5.

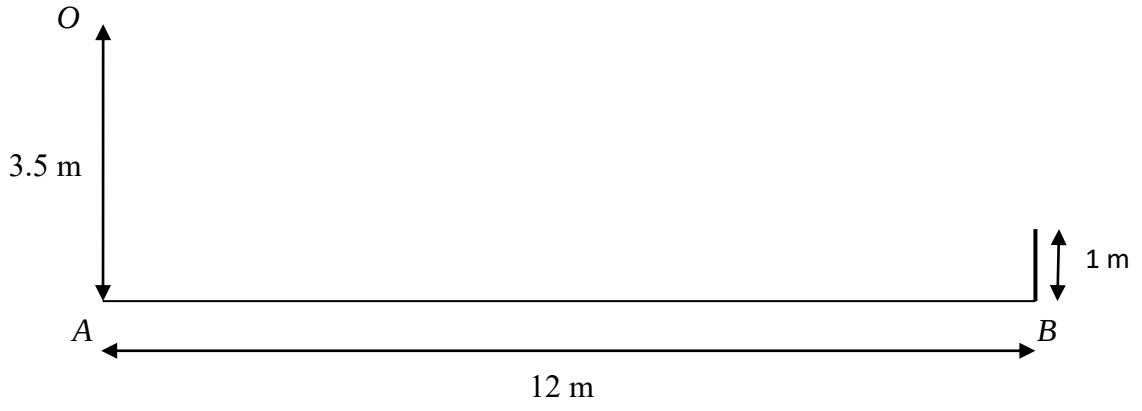

Figure 3

A tennis player serves a ball so as to pass over the net. The ball is given an initial velocity of 45 m s^{-1} in a direction 10° below the horizontal. The ball is struck at a point O which is 3.5 m vertically above the point A which is on horizontal ground. The bottom of the net is the point B which is on the ground and AB = 12 m. The height of the net is 1 m, as shown in Figure 3.

The ball is modelled as a particle moving freely under gravity. The ball passes over the net at a point which is vertically above B.

Using the model, find

(a) in centimetres to 2 significant figures, the distance between the ball and the top of the net, as the ball passes over the net,

(8)

(b) to 2 significant figures, the speed of the ball as it passes over the net.

(4)

(c) State two limitations of the model that could affect the reliability of your answers.

(2)

(Total 14 marks)