Merit Minds
www.merit-minds.com
Exam Preparation and Free Resources

Name of the Student:_____

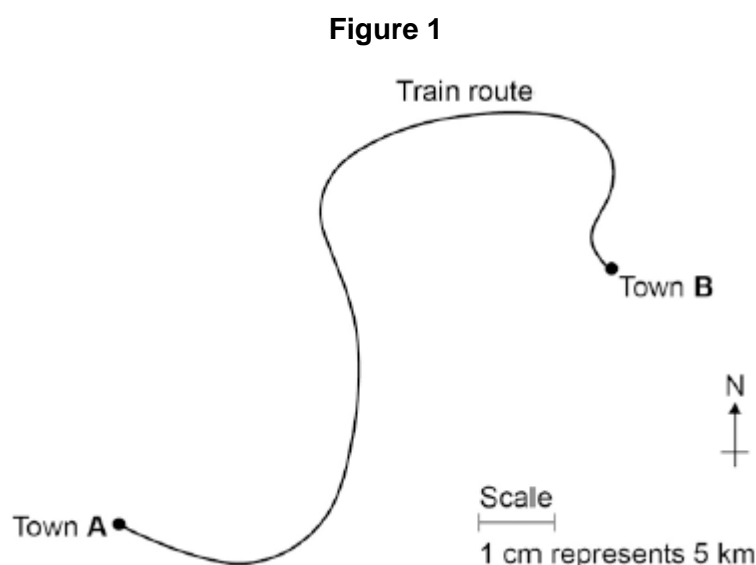**Max. Marks : 19 Marks**   **Time : 19 Minutes**

Q1.

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.

_____

_____
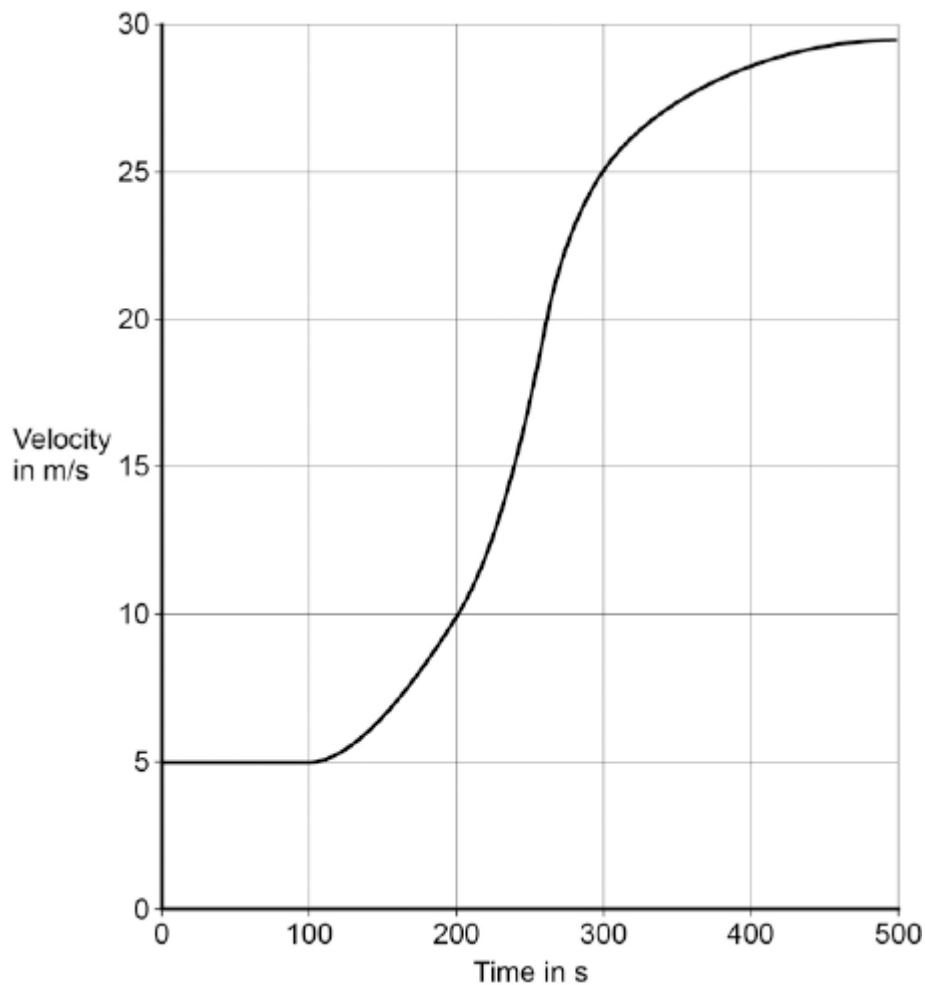
Displacement = _____ km

Direction = _____

(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)

Q2.

The stopping distance of a car is the sum of the thinking distance and the braking distance.

The table below shows how the thinking distance and braking distance vary with speed.

Speed in m/s	Thinking distance in m	Braking distance in m
10	6	6.0
15	9	13.5
20	12	24.0
25	15	37.5
30	18	54.0

(a)   What is meant by the braking distance of a vehicle?

_____

_____

(1)

(b)   The data in the table above refers to a car in good mechanical condition driven by an alert driver.

Explain why the stopping distance of the car increases if the driver is very tired.

_____

_____

_____

_____

(2)

(c)   A student looks at the data in the table above and writes the following:

thinking distance ∝ speed

braking distance ∝ speed

Explain whether the student is correct.

_____

_____

_____

_____

(2)

(d)   Applying the brakes with too much force can cause a car to skid.

The distance a car skids before stopping depends on the friction between the road surface and the car tyres and also the speed of the car.

Friction can be investigated by pulling a device called a 'sled' across a surface at constant speed.

The figure below shows a sled being pulled correctly and incorrectly across a surface.

The constant of friction for the surface is calculated from the value of the force pulling the sled and the weight of the sled.

Why is it important that the sled is pulled at a constant speed?

Tick **one** box.

If the sled accelerates it will be difficult to control. ☐

If the sled accelerates the value for the constant of friction will be wrong. ☐

If the sled accelerates the normal contact force will change. ☐

(1)

(e)   If the sled is pulled at an angle to the surface the value calculated for the constant of friction would not be appropriate.

Explain why.

_____

_____

_____

_____

(2)

(f)   By measuring the length of the skid marks, an accident investigator determines that the distance a car travelled between the brakes being applied and stopping was 22 m.

The investigator used a sled to determine the friction. The investigator then calculated that the car decelerated at 7.2 m/s^2.

Calculate the speed of the car just before the brakes were applied.

Give your answer to two significant figures.

Use the correct equation from the Physics Equation Sheet.

_____

_____

_____

_____

Speed = _____ m/s

(3)
(Total 11 marks)