

QUES 04:-

Ans:-

Two particles are projected from the same point with the same speed u such that they have the same range R , but different maximum heights, h_1 and h_2 . Which of the following is correct? [Main 12 April 2019 (II)]

- (a) $R^2 = 4 h_1 h_2$ (b) $R^2 = 16 h_1 h_2$
(c) $R^2 = 2 h_1 h_2$ (d) $R^2 = h_1 h_2$

(b) For same range, the angle of projections are : θ and $90^\circ - \theta$. So,

$$h_1 = \frac{u^2 \sin^2 \theta}{2g} \text{ and}$$

$$h_2 = \frac{u^2 \sin^2 (90^\circ - \theta)}{2g} = \frac{u^2 \cos^2 \theta}{2g}$$

$$\text{Also, } R = \frac{u^2 \sin 2\theta}{g}$$

$$h_1 h_2 = \frac{u^2 \sin^2 \theta}{2g} \times \frac{u^2 \cos^2 \theta}{2g}$$

$$= \frac{u^2 u^2 (2 \sin \theta \cos \theta)^2}{16 g^2} = \frac{R^2}{16}$$

$$\text{or } R^2 = 16 h_1 h_2$$