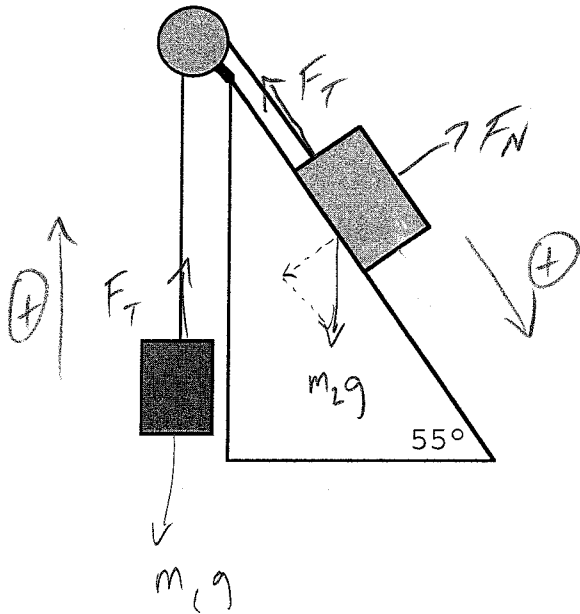


Physics 10154 - Exam #4B

Each problem is worth 50 points. Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work (or if some parts are incorrect) even if you get the right answer. Clearly indicate your answer with a circle or box and remember to include correct units and significant figures.

1. Starting from rest, a hanging 25-kg wooden crate is lifted using the apparatus shown. The mass on the frictionless incline is 34-kg. How many seconds does it take for the 25-kg crate to rise through a vertical distance of 3.0 meters?



$$\Sigma F_1 = F_T - m_1 g = m_1 a$$

$$\Sigma F_{2,\parallel} = m_2 g \sin 55 - F_T = m_2 a$$

$$F_T = m_1 a + m_1 g$$

$$m_2 g \sin 55 - m_1 a - m_1 g = m_2 a$$

$$m_2 g \sin 55 - m_1 g = (m_1 + m_2) a$$

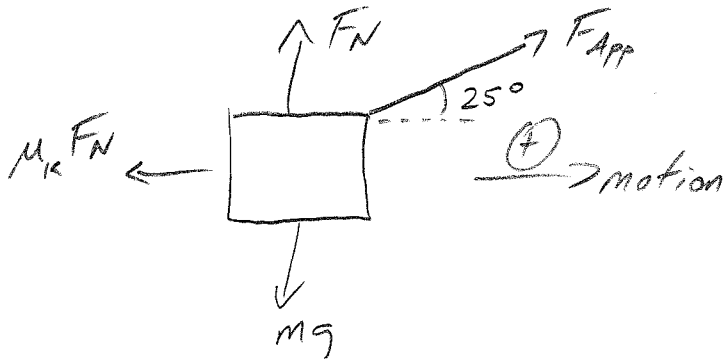
$$a = \frac{m_2 g \sin 55 - m_1 g}{m_1 + m_2} = \frac{273 - 245}{25 + 34} = 0.475 \text{ m/s}^2$$

$$\Delta s = v_0 t + \frac{1}{2} a t^2$$

$$3.0 = \frac{1}{2} (.475) t^2$$

$$t = 3.6 \text{ s}$$

2. A 950-Newton crate is being pulled across a rough surface at a constant speed by an applied force of 440 Newtons directed 25° above the horizontal. Find the coefficient of kinetic friction between the crate and the surface.



$$m = \frac{950}{9.8} = 96.9 \text{ kg}$$

$$\Sigma F_x = F_{\text{App}} \cos 25 - \mu_k F_N = ma$$

$$\Sigma F_y = F_N + F_{\text{App}} \sin 25 - mg = 0$$

$$F_N = mg - F_{\text{App}} \sin 25$$

$$= 950 - 440 \sin 25 = 764 \text{ N}$$

$$440 \cos 25 - \mu_k (764) = (96.9)(0) \quad \begin{matrix} a=0 \\ \text{since} \\ v=\text{const} \end{matrix}$$

$$\mu_k = \frac{440 \cos 25}{764} = \boxed{0.52}$$