

A cricket ball of mass m is hit at an angle 45° to the horizontal with velocity v . What is its kinetic energy at the topmost point?

Solution:

Gravitational acceleration change velocity amount only on the vertical component, the horizontal component then remains constant:

$$V_y \neq \text{const}, V_x = \text{const} = V \cos \alpha$$

$$\alpha = 45^\circ, \cos 45^\circ = \frac{1}{\sqrt{2}}$$

$$V_x = V \cos \alpha = \frac{V}{\sqrt{2}}$$

At the topmost point of the trajectory velocity of the body is equal to the horizontal component of the initial velocity, so that the vertical component of the velocity is zero:

$$2: V_2 = V_x = \frac{V}{\sqrt{2}} \quad (1)$$

Formula of the kinetic energy:

$$E_k = \frac{mV_2^2}{2} \quad (2)$$

$$(1) \text{ in } (2): E_k = \frac{mV_2^2}{2} = \frac{mV^2}{4} = 0.25mV^2$$

Answer: $E_k = 0.25mV^2$

