

Accelerated pendulum

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Solution: The force accelerating the car is,

$$\mathbf{F}_{car} = m\mathbf{a} \quad \text{with} \quad a = g \sin \alpha .$$

The effective force acting on the pendulum suspended inside the cart is,

$$\mathbf{F}_{eff} = m\mathbf{g} - m\mathbf{a} \quad \text{with} \quad F_{eff} = gm \cos \alpha .$$

where \mathbf{a} is the acceleration of the cart along the plane. Hence, the pendulum's oscillation frequency is,

$$\omega_0 = \sqrt{\frac{g_{eff}}{L}} = \sqrt{\frac{g \cos \alpha}{L}} .$$

