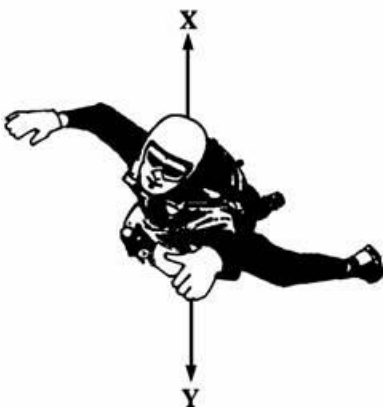
Terminal velocity



1. A sky-diver jumps from a plane.

   The sky-diver is shown in the diagram.

   (a) Arrows **X** and **Y** show two forces acting on the sky-diver as he falls.

   (i) Name the forces **X** and **Y**.

   X .....

   Y ..... **(2)**

   (ii) Explain why force **X** acts in an upward direction.

   .....

   ..... **(1)**

   (iii) At first forces **X** and **Y** are unbalanced.

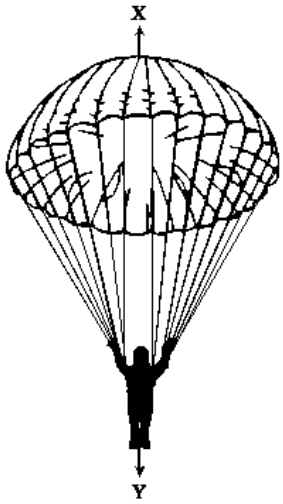
   Which of the forces will be bigger? ..... **(1)**

   (iv) How does this unbalanced force affect the sky-diver?

   .....

   ..... **(2)**

   (b) After some time the sky-diver pulls the rip cord and the parachute opens.



   The sky-diver and parachute are shown in the diagram.

   After a while forces **X** and **Y** are balanced.

   Underline the correct answer in each line below.

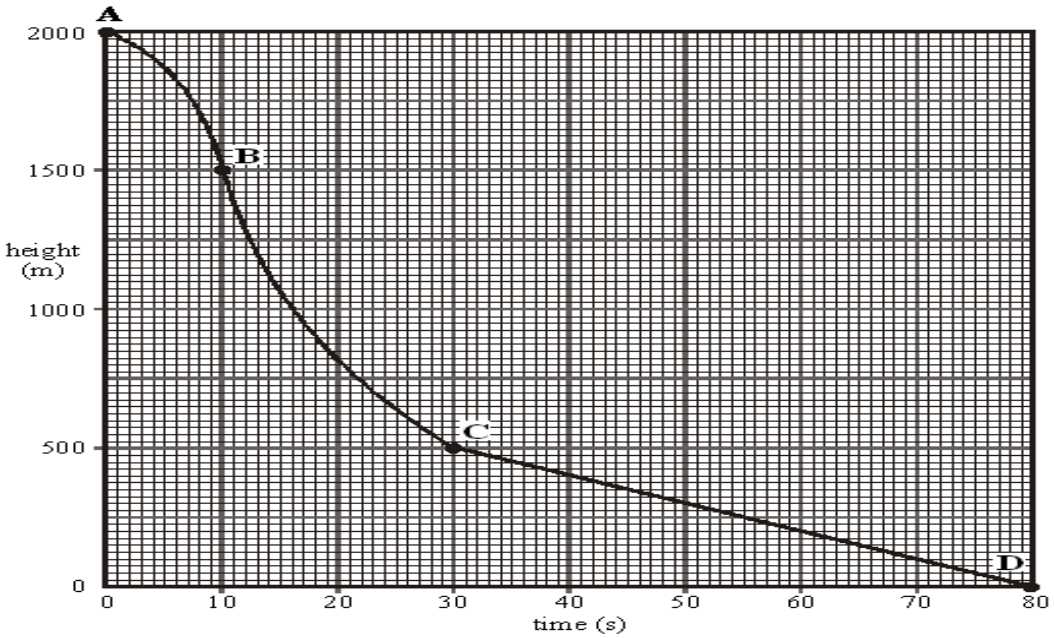
   Force **X** has…*increased / stayed the same / decreased.*

   Force **Y** has…*increased / stayed the same / decreased.*

   The speed of the sky-diver will…*increase / stay the same / decrease.*

   (3)

(c) The graph shows how the height of the sky-diver changes with time.



(i) Which part of the graph, **AB**, **BC** or **CD** shows the sky-diver falling at a constant speed? ..... **(1)**

(ii) What distance does the sky-diver fall at a constant speed?

Distance ..... m **(1)**

(iii) How long does he fall at this speed?

Time ..... s **(1)**

(iv) Calculate this speed.

.....

.....

Speed ..... m/s **(2)**

2. If a parachutist has a greater weight, explain how the terminal velocity of a parachutist will change at each stage (compared to a lighter parachutist):

a) At the initial fall

..... **(1)**

b) A few seconds after falling

..... **(1)**

c) When he/she has reached terminal velocity

..... **(2)**

(Total 18 marks)

(a) (i) air resistance/drag/friction (or upthrust)
weight/gravitational pull/gravity
for 1 mark each

1

(ii) air resistance/friction acts in opposite direction to motion

1

(iii) Y

1

(iv) the sky-diver accelerates/his speed increases
in downward direction/towards the Earth/falls
for 1 mark each

2

(b) force X has increased force Y has stayed the same the speed of the sky-diver will stay the same
for 1 mark each

3

(c) (i) CD

1

(ii) 500
(iii) 50
} (but apply e.c.f. from (i))

3

(iv) 10 (but apply e.c.f. from (ii) and (iii))
gets 2 marks

or 500/50 or d/t
gets 1 mark

2

[14]