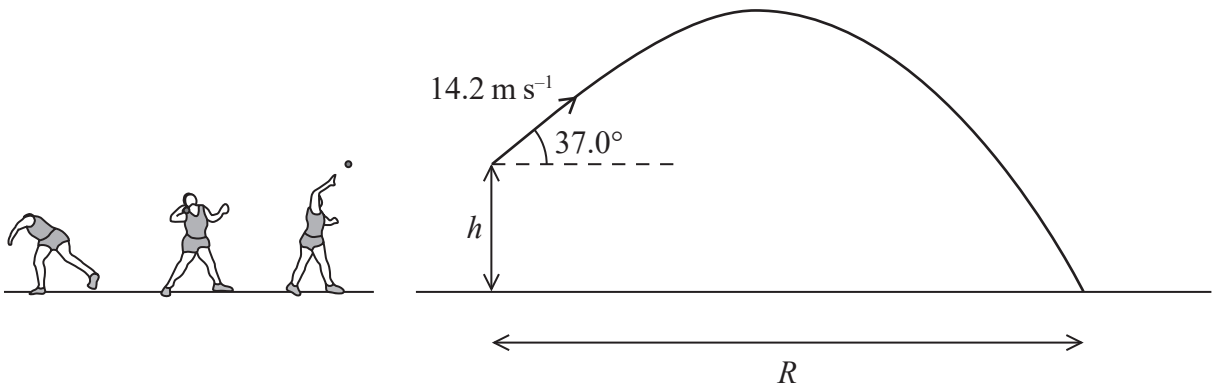
12 The shot put is an Olympic field event. The distance for the women's world record shot put is in excess of twenty two metres.

The shot is a metal ball, which is thrown from a standing position so that it lands on the ground a horizontal distance R away from the thrower.



A shot is thrown from a height h above the ground with an initial velocity of 14.2 m s^{-1} at an angle of 37.0° to the horizontal. The time it takes for the shot to reach the ground is 1.98 s.

(a) Show that the vertical component of the initial velocity is about 8.6 m s^{-1}.

(2)

(b) Calculate the height h above the ground from which the shot was thrown.

(3)

h = ...

(c) Calculate the horizontal distance R for this throw.

(3)

R = ...

(Total for Question 12 = 8 marks)