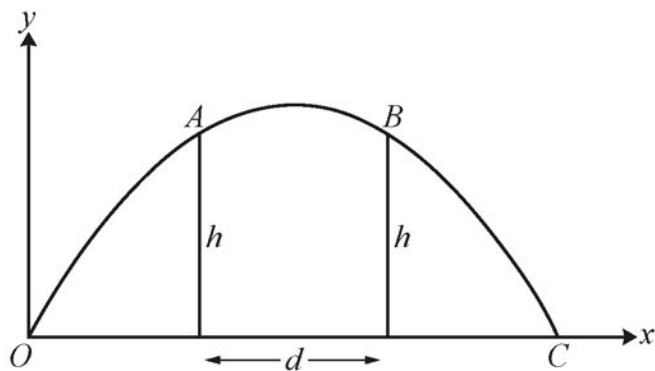**11**

A particle P moves freely under gravity in the plane of a fixed horizontal axis Ox, which lies on horizontal ground, and a fixed vertical axis Oy. P is projected from O with a velocity whose components along Ox and Oy are U and V, respectively. P returns to the ground at a point C.

(a) Determine, in terms of U, V and g, the distance OC. **[4]**

P passes through two points A and B, each at a height h above the ground and a distance d apart, as shown in the diagram.

(b) Write down the horizontal and vertical components of the velocity of P at A. **[2]**

(c) Hence determine an expression for d in terms of U, V, g and h. **[3]**

(d) Given that the direction of motion of P as it passes through A is inclined to the horizontal at an angle θ, where $\tan \theta = \frac{1}{2}$, determine an expression for V in terms of g, d and h. **[4]**