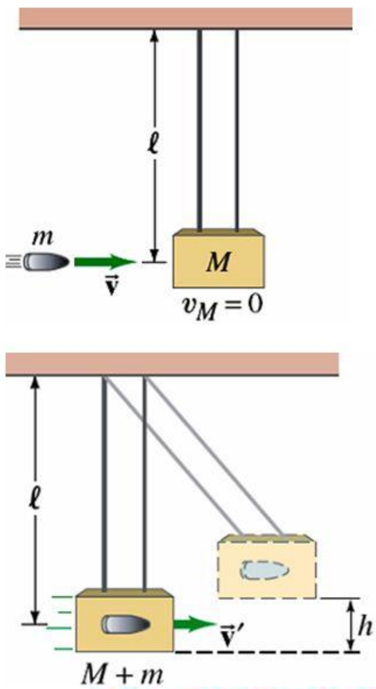
AP Physics
Instructor: Mr. Butler

The Ballistic Pendulum
Applying Momentum-Energy Conservation

Using Momentum and Energy Conservation Principles

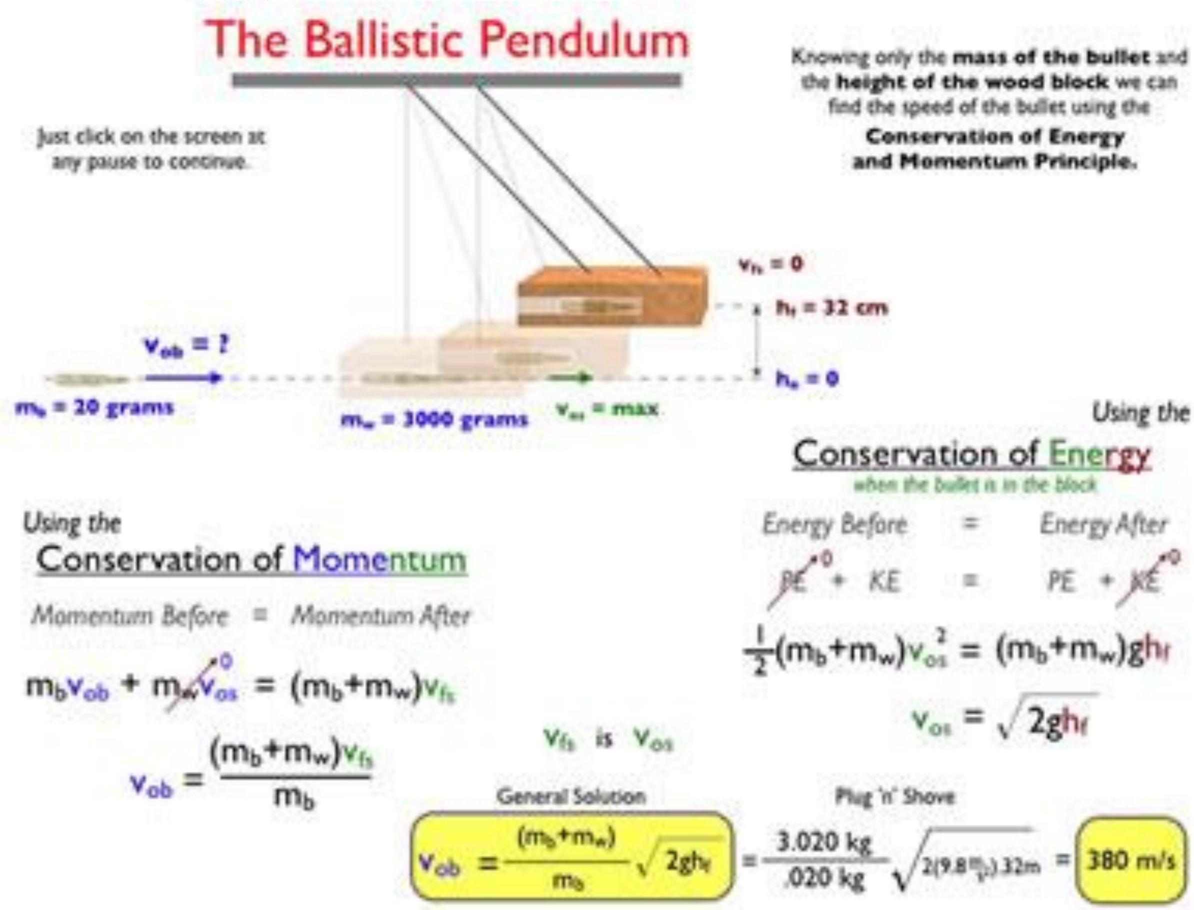
Example 7-10: Ballistic pendulum

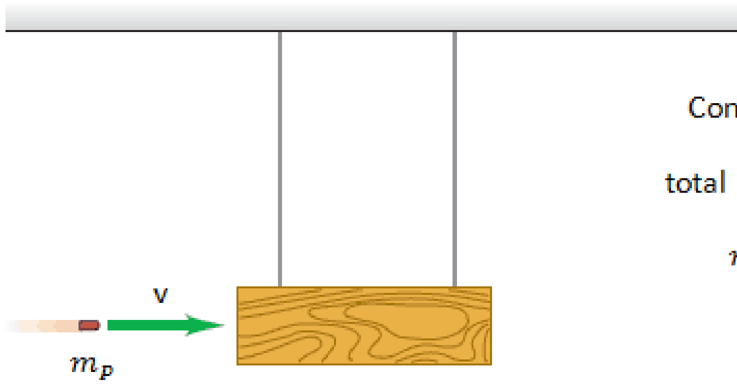


The ballistic pendulum is a device used to measure speeds of projectiles, such as a bullet.

A projectile, mass **m**, is fired into a large block, mass **M**, which is suspended like a pendulum. After the collision, pendulum & projectile swing up to a maximum height **h**.

Find the relation between the initial horizontal speed of the projectile, **v** & the maximum height **h**.



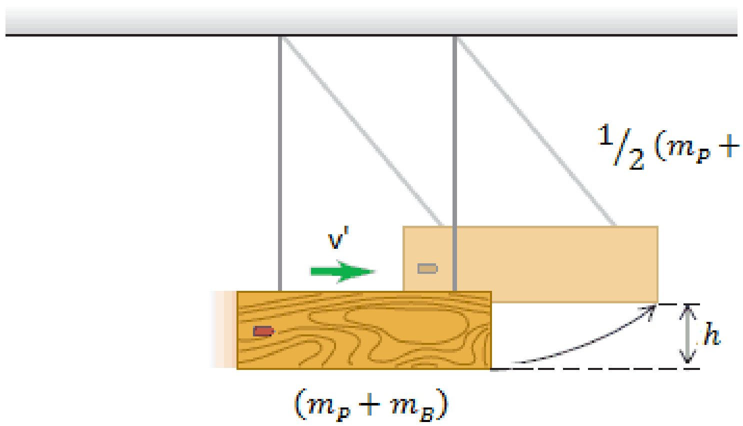


Conservation of Momentum

total P before = total P after

$$m_p v = (m_p + m_B)v'$$

$$v' = \frac{m_p}{(m_p + m_B)} v$$



Conservation of Energy

$$\frac{1}{2}(m_p + m_B)v'^2 + 0 = 0 + (m_p + m_B)gh$$

$$v = \frac{(m_p + m_B)}{m_p}\sqrt{2gh}$$