Section A

Answer **all** the questions in this section. Answer in the spaces provided.

1 Fig. 1.1 is the distance–time graph for a skydiver who jumps from a balloon at time $t = 0$.

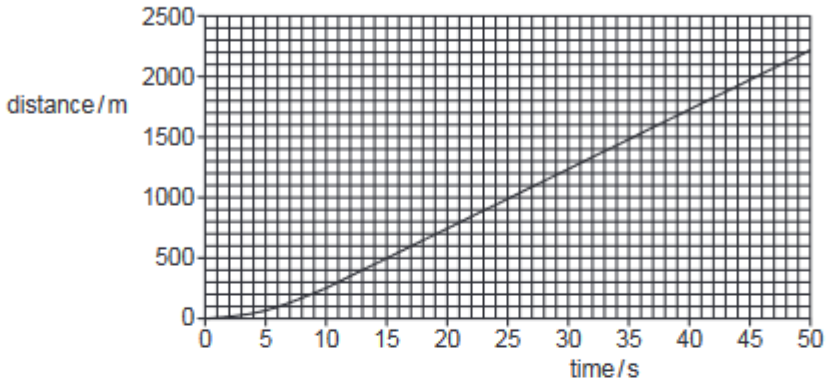

Fig. 1.1

(a) The first part of the graph shows the motion of the skydiver from when he jumps until he reaches terminal velocity.

(i) Describe the motion of the skydiver between $t = 0$ and $t = 20$ s.

.....

.....

..... [2]

(ii) Explain the motion of the skydiver between $t = 0$ and $t = 20$ s in terms of the forces acting on him.

.....

.....

.....

..... [3]

(b) Using Fig. 1.1, determine the terminal velocity of the skydiver.

On Fig. 1.1, indicate any values used for your calculation.

terminal velocity = ... [3]

[Total: 8]

2 Fig. 2.1 shows a satellite moving at a constant speed in a circular orbit around the Earth.

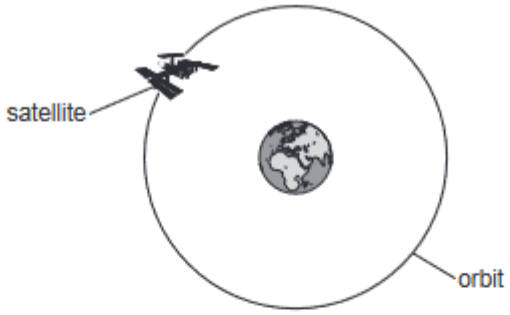

Fig. 2.1 (not to scale)

Speed is a scalar quantity but velocity is a vector quantity.

(a) State how a scalar quantity differs from a vector quantity.

.....

..... [1]

(b) Underline every vector quantity in the list.

distance **displacement** **force** **length** **mass** **time**

[1]

(c) There is a resultant force acting on the satellite in Fig. 2.1.

(i) Explain how the motion of the satellite shows that a resultant force is acting on it.

.....

.....

..... [2]

(ii) State the cause of this force.

.....

..... [1]

[Total: 5]

Answer **two** questions from this section. Answer in the spaces provided.

7 A bus leaves a bus-stop at time $t = 0$ and travels along a horizontal road until it reaches a second bus-stop. Fig. 7.1 is the distance-time graph for the bus between $t = 0$ and $t = 60$ s.

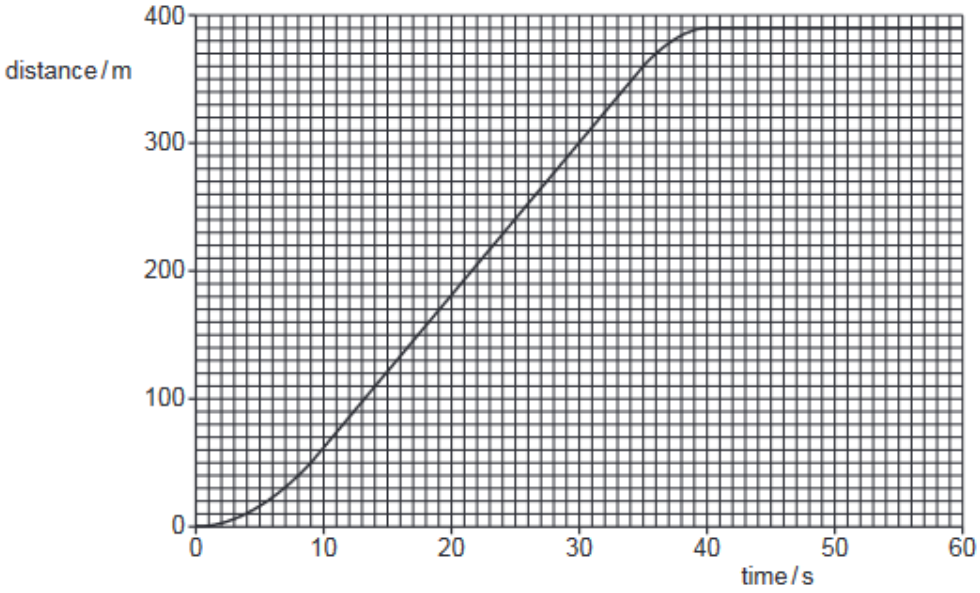

Fig. 7.1

The road on which the bus is travelling is straight except for a short, curved section. The bus travels around this circular curve between $t = 21$ s and $t = 24$ s.

(a) Describe how the motion of the bus between $t = 0$ and $t = 10$ s differs from its motion between $t = 35$ s and $t = 40$ s.

.....

.....

.....

.....

..... [3]

(b) Determine:

(i) the maximum speed of the bus during these 60 s

maximum speed = ... [3]

(ii) the average speed of the bus between leaving the first bus-stop and arriving at the second bus-stop.

average speed = ... [2]

(c) **(i)** State how *velocity* differs from *speed*.

.....

..... [1]

(ii) There are **three** periods during the 60 s when there is a non-zero resultant force acting on the bus.

Complete the statements to indicate these three time periods and state the direction of the resultant force in that period.

1. Between t = ... and t = ... the direction of the resultant force is

.....

2. Between t = ... and t = ... the direction of the resultant force is

.....

3. Between t = ... and t = ... the direction of the resultant force is

.....

[4]

(d) During the journey, the air resistance acting on the bus varies.

(i) State why the air resistance changes during the journey.

.....

..... [1]

(ii) On Fig. 7.1, mark and label with an M a time when the air resistance is a maximum value. [1]

[Total: 15]