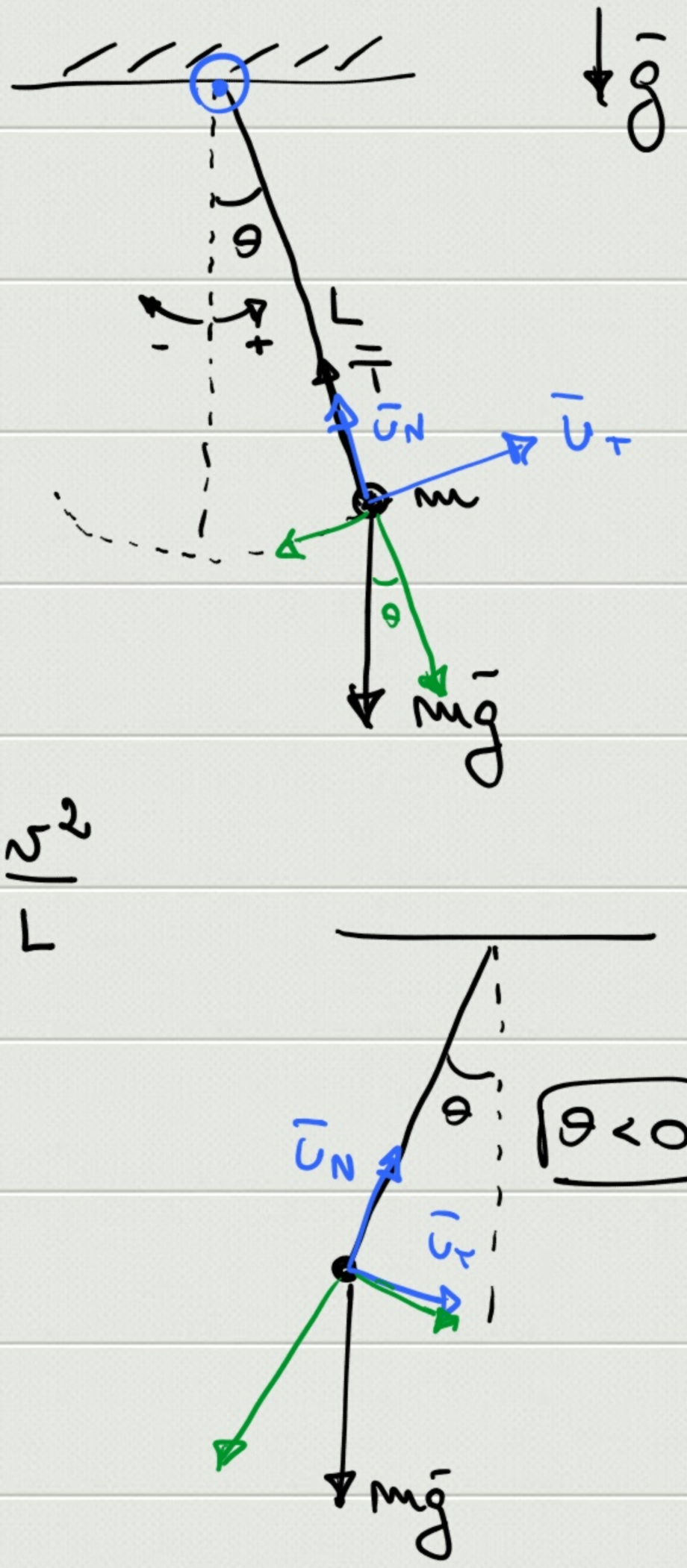
Pendolo semplice



$$m\bar{g} + \bar{T} = m\bar{a} = m(\bar{a}_T + \bar{a}_N)$$

$$\bar{U}_T : \boxed{-mg\sin\theta = m a_T} \quad *$$

$$\bar{U}_N : -mg\cos\theta + T = m a_N = m\frac{v^2}{L}$$

$$a_T = \alpha L = \frac{d^2\theta}{dt^2} L$$

$$\bar{U}_T : \quad \frac{d^2\theta}{dt^2} L = -g\sin\theta$$

$$\frac{d^2\theta}{dt^2} + \frac{g}{L}\sin\theta = 0$$

piccole oscillazioni : $\boxed{\sin\theta \simeq \theta} - \frac{\theta^3}{3!} + \dots$

$\theta < 14^\circ \Rightarrow \sin\theta \simeq \theta$ $\qquad \frac{g}{L} = \omega^2$

$$\boxed{\frac{d^2\theta}{dt^2} + \omega^2\theta = 0}$$

$$\boxed{\theta(t) = \theta_0 \sin(\omega t + \phi)}$$

$$\boxed{T = \frac{2\pi}{\omega} = 2\pi\sqrt{\frac{L}{g}}}$$

$$s(t) = \theta(t)\, L = L\theta_0 \sin(\omega t + \phi)$$

$$v(t) = \frac{ds}{dt} = L\theta_0 \omega \cos(\omega t + \phi)$$

$$T = mg\cos\theta + m\frac{v^2}{L} = T(t)$$