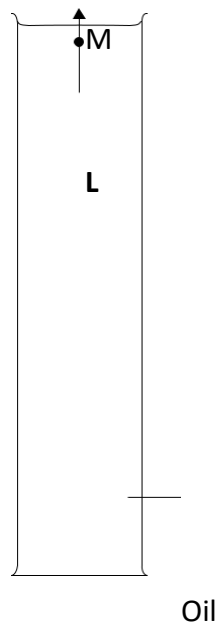# TERMINAL VELOCITY

Q:1 The diagram shows a steel ball-bearing falling through a tube of oil. The forces, L and M, act on the ball-bearing.
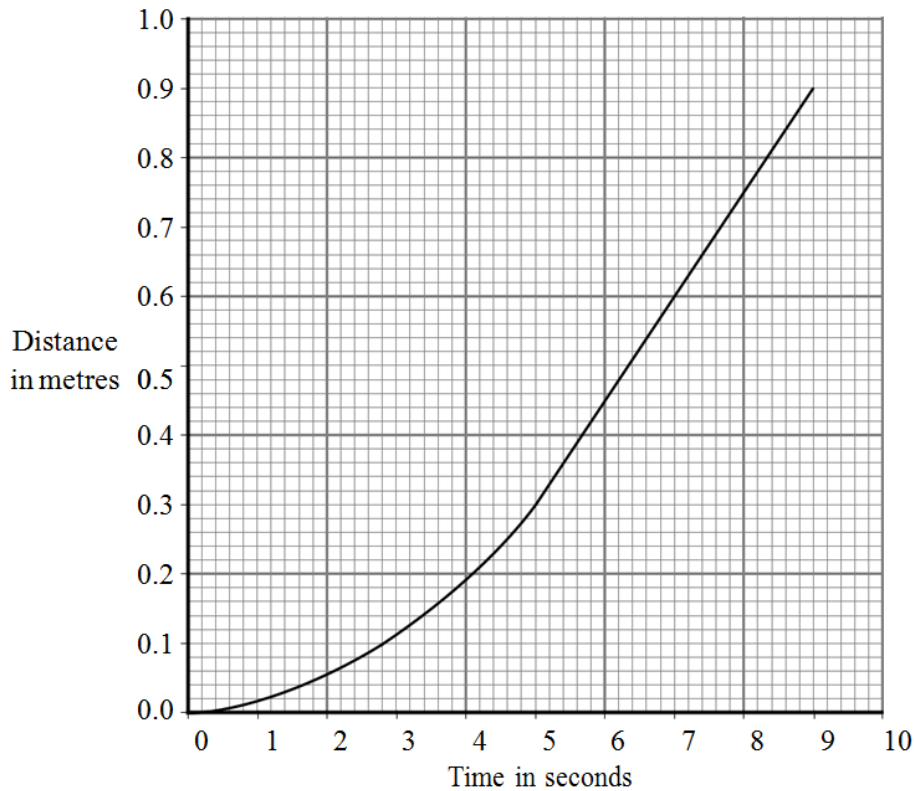

Oil

What causes force L?

_____

(1 mark)

(b) The distance – time graph represents the motion of the ball-bearing as it falls through the oil.

(b)(i) Explain, in terms of the forces, L and M, why the ball-bearing accelerates at first but then falls at constant speed.

_____

_____

_____

_____

(3 marks)

(b)(ii) What name is given to the constant speed reached by the falling ball-bearing?

_____

(1 mark)

(b)(iii) Calculate the constant speed reached by the ball-bearing.

Show clearly how you use the graph to work out your answer.

_____
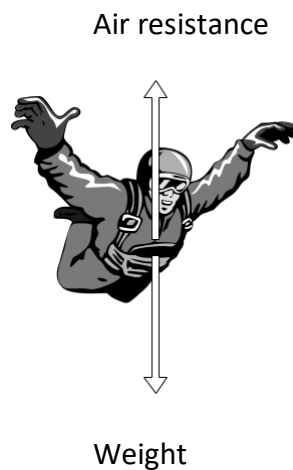
_____

_____

Speed = _____ m/s

(2 marks)

Q:2 **(a)** The diagram shows the forces acting on a parachutist in free fall.

Air resistance

Weight

The parachutist has a mass of 75 kg. Calculate the weight of the parachutist

gravitational field strength = 10 N/kg

Use the correct equation from the Physics Equations Sheet. Show clearly how you work out your answer and give the unit.

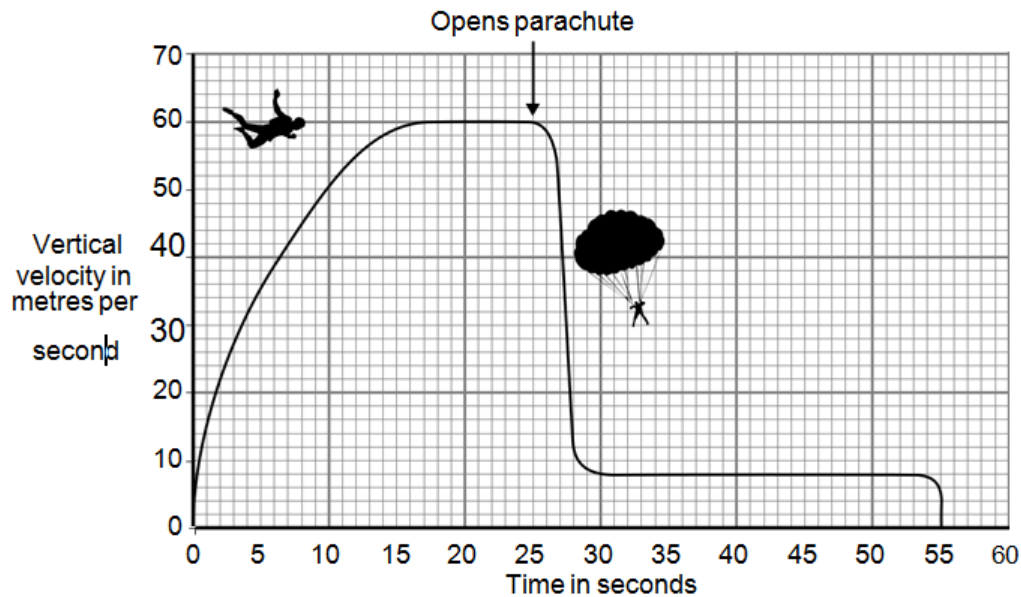_____

_____

Weight = _____

(3 marks)

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

The graph shows how the vertical velocity of a parachutist changes from the moment the parachutist jumps from the aircraft until landing on the ground.

Using the idea of forces, explain why the parachutist reaches a terminal velocity and why opening the parachute reduces the terminal velocity.

_____

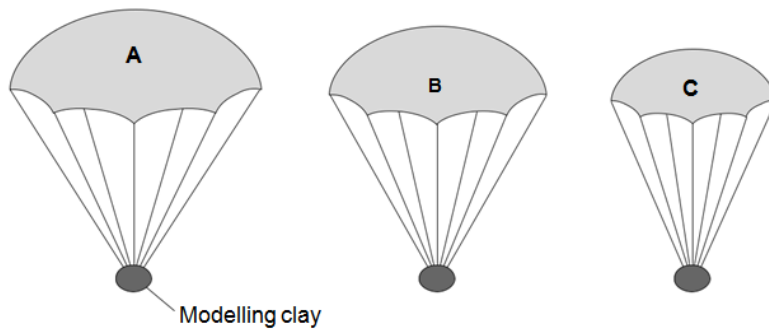_____

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(6 marks)

(c) A student wrote the following hypothesis.

'The larger the area of a parachute, the slower a parachutist falls.'

To test this hypothesis the student made three model parachutes, A, B and C, from one large plastic bag. The student dropped each parachute from the same height and timed how long each parachute took to fall to the ground.

(c) (i) The height that the student dropped the parachute from was a control variable.

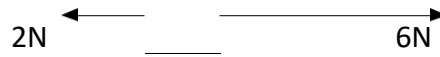Name one other control variable in this experiment.

_____

(1 mark)

(c) (ii) Use the student's hypothesis to predict which parachute, A, B or C, will hit the ground first.

Give a reason for your answer.

_____

_____

_____

(2 marks)

Q:3 **(a)** The diagram shows two forces acting on an object.

2N ←————   ————→ 6N

What is the resultant force acting on the object?

Tick (☑) one box.

8 N to the right ☐
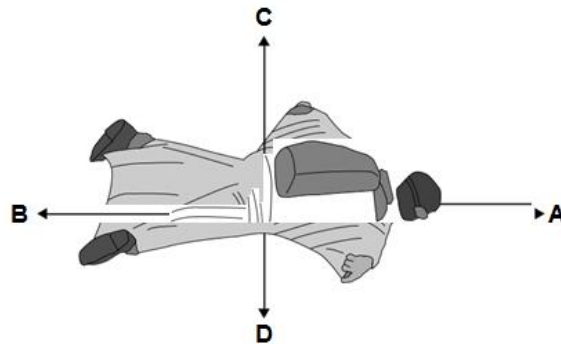
8 N to the left ☐

4 N to the right ☐

4 N to the left ☐

(1 mark)

(b) BASE jumpers jump from very high buildings and mountains for sport.

The diagram shows the forces acting on a BASE jumper in flight.

The BASE jumper is wearing a wingsuit.

(b) (i) Draw a ring around the correct answer in the box to complete each sentence.

The BASE jumper accelerates forwards when force A is

smaller than
equal to force B.
bigger than

The BASE jumper falls with a constant speed when force C is

smaller than
equal to force D.
bigger than

(2 marks)

(b) (ii) To land safely the BASE jumper opens a parachute.

Parachute

What effect does opening the parachute have on the speed of the falling BASE jumper?

_____

Give a reason for your answer.

_____

_____

(2 marks)

TOTAL MARKS=24