Name: _____

Motion

Questions

Date:

Time:

Total marks available:

Total marks achieved: _____

Questions

Q1.

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)

Q2.

Use words from the box to complete the sentences below.

direction	energy	mass	size

(2)

Vectors have size and ..... **.**

Scalars have only ..... **.**

(Total for question = 2 marks)

Q3.

An aircraft waits at the start of a runway.
The aircraft accelerates from a speed of 0 m/s to a speed of 80 m/s.
The acceleration of the aircraft is 4 m/s^2.

Calculate the distance, *x*, travelled by the aircraft while it is accelerating.

Use the equation

$$x = \frac{v^2 - u^2}{2a}$$

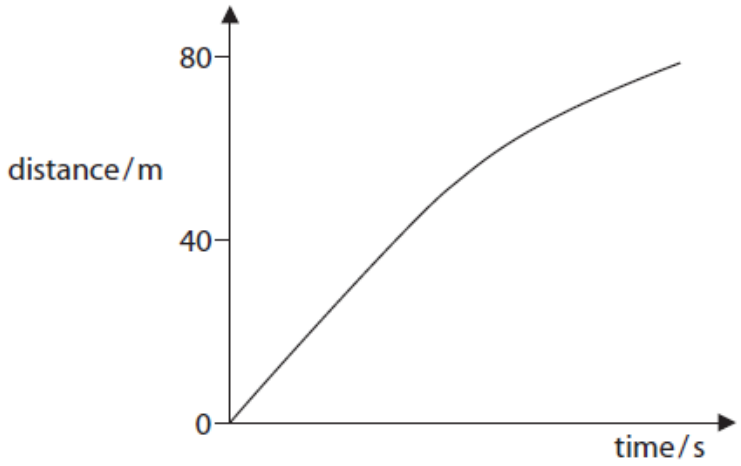
(2)

x = ... m

(Total for question = 2 marks)

Q4.

The distance-time graph for a car is shown below.



Describe what the graph shows about the speed of the car as it travels the 80 m.

(2)

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.....

.....

.....

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.

Describe how the student could extend the investigation to determine the average speed of the trolley as it rolls back down the track.

(3)

.....

.....

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(Total for question = 3 marks)

Q7.

Figure 7 shows a skier going down a hill.

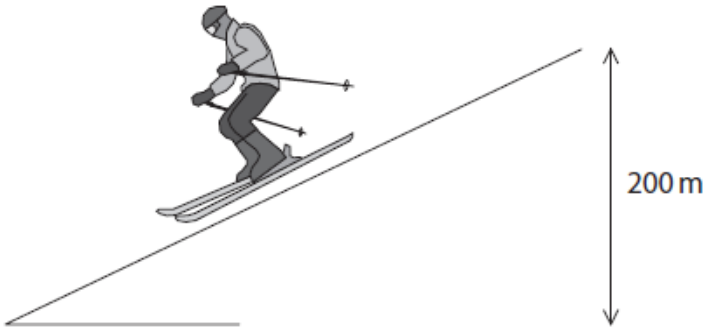


Figure 7

Describe how her speed at the bottom of the slope could be determined.

(3)

.....

.....

.....

.....

.....

.....

(Total for question = 3 marks)

Q8.

A student needs to measure the average speed of an accelerating trolley between two marks on a bench.

Figure 5 shows the arrangement of some apparatus that the student can use.

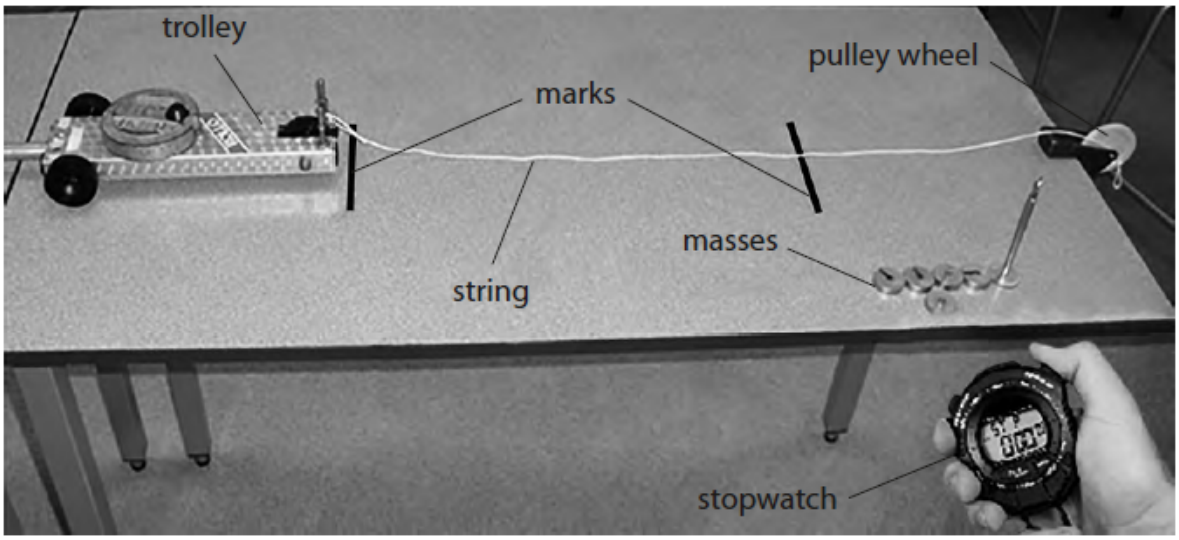


Figure 5

(i) One piece of apparatus is missing from the diagram.

This piece of apparatus is needed to determine the average speed.

State the extra piece of apparatus needed to determine the average speed.

(1)

.....

(ii) Describe how the student can make the trolley accelerate along the bench.

(2)

.....

.....

.....

.....

(iii) The student wishes to develop the experiment to determine the acceleration of the trolley.

State **one other** measurement that the student must make to determine the acceleration of the trolley.

(1)

.....

.....

(Total for question = 4 marks)

Q9.

Two students try to determine a value for *g*, the acceleration due to gravity.

(i) They measure the time, *t*, for a small steel ball to fall through a height, *h*, from rest.

They measure *t* to be 0.74 s, using a stopwatch.

They measure *h* to be 2.50 m, using a metre rule.

Calculate a value for *g* from the students' measurements.

Use the equation

$$g = \frac{2h}{t^2}$$

(2)

g = ... m/s^2

(ii) They record the time *t* for two more drops from the same height.

The three values for time *t* are

0.74 s, 0.69 s, 0.81 s.

Calculate the average value of time *t* to an appropriate number of significant figures.

(2)

average value of time *t* = ... s

(Total for question = 4 marks)

Q10.

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

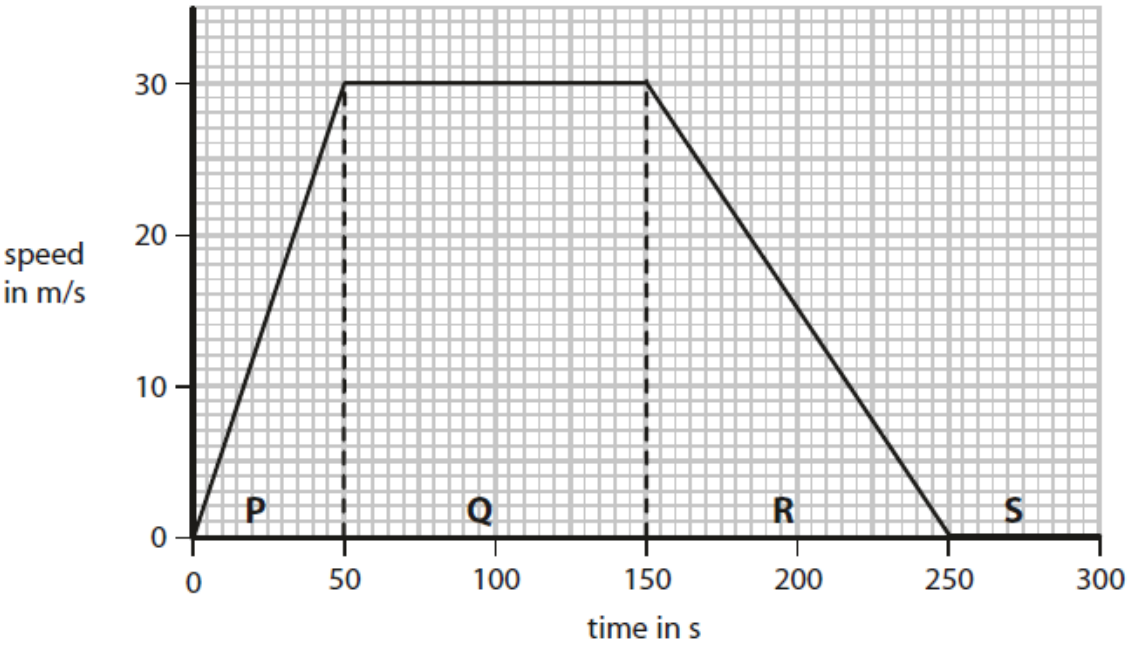


Figure 1

(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)

Q11.

Figure 12 shows a skier on a slope.

The skier travels down the slope with a constant acceleration.

The speed of the skier is measured at points P and Q.

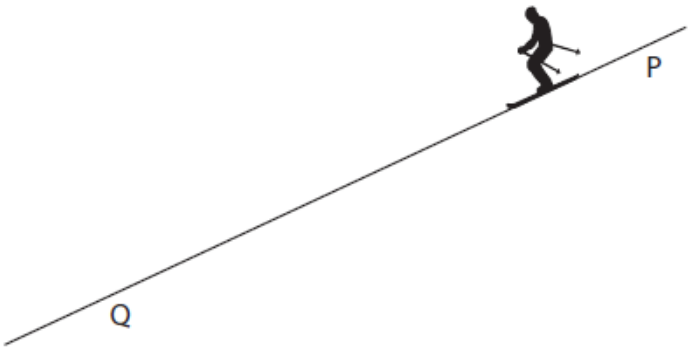


Figure 12

The table in Figure 13 gives some data about the skier making one downhill run.

acceleration	3.0 m/s^2
speed at P	7.6 m/s
speed at Q	24 m/s

Figure 13

(i) Calculate the distance from P to Q.

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

(3)

distance from P to Q = ... m

(ii) Calculate the time taken for the skier to travel from P to Q.

(3)

time from P to Q = ... s

(Total for question = 6 marks)

Q12.

Some students investigate the speed of cars.
They measure the time it takes each car to travel a distance of 80 m.

(a) State **two** measuring instruments the students should use.

(2)

1

.....

2

.....

(b) The table shows some of their results.

colour of car	distance travelled / m	time / s
green	80	5.0
red	80	4.0
blue	80	5.5
black	80	4.3
white	80	5.6

(i) State the colour of the slowest car.

(1)

colour of the slowest car .....

(ii) Calculate the speed of the black car.

(2)

speed of the black car = ... m/s

(iii) 20 miles per hour is approximately 9 m/s.

Estimate the speed, in miles per hour, of the black car.

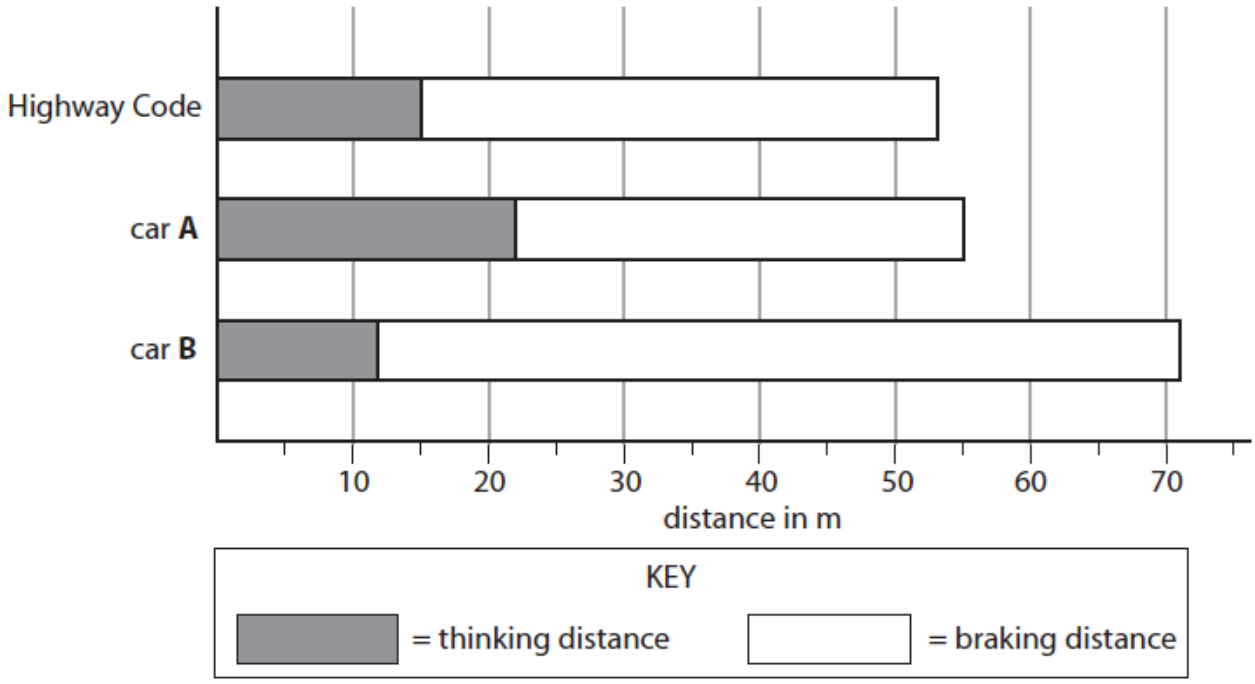
(1)

speed of the black car = ... miles per hour

Q13.

* The chart shows the thinking, braking and stopping distances for an average car and driver stopping from 50 miles per hour as shown in the Highway Code.

It also shows the thinking, braking and stopping distances for drivers of cars **A** and **B**, both stopping from 50 miles per hour.



A and **B** are different cars on different roads.

Use the factors that can affect thinking and braking distances to explain the differences in stopping distances for cars **A** and **B**.

(6)

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