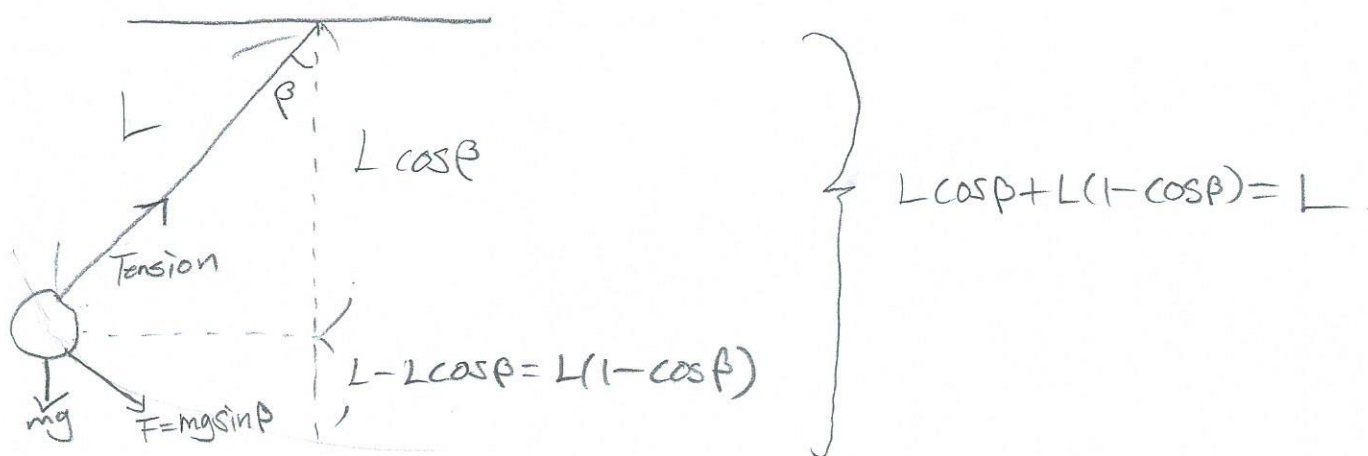


Chap. 13 The Pendulum

- Simple pendulum

• The period of the pendulum is independent of mass.



Potential energy, $U = mgh_{\max} = mgL(1 - \cos\beta)$ } $U + K = \text{const}$
 Kinetic energy, $K = \frac{1}{2}mv_{\max}^2$

$$U + K = \text{const} = \underbrace{mgh_{\max} + 0}_{\text{Same time}} = \underbrace{0 + \frac{1}{2}mv_{\max}^2}_{\text{Different time}}$$

$$\frac{1}{2}mv^2 + mgh = mgh_{\max}$$

$$\frac{1}{2}mv^2 = mgh_{\max} - mgh$$

$$\frac{1}{2}v^2 = g(h_{\max} - h)$$

$$v^2 = 2g(h_{\max} - h)$$

$$v = \sqrt{2g(h_{\max} - h)}$$

$$h = L(1 - \cos\beta)$$

$$= \sqrt{2g(L(1 - \cos\beta_{\max}) - L(1 - \cos\beta))}$$

$$v = \sqrt{2gL(\cos\beta - \cos\beta_{\max})}$$