Answer on Question #56465-Physics-Mechanics-Relativity

An object is projected at 36.9 degrees above the horizontal. The potential energy of the object at the top of the trajectory is 144j. What is the kinetic energy at the top?

Solution

At the top of the trajectory the vertical speed of the projectile is zero, so

$$v_{top} = v_{topx} = v_0 \cos 36.9.$$

The kinetic energy at the top is

$$K_{top} = \frac{mv_{top}^2}{2} = \frac{mv_0^2}{2} \cos^2 36.9.$$

The total energy is

$$E = \frac{mv_0^2}{2}.$$

The potential energy of the object at the top of the trajectory is

$$P_{top} = E - K_{top} = \frac{mv_0^2}{2} - \frac{mv_0^2}{2} \cos^2 36.9 = \frac{mv_0^2}{2} \sin^2 36.9 = 144 \text{ J}.$$

The kinetic energy at the top is

$$K_{top} = P_{top} \cot^2 36.9 = 144 \cot^2 36.9 = 255\, J.$$

Answer: $255\ J$.

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