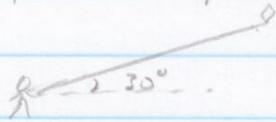


Chapter 10 6, 22, 30, 60



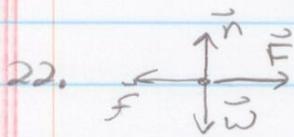
$T = 4.5 \text{ N}$



a. $W = F_i \cdot \Delta x$ $\Delta x = 0$ if he's standing still
 $W = 0$

b. If he walks away from the kite Force & Δx are in opposite directions. The kite resists his motion.
 $W = T \cos 30^\circ \cdot (-11 \text{ m})$
 $= 4.5 \text{ N} \cos 30^\circ (-11 \text{ m}) = -43 \text{ Nm}$ or $\boxed{-43 \text{ J}}$

c. If he walks towards the kite Δx is +. The kite actually helps him move.
 $W = 4.5 \text{ N} \cos 30^\circ 11 \text{ m} = \boxed{43 \text{ J}}$



$\sum F_y = n - w = 0$

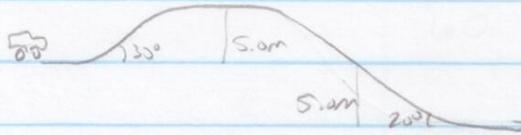
$\sum F_x = F - f = ma$

$f = \mu n$ $n = w = mg$
 $F = \mu mg = 0.15 \cdot 23 \text{ kg} \cdot 9.8 \text{ m/s}^2 = 33.8 \text{ N}$

$W = f \cdot \Delta x = -33.8 \text{ N} \cdot 14 \text{ m} = -473 \text{ Nm} = \boxed{-473 \text{ J}}$

↑ friction and displacement are opposite directions

30.



$$m = 1500 \text{ kg}$$

$$v_i = 10.0 \text{ m/s}$$

Assume no friction.

- a. Use conservation of energy. If all the car's kinetic energy is converted to potential, will it get at least as high as the top of the hill, 5.0m?

$$\frac{1}{2} m v^2 = \frac{1}{2} 1500 \text{ kg} (10.0 \text{ m/s})^2 = 75,000 \text{ J}$$

$$mgh = 1500 \text{ kg} \cdot 9.8 \text{ m/s}^2 \cdot 5.0 \text{ m} = 73,500 \text{ J}$$

This shows that the car has more kinetic energy than the increase in gravitational potential to climb the hill. Therefore - it makes it!

- b. Again mechanical energy conservation.

$$K_i + U_{g_i} = K_f + U_{g_f}$$

I'm going to make the lowest point on the hill my $h=0$ for this part. You can use any point you want as long as you measure h the all the same point.

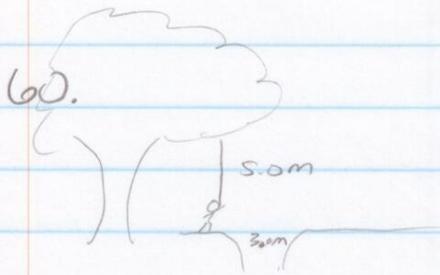
$$\frac{1}{2} m v_i^2 + mgh_i = \frac{1}{2} m v_f^2 + mgh_f = 0$$

$$\frac{1}{2} m v_i^2 + mgh_i = v_f^2$$

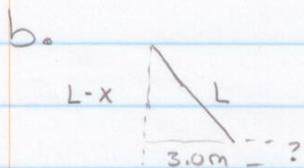
$$v_i^2 + 2gh_i = v_f^2$$

$$(10.0 \text{ m/s})^2 + 2 \cdot 9.8 \text{ m/s}^2 \cdot 5.0 \text{ m} = v_f^2$$

$$198 \text{ m}^2/\text{s}^2 = v_f^2 = \boxed{14 \text{ m/s}}$$



a. Kinetic is converting to potential energy



$$(L-x)^2 + (3.0\text{m})^2 = L^2$$

$$(5-x)^2 = 25-9$$

$$(5-x)^2 = 16$$

$$5-x = 4$$

$$\boxed{x = 1\text{m}}$$

c. The question wants her minimum speed to make it across. If she runs faster, she'll clear it by more.

Conservation of energy

$$K_i = U_{gF}$$

$$\frac{1}{2}mv^2 = mgh_f$$

$$v^2 = 2gh_f$$

$$v^2 = \sqrt{2 \cdot 9.8 \text{ m/s}^2 \cdot 1.0\text{m}}$$

$$= \boxed{4.4 \text{ m/s}}$$