Answer on Question 69769, Physics, Other

Question:

A projectile is launched at an angle of 30° and a speed of $30\ m/s$. How long did it spend in the air?

Solution:

We can find the time of flight of the projectile from the equation of motion:

$$y = v_0 t sin\theta - \frac{1}{2} g t^2,$$

here, v_0 is the initial speed of the projectile, θ is the launch angle, g is the acceleration due to gravity, y is the height of the projectile above the ground and t is the time of flight of the projectile.

Since the projectile returns to the horizontal axis (after flight it falls to the ground), $y = 0$, and we get:

$$v_0 t sin\theta - \frac{1}{2} g t^2 = 0,$$

$$v_0 t sin\theta = \frac{1}{2} g t^2,$$

$$t = \frac{2 v_0 sin\theta}{g} = \frac{2 \cdot 30\ \frac{m}{s} \cdot sin30^{\circ}}{9.8\ \frac{m}{s^2}} = 3.06\ s.$$

Answer:

$t = 3.06\ s.$