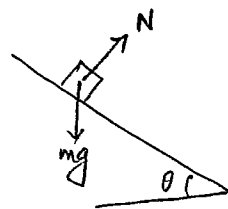


Prob. 1

$$(a) \quad mg \sin \theta = ma$$

$$a = g \sin \theta$$



$$(b) \quad N - mg \cos \theta = 0$$

$$(c) \quad a = g \sin \theta = 9.8 \sin 23 = 3.83 \frac{m}{s^2}$$

Prob. 2

$$(a) \quad mg \sin \theta - F_f = 0$$

$$(b) \quad N - mg \cos \theta = 0$$

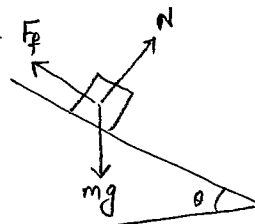
$$(c) \quad \text{At maximum angle } F_f = \mu_s N$$

$$mg \sin \theta = \mu_s N$$

$$mg \sin \theta = \mu_s mg \cos \theta$$

$$\tan \theta = \mu_s$$

$$\theta = \tan^{-1} \mu_s = \tan^{-1} 0.40 = 21.8^\circ$$

Prob. 3

$$a_c = \omega^2 R$$

$$= (5.0)^2 6.00$$

$$= 150 \frac{m}{s^2}$$

Prob. 4

$$W_T = T \Delta x \cos 90 = 0.$$

Prob. 5

$$\frac{1}{2} m v_A^2 + m g h_A = \frac{1}{2} m v_c^2 + m g h_c$$

$$\begin{aligned} v_c &= \sqrt{v_A^2 + 2g(h_A - h_c)} \\ &= \sqrt{(5.0)^2 + 2 \times 9.8(50 - 40)} \\ &= 14.9 \frac{m}{s} \end{aligned}$$

Prob. 6

$$\begin{aligned} \frac{1}{2} m v_A^2 + m g h_A + \frac{1}{2} k x_A^2 &= \frac{1}{2} m v_c^2 + m g h_c + \frac{1}{2} k x_c^2 \\ m g h_A &= \frac{1}{2} k x_c^2 \\ 30.0 \times 9.8 \times 1.0 &= \frac{1}{2} 4.0 \times 10^4 x_c^2 \\ x_c &= 0.12 \text{ m} = 12 \text{ cm} \end{aligned}$$

Prob. 7

$$\begin{aligned} m_1 v_{1i} + m_2 v_{2i} &= m_1 v_{1f} + m_2 v_{2f} \\ m_2 &= -m_1 \frac{v_{1f}}{v_{2f}} = - \frac{48 \times 0.60}{(-0.90)} = 32 \text{ kg} \end{aligned}$$

Prob. 8

$$m_1 v_{1i} + m_2 v_{2i} = m_1 v_{1f} \cos 60 + m_2 v_{2f}$$

$$\begin{aligned} v_{2f} &= - \frac{m_1 v_{1f} \cos 60}{m_2} \\ &= - \frac{3.60 \times 10^{-3} \times 600.0 \times \cos 60}{110.0} \\ &= - 8.2 \frac{m}{s} \end{aligned}$$

