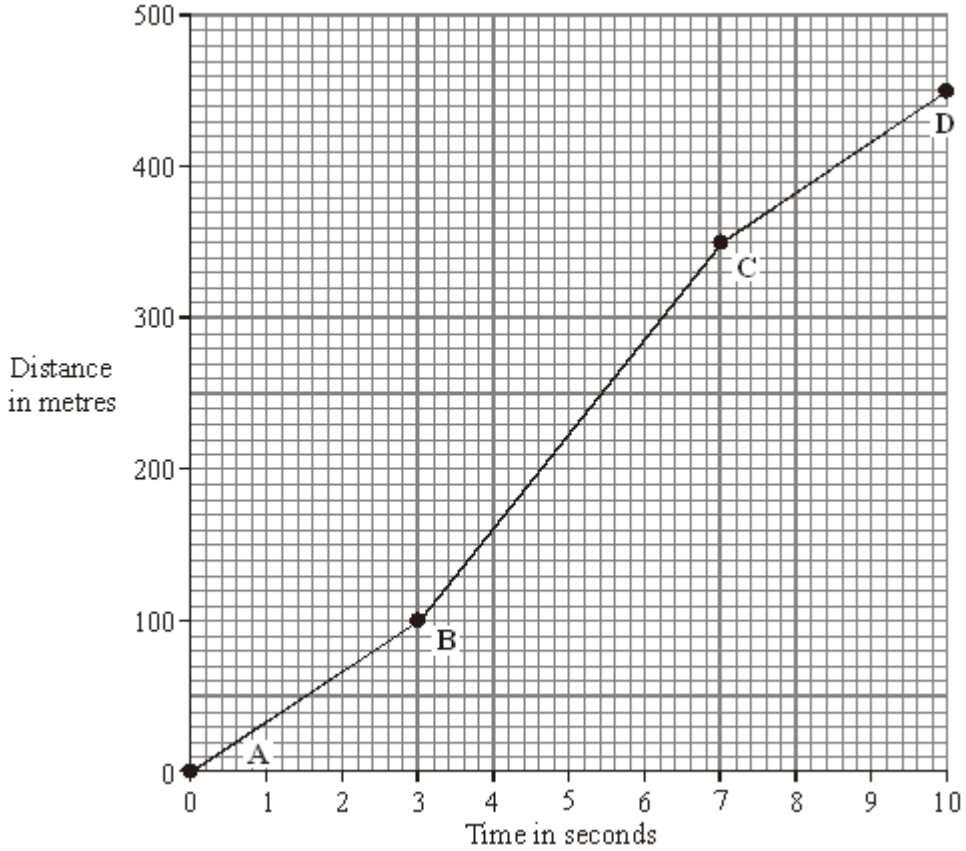
Also, the greater the speed of the car, then the greater the braking _____ needed to stop in a certain time.

(3)

(Total 5 marks)

Q11.

The distance-time graph represents the motion of a car during a race.



(a) Describe the motion of the car between point **A** and point **D**. You should not carry out any calculations.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

_____

_____

_____

_____

_____

(3)

(b) Calculate the gradient of the graph between point **B** and point **C**. Show clearly how you get your answer.

_____

_____

_____

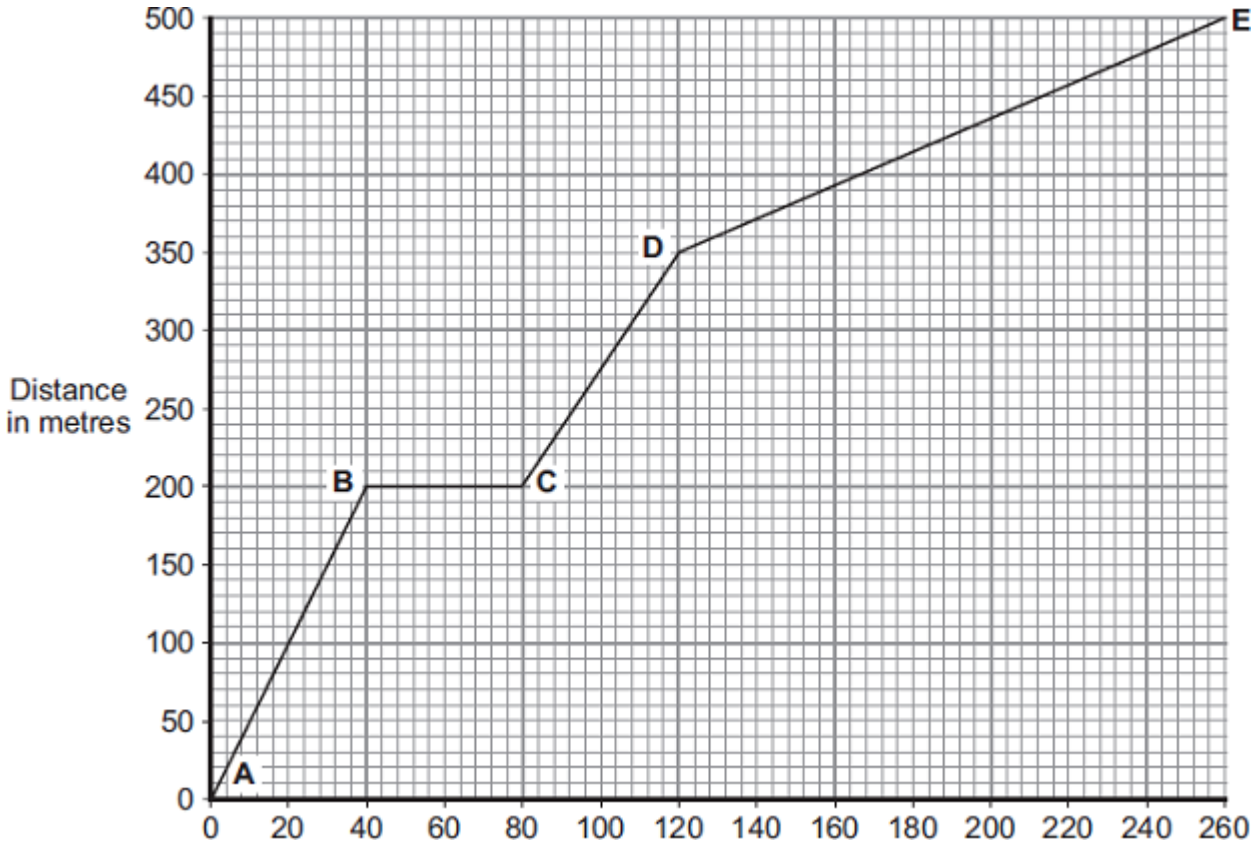
gradient = _____

(3)

(Total 6 marks)

Q12.

Part of a bus route is along a high street.
The distance-time graph shows how far the bus travelled along the high street and how long it took.



(a) Between which two points was the bus travelling the slowest?

Put a tick (✓) in the box next to your answer.

Points	Tick (✓)
A – B	
C – D	
D – E	

Give a reason for your answer.

_____

_____

(2)

(b) The bus travels at 5 m/s between points **A** and **B**.
The bus and passengers have a total mass of 16 000 kg.

Use the equation in the box to calculate the momentum of the bus and passengers between points **A** and **B**.

momentum = mass x velocity

Show clearly how you work out your answer.

_____

_____

Momentum = _____ kg m/s

(2)

(c) A cyclist made the same journey along the high street.
The cyclist started at the same time as the bus and completed the journey in 220 seconds. The cyclist travelled the whole distance at a constant speed.

(i) Draw a line on the graph to show the cyclist's journey.

(2)

(ii) After how many seconds did the cyclist overtake the bus?

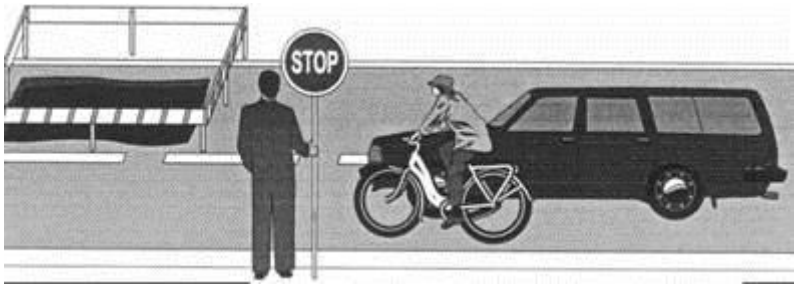
The cyclist overtook the bus after _____ seconds.

(1)

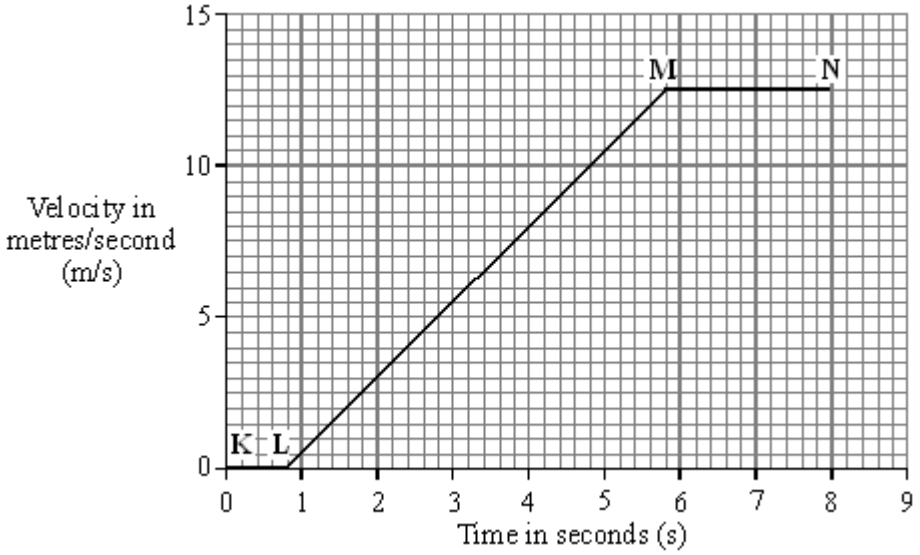
(Total 7 marks)

Q13.

A car and a bicycle are travelling along a straight road. They have stopped at road works.



The graph shows how the velocity of the car changes after the sign is changed to GO.



(a) Between which two points on the graph is the car moving at constant velocity?

_____

(1)

(b) Between which two points on the graph is the car accelerating?

_____

(1)

(c) Between the sign changing to GO and the car starting to move, there is a time delay. This is called the reaction time.

(i) What is the reaction time of the car driver?

Reaction time = _____ seconds

(1)

(ii) Which **one** of the following could increase the reaction time of a car driver? Tick the box next to your choice.

Drinking alcohol ☐

Wet roads ☐

Worn car brakes ☐

(1)

(d) The cyclist starts to move at the same time as the car. For the first 2 seconds the cyclist's acceleration is constant and is greater than that of the car.

Draw a line on the graph to show how the velocity of the cyclist might change during the first 2 seconds of its motion.

(2)

(Total 6 marks)

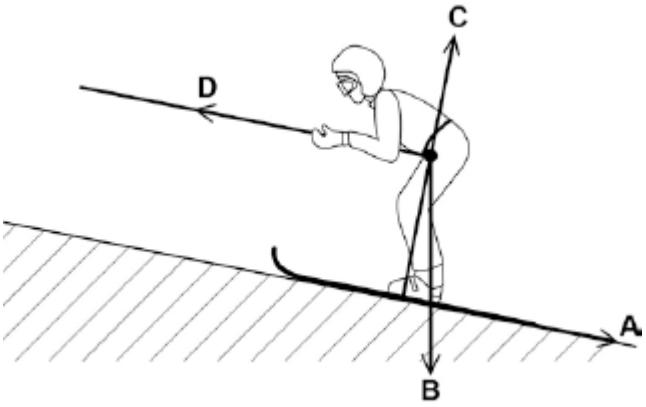
Q14.

Figure 1 shows a skier using a drag lift.

The drag lift pulls the skier from the bottom to the top of a ski slope.

The arrows, **A**, **B**, **C** and **D** represent the forces acting on the skier and her skis.

Figure 1



(a) Which arrow represents the force pulling the skier up the slope?

Tick **one** box.

A ☐

B ☐

C ☐

D ☐

(1)

(b) Which arrow represents the normal contact force?

Tick **one** box.

A ☐

B ☐

C ☐

D ☐

(1)

(c) The drag lift pulls the skier with a constant resultant force of 300N for a distance of 45 m.

Use the following equation to calculate the work done to pull the skier up the slope.

work done = force × distance

_____

_____

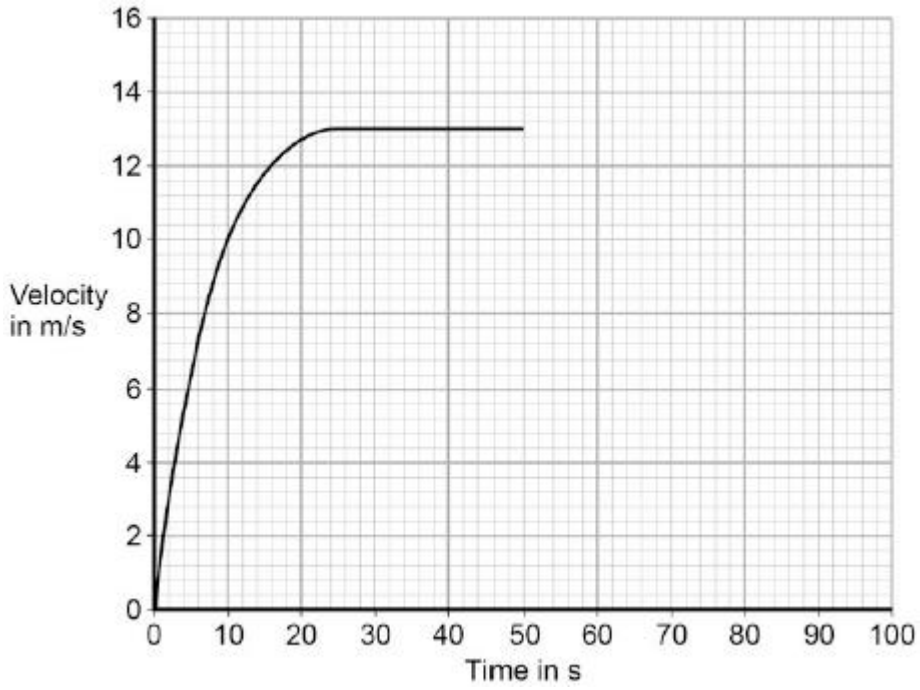
Work done = _____ J

(2)

(d) At the top of the slope the skier leaves the drag lift and skis back to the bottom of the slope.

Figure 2 shows how the velocity of the skier changes with time as the skier moves down the slope.

Figure 2



After 50 seconds the skier starts to slow down.

The skier decelerates at a constant rate coming to a stop in 15 seconds.

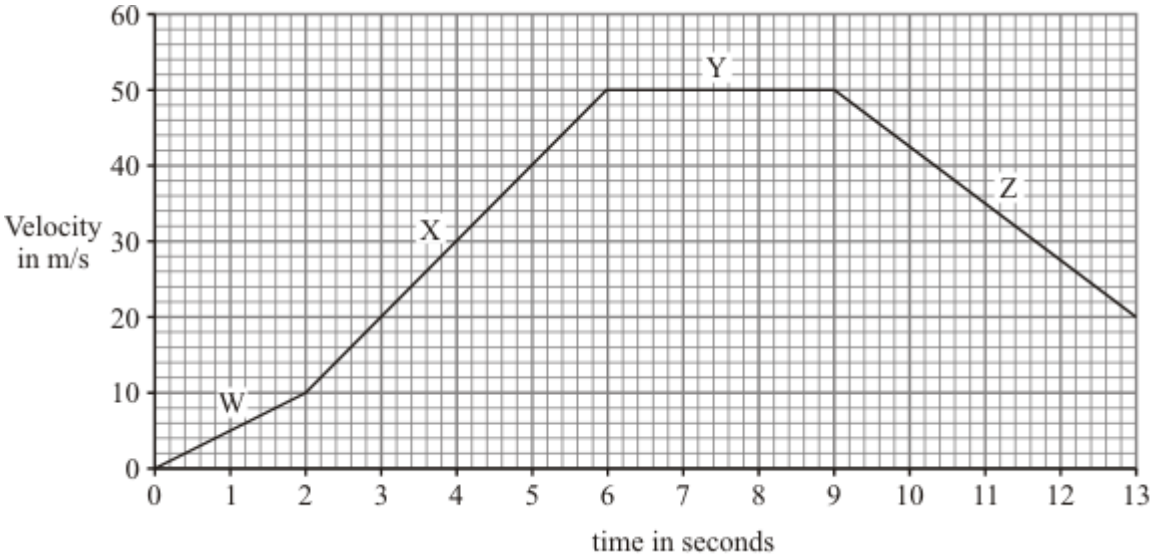
Draw a line on **Figure 2** to show the change in velocity of the skier as she slows down and comes to a stop.

(2)

(Total 6 marks)

Q15.

The graph shows changes in the velocity of a racing car.



(a) Describe the motion of the racing car during:

(i) the period labelled **W**; _____

_____

(1)

(ii) the period labelled **Y**. _____

_____

(1)

(b) Calculate the acceleration of the racing car during the period labelled **X**.
Show clearly how you work out your answer and give the unit.

_____

_____

_____

_____

_____

_____

_____

_____

Acceleration = _____

(4)

(Total 6 marks)

Q16.

A number of different forces act on a moving vehicle.

(a) A car moving at a steady speed has a driving force of 3000 N.

(i) What is the value of the resistive force acting on the car?

Tick (✓) **one** box.

	Tick (✓)
2000 N	
3000 N	
4000 N	

(1)

(ii) What causes most of the resistive force?

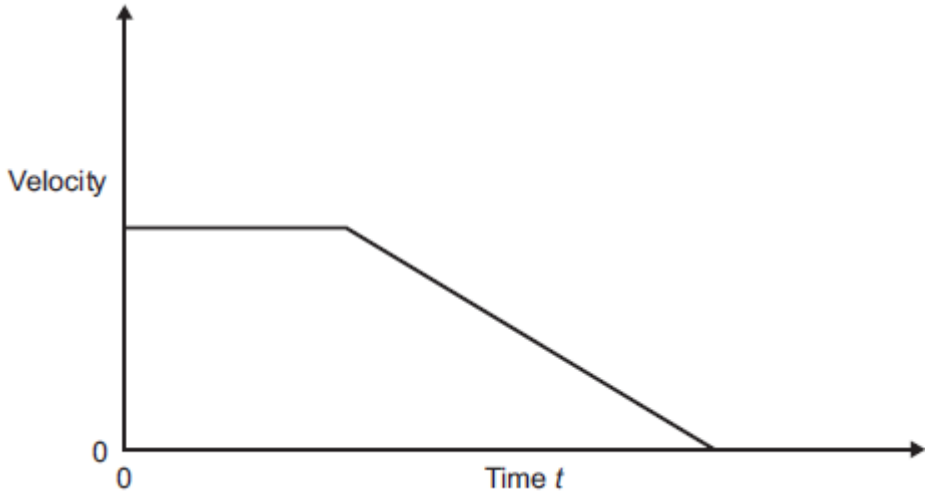
Tick (✓) **one** box.

	Tick (✓)
Air resistance	
Faulty brakes	
Poor condition of tyres	

(1)

(b) A car is moving along a road. The driver sees an obstacle in the road at time $t = 0$ and applies the brakes until the car stops.

The graph shows how the velocity of the car changes with time.



(i) Which feature of the graph represents the negative acceleration of the car?

Tick (✓) **one** box.

	Tick (✓)
The area under the graph	
The gradient of the sloping line	

The intercept on the y-axis	

(1)

(ii) Which feature of the graph represents the distance travelled by the car?

Tick (✓) **one** box.

	Tick (✓)
The area under the graph	
The gradient of the sloping line	
The intercept on the y-axis	

(1)

(iii) On a different journey, the car is moving at a **greater** steady speed.

The driver sees an obstacle in the road at time $t = 0$ and applies the brakes until the car stops.

The driver's reaction time and the braking distance are the same as shown the graph above.

On the graph above draw another graph to show the motion of the car.

(3)

(c) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Thinking distance and braking distance affect stopping distance.

Explain how the factors that affect thinking distance and braking distance affect stopping distance.

(6)

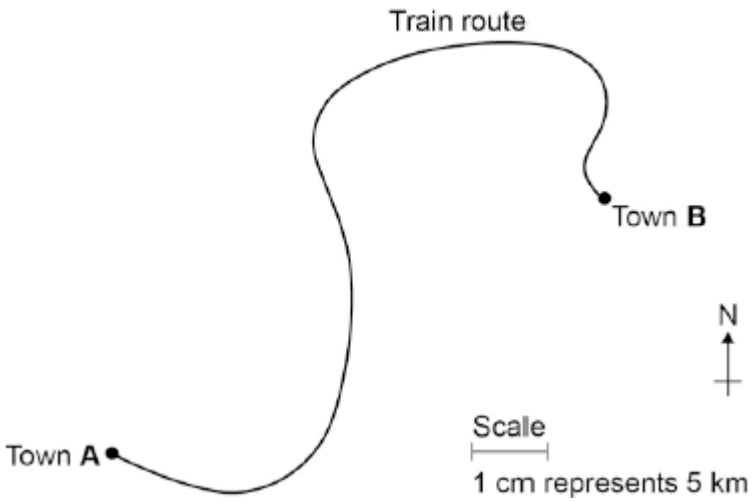
(Total 13 marks)

Q17.

A train travels from town **A** to town **B**.

Figure 1 shows the route taken by the train.
Figure 1 has been drawn to scale.

Figure 1



(a) The distance the train travels between **A** and **B** is not the same as the displacement of the train.

What is the difference between distance and displacement?

_____

_____

_____

(1)

(b) Use **Figure 1** to determine the displacement of the train in travelling from **A** to **B**.

Show how you obtain your answer.

_____

_____

Displacement = _____ km

Direction = _____

(2)

(c) There are places on the journey where the train accelerates without changing speed.

Explain how this can happen.

_____

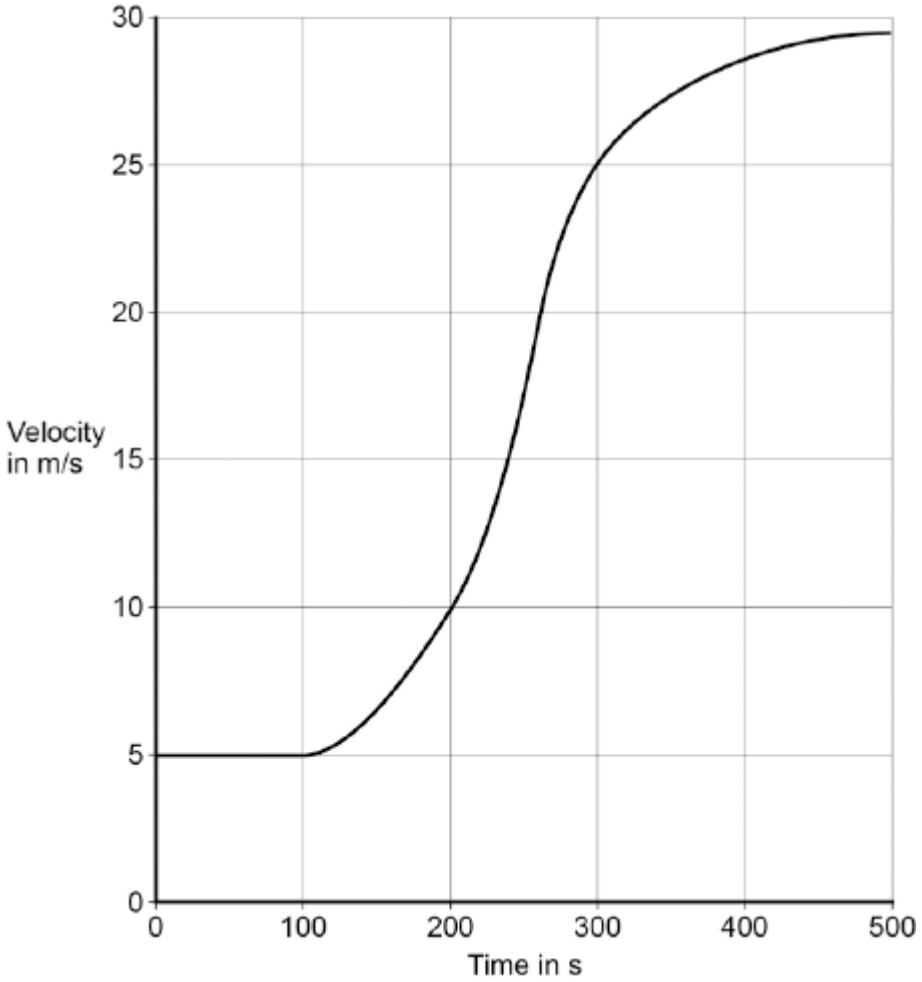
_____

_____

(2)

(d) **Figure 2** shows how the velocity of the train changes with time as the train travels along a straight section of the journey.

Figure 2



Estimate the distance travelled by the train along the section of the journey shown in **Figure 2**.

To gain full marks you must show how you worked out your answer.

Distance = _____ m

(3)

(Total 8 marks)

Q18.

A high-speed train accelerates at a constant rate in a straight line.

The velocity of the train increases from 30 m/s to 42 m/s in 60 seconds.

(a) (i) Calculate the change in the velocity of the train.

_____

Change in velocity = _____ m/s

(1)

(ii) Use the equation in the box to calculate the acceleration of the train.

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken for change}}$$

Show clearly how you work out your answer and give the unit.
Choose the unit from the list below.

m/s **m/s²** **N/kg** **Nm**

_____

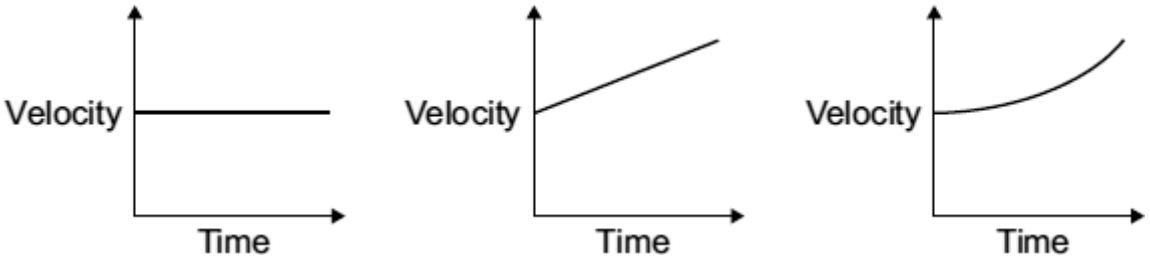
_____

Acceleration = _____

(2)

(b) Which **one** of the graphs, **A**, **B** or **C**, shows how the velocity of the train changes as it accelerates?

Write your answer, **A**, **B** or **C**, in the box.



A **B** **C**

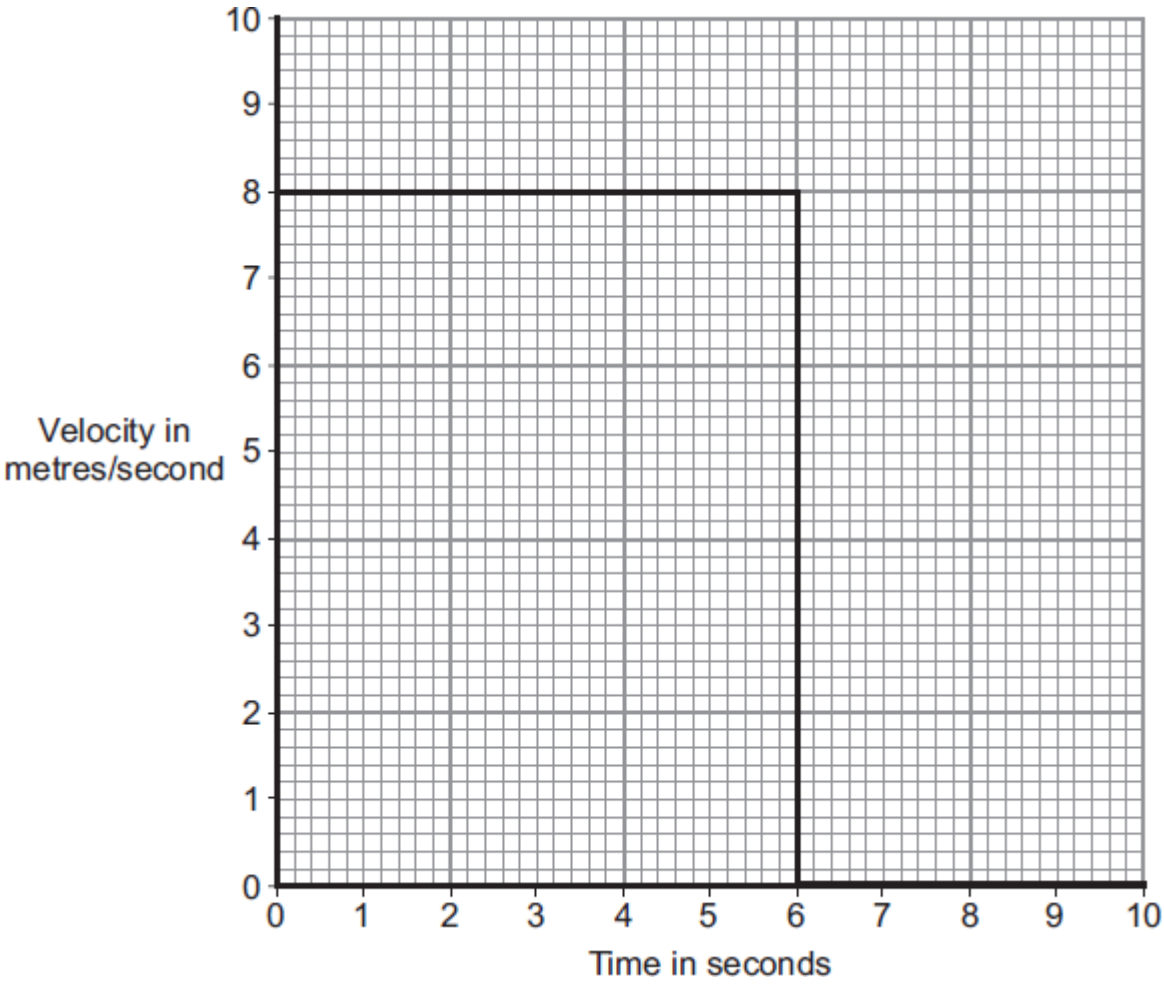
Graph ☐

(1)

(Total 4 marks)

Q19.

The diagram shows the velocity-time graph for an object over a 10 second period.



(a) Use the graph to calculate the distance travelled by the object in 10 seconds.

Show clearly how you work out your answer.

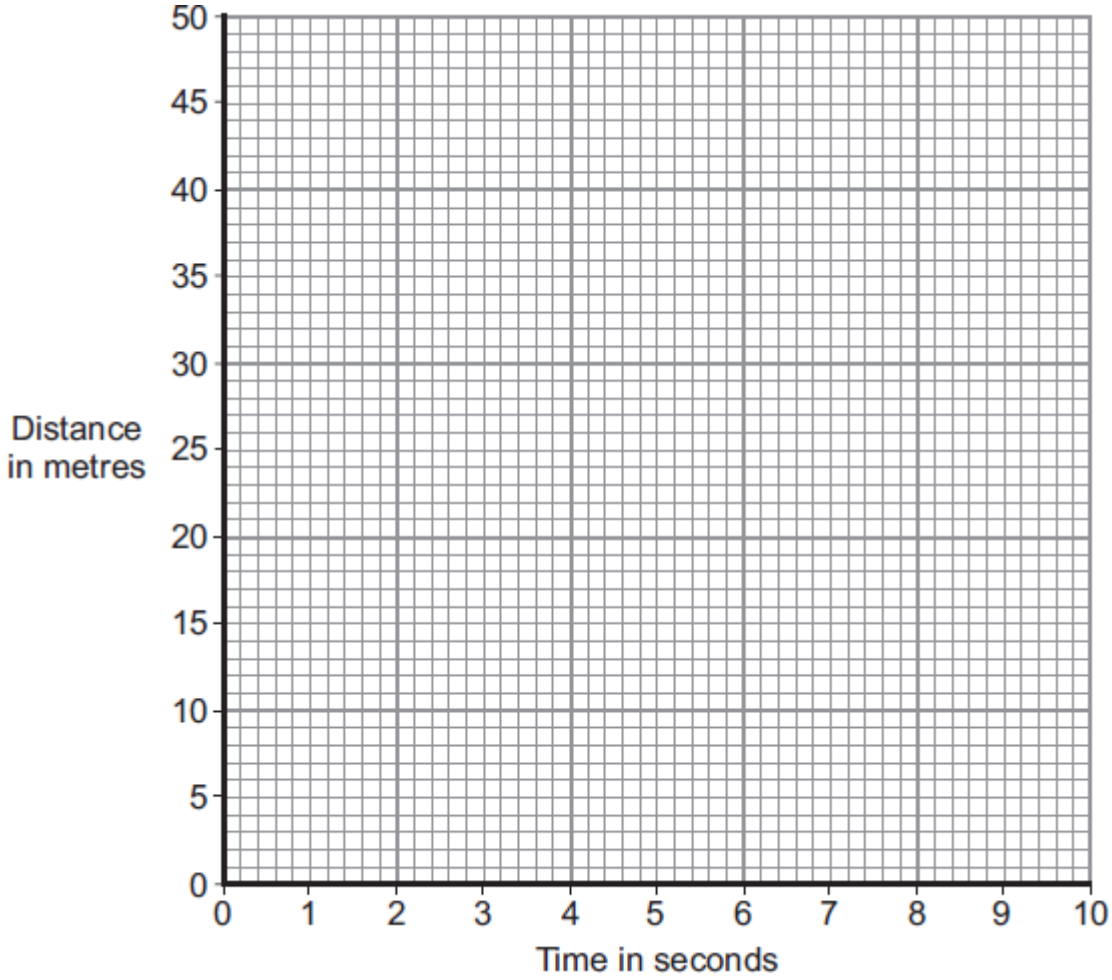
_____

_____

Distance = _____ m

(2)

(b) Complete the distance-time graph for the object over the same 10 seconds.



(2)

(Total 4 marks)

Mark schemes

Q1.

(i) C and D **or** D and C

accept CD
accept DC
accept answers in terms of time

1

(ii) any **one** from:

streamline position streamline clothes

accept crouched position
accept tight clothes
accept design of cycle
accept cycle slower

1

(iii) 0.5 hours **or** 30 minutes **or** 1800 seconds

***must** have unit*

1

(iv) speed = $\frac{\text{distance}}{\text{time (taken)}}$

accept any correct rearrangement
*accept s = d/t **or** v s/t*
accept velocity for speed

accept 

if subsequent use of  *correct*

1

(v) 16

allow for mark for each of time = 3.5 hours
distance = 56km
allow e.c.f. from *part (a)(iii) if correctly used*
*an answer of 14 gains **2** marks*
*allow **1** mark for correct attempt to average the three sections*

3

[7]

Q2.

(a) (i) same size

1

(ii) **K**

1

(b) velocity

1

(c) **C**

1

greatest mass **or** because it's heavier

accept biggest load
*accept heaviest **or** more weight*
*do **not** accept fuller*
*do **not** accept more items*
*do **not** accept it's loaded*
*do **not** accept loaded most*
ignore references to time as neutral

1

[5]

Q3.

(a) (i) decreases

for 1 mark

1

(ii) decreases

for 1 mark

1

(iii) lower speed everywhere

for 1 mark

1

(b) (i) $3\ a = \frac{s}{t}$ **or** $a = \frac{33}{11}$

gains 1 mark

1

ms^{-2}

gains 1 mark

1

(ii) 2850 ecf

gains 2 marks

else working

gains 1 mark

2

(iii) air resistance/frictional forces increase with speed;
till frictional force = max forward engine force;
when acceleration is zero

(incorrect statement – 1 mark)

or (limitation on maximum speed for safety-1 mark)

any two for 1 mark each

2

[9]

Q4.

(a) 60

1

(b) $5\frac{1}{2}$ hours

must include unit

1

(c) 30

1

(d) 30 minutes or

$\frac{1}{2}$ hour

must include unit

1

(e) D **and** E

accept finish for E
accept correct numbers from axes with units

1

least steep part of the graph

accept covers smallest distance in a set time
accept only moves 5 km in 1 ½ hours (accept anything between 5 and 6)
ignore horse is tired

1

[6]

Q5.

(a) A = speeding up

[Accept 'accelerating / acceleration / going faster]

B =moving at a steady speed

[Accept 'constant speed']

C = slowing down

[Accept 'going slower' / decelerating]
each for 1 mark

3

(b) acceleration = $\frac{\text{change in speed/velocity}}{\text{time taken}}$

NB if formula given must be correct

or $\frac{10}{4}$

gains 1 mark

but 2.5

gains 2 marks

unit m/s^2 **or** metres per second squared
or metres per second per second
for 1 mark

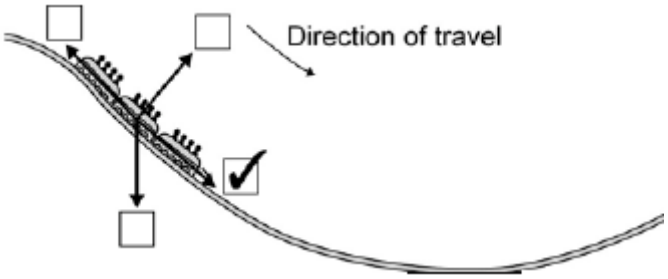
or m/s^{-2}
[Credit even if no / an incorrect numerical answer is given]

3

[6]

Q6.

(a) correct box ticked



1

(b) (i) 30

ignore added units

1

(ii) 2250 **or** their (b)(i) × 75 correctly calculated

*allow **1** mark for correct substitution ie 75 × 30 **or** their (b)(i) × 75 provided no subsequent step shown*

*an answer of 750 gains **1** mark only if answer to (b)(i) is 10*

2

[4]

Q7.

(a) (i) longer reaction time

accept slower reactions

*do **not** accept slower reaction time unless qualified*

or
greater thinking distance

accept greater thinking time

or
greater stopping distance

accept greater stopping time

greater braking distance negates answer

1

(ii) lines / slopes have the same gradient

accept slopes are the same

or
velocity decreases to zero in same time / in 2.6 seconds

accept any time between 2.4 and 2.8

accept braking distances are the same

1

(iii) 12

*accept extracting both reaction times correctly for **1** mark (0.6 and 1.4)*

or

*time = 0.8 (s) for **1** mark*

*accept 0.8 × 15 for **2** marks*

*accept calculating the distance travelled by car **A** as 28.5 m*

or

*the distance travelled by car **B** as 40.5 m for **2** marks*

3

(b) **Z**

1

different force values give a unique / different resistance

*only scores if **Z** chosen*

*do **not** accept force and resistance are (directly) proportional*

*accept answers in terms of why either **X** or **Y** would not be best eg*

***X** – same resistance value is obtained for 2 different force values*

***Y** – all force values give the same resistance*

1

[7]

Q8.

(a) 4

*allow **1** mark for extracting correct information 12*

2

m/s^2

ignore negative sign

1

(b) 9 (s)

1

[4]

Q9.

(a) WX deceleration / speed decreasing / slowing down / negative acceleration

XY constant speed / steady speed *not* constant motion / slow speed

YZ acceleration / speed increasing / speeding up

for 1 mark each

3

(b) distance = v × t **or** distance = 30 × 20

gains 1 mark

but

distance = 600(m)

gains 2 marks

2

(c) acceleration = v / t **or** acceleration = 30 / 12

gains 1 mark
(if –30 / 12, allow negative sign here if not in the answer)

3

but
acceleration = 2.5 (m/s²)

gains 2 marks

but
acceleration = -2.5 (m/s²)

gains 3 marks

(d) in a crash / during hard braking car body stops / slows rapidly driver / passengers continue to move forward *not* thrown forward seatbelts provide backward force / keep them in their seats / restrain them to stop them hitting the windscreen / dashboard

(an alternative argument involving momentum is acceptable)
for 1 mark each

4

[12]

Q10.

(a) (i) **E-F** (ticked)

1

(ii) **B-C or D-E**

accept both answers

1

(b) fast(er)

accept downhill

1

slow(er)

1

force

*do **not** accept distance*

1

[5]

Q11.

(a) **Quality of written communication**

for correct use of term speed in all correct examples
Q ✓ Q ✗

1

*describes all 3 sections correctly for **2** marks*
*describes 2 or 1 section correctly for **1** mark*

max 2

A – **B** constant <u>speed</u>

*do **not** accept pace for speed*

B – **C** (has accelerated) to a higher (constant) speed

C – **D** goes back to original / lower (constant) speed

*allow for **1** mark, initial and final (constant) speeds are the same accept velocity for speed*
ignore reference to direction

(b) 62.5

allow answer to 2 s.f.

*allow **1** mark for drawing a correct triangle **or** for using two correct pairs of coordinates*

*allow **1** mark for correct use of y/x*

ignore units

3

[6]

Q12.

(a) **D** – **E**

reason only scores if D – E chosen

1

shallowest slope / gradient

accept smallest distance in biggest time
accept longest time to travel the same distance
accept the line is not as steep
accept it is a less steep line
*do **not** accept the line is not steep*

1

(b) 80 000

*allow **1** mark for correct substitution, ie 16 000 × 5 provided no subsequent step shown*

2

(c) (i) straight line starting at origin

accept within one small square of the origin

1

passing through t = 220 and d = 500

1

(i) 186

accept any value between 180 and 188
accept where their line intersects given graph line correctly read ±4 s

1

[7]

Q13.

(a) MN

accept 5.8, 8 seconds must include unit

1

(b) LM

accept 0.8, 5.8 seconds must include unit

1

(c) (i) 0.8

1

(ii) drinking alcohol

1

(d) straight (by eye) line starting at 0.8 seconds

1

line drawn steeper than LM starting before L

ignore lines going beyond 2 seconds but line must exceed 2.5 metres per second before terminating

1

[6]

Q14.

(a) D

1

(b) C

1

(c) W = 300 × 45

1

W = 13 500

1

*allow 13 500 with no working shown for **2** marks*

(d) straight line drawn from 13 m / s to 0 m / s

1

finishing on x-axis at 65 s

1

[6]

Q15.

(a) (i) acceleration / speeding up

do not accept acceleration increases

1

(ii) constant / steady velocity

accept constant / steady speed

1

(b) 10

3

m/s^2 or ms^{-2}

reject ms^2

if answer not correct then allow 1 mark for

acceleration = $\frac{\text{change in velocity}}{\text{time taken for change}}$

and allow 1 mark for $\frac{40\ (m/s)}{4(s)}$

1

[6]

Q16.

(a) (i) 3000 N

1

(ii) air resistance

1

(b) (i) the gradient of the sloping line

1

(ii) the area under the graph

1

(iii) horizontal line above previous one

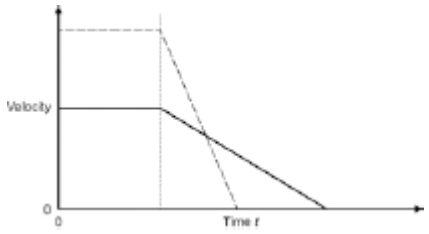
1

for the same time

1

sloping line cutting time axis before previous line

eg



1

(c) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1−2 marks)
One factor is given that affects thinking distance
or
one factor is given that affects braking distance

Level 2 (3−4 marks)
One factor and a description of its effect is given for **either** thinking distance **or** braking distance

Level 3 (5−6 marks)
One factor and a description of its effect is given for **both** thinking distance and braking distance
plus
some extra detail

Examples of the points made in the response
stopping distance = thinking distance + braking distance

the faster the car travels the greater the stopping distance

thinking distance is the distance travelled from when the driver sees an obstacle to when the brakes are applied

braking distance is the distance travelled from when the brakes are applied to when the car stops

thinking distance:
- tiredness increases thinking distance
- taking drugs increases thinking distance
- drinking alcohol increases thinking distance
- distractions in the car increase thinking distance.

braking distance:
- poor condition of brakes increases braking distance
- poor condition of tyres increases braking distance
- wet roads increase braking distance
- icy roads increase braking distance.

6

[13]

Q17.

(a) distance is a scalar and displacement is a vector

or

distance has magnitude only, displacement has magnitude and direction

1

(b) 37.5 km

accept any value between 37.0 and 38.0 inclusive

1

062° or N62°E

accept 62° to the right of the vertical

1

accept an angle in the range 60° −64°

accept the angle correctly measured and marked on the diagram

(c) train changes direction so velocity changes

1

acceleration is the rate of change of velocity

1

(d) number of squares below line = 17

accept any number between 16 and 18 inclusive

1

each square represents 500 m

1

distance = number of squares × value of each square correctly calculated − 8500 m

1

[8]

Q18.

(a) (i) 12

1

(ii) 0.2

*allow **1** mark for their (a)(i) ÷ 60 and correctly calculated*

1

m/s^2

accept correct unit circled in list

accept ms^{-2}

*do **not** accept mps^2*

1

(b) **B**

1

[4]

Q19.

(a) 48

*allow for **1** mark correct method shown, ie 6 × 8*

***or** correct area indicated on the graph*

2

(b) diagonal line from (0,0) to (6,48) / (6, their (a))

if answer to (a) is greater than 50, scale must be changed to gain this mark

1

horizontal line at 48m between 6 and 10 seconds

accept horizontal line drawn at their (a) between 6 and 10 seconds

1

[4]