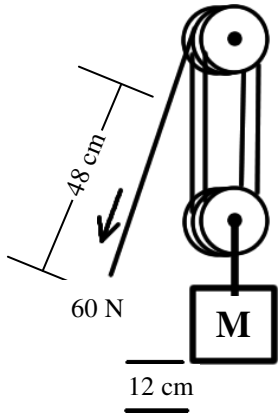


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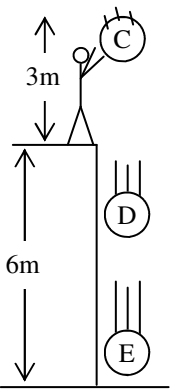
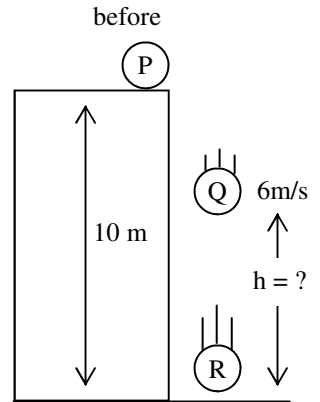
Period: _____

Advanced Conservation of Energy



1. Using a pulley system a person pulls 48cm and with 60N to lift an object 12cm.
 - A. Convert all numbers to standard units on the diagram.
 - B. What kind of energy is the object gaining?
 - C. Where does it come from?
 - D. Write the Conservation of Energy equation:
 - E. Solve for the mass of the object.
 - F. If it was lifted in 5.5 seconds, how much power was used?

2. A mass is dropped from 10m. At what height above the ground will it be going 6m/s?
 - A. At letter Q what kind of energy does it have?
 - B. Write the Conservation of Energy equation:
 - C. Solve for the height at Q.

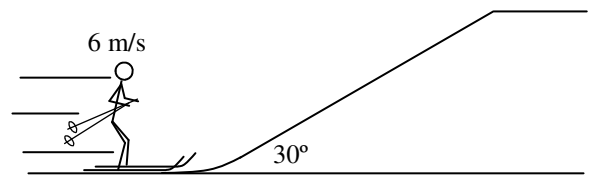


3. Slim Jim is standing on a 6m tall ledge and holds a 1.5kg ball 3m above his head. He drops the ball to the ground below. This time there is air friction.
 - A. How much total energy does the ball have when he holds it above his head?

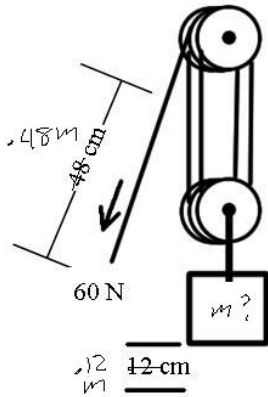
The ball is moving 11m/s just before it hits the ground, due to air friction.

 - B. How far does it fall?
 - C. How far does air friction act on the ball?
 - D. $E_{\text{before}} = \underline{\hspace{2cm}}$ $\text{Work?} = \underline{\hspace{2cm}}$ $E_{\text{after}} = \underline{\hspace{2cm}}$
 - E. Conservation of Energy equation:
 - F. Solve for the force of air friction.

4. Always the consummate outdoorsman, Slim Jim is skiing 6m/s when he begins to ski up a ramp that is tilted at 30°.
 - A. Using Conservation of Energy, calculate how high he goes.
 - B. Now that you have his vertical distance, calculate how far up the ramp he goes.



Advanced Conservation of Energy



1. Using a pulley system a person pulls 48cm and with 60N to lift an object 12cm.
 A. Convert all numbers to standard units on the diagram.

- B. What kind of energy is the object gaining? E_p
 C. Where does it come from? $+W$ (on the rope)
 D. Write the Conservation of Energy equation: $W = E_p$
 E. Solve for the mass of the object.

$$Fd = mgh$$

$$60(.48) = m(10)(.12) \quad \rightarrow \quad 28.8 = 1.2m$$

$$m = 24 \text{ kg}$$

- F. If it was lifted in 5.5 seconds, how much power was used?

$$P = \frac{W}{t} = \frac{60(.48)}{5.5} = 5.24 \text{ watts}$$

2. A mass is dropped from 10m. At what height above the ground will it be going 6m/s?

- A. At letter Q what kind of energy does it have? $E_p + E_k$

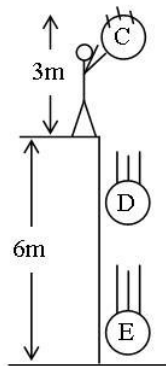
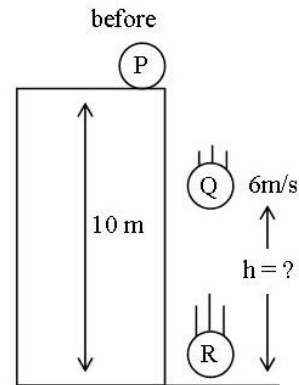
- B. Write the Conservation of Energy equations: $E_p = E_p + E_k$
 $mgh = mgh + \frac{1}{2}mv^2$
 m's cancel

$$10(10) = 10(h) + \frac{1}{2}36$$

$$100 = 10h + 18$$

$$82 = 10h$$

$$8.2m = h$$



3. Slim Jim is standing on a 6m tall ledge and holds a 1.5kg ball 3m above his head. He drops the ball to the ground below. This time there is air friction.

- A. How much total energy does the ball have when he holds it above his head?

$$h = 9m \quad \text{so, } mgh = 1.5(10)(9) = 135 \text{ J}$$

The ball is moving 11m/s just before it hits the ground, due to air friction.

- B. How far does it fall? 9m C. How far does air friction act on the ball? 9m

D. $E_{\text{before}} = E_p$ Work? = $-W$ $E_{\text{after}} = E_k$
 E. Conservation of Energy equation: $E_p - W = E_k$
 F. Solve for the force of air friction.

$$135 - 90.75 = 9F$$

$$44.25 = 9F$$

$$F = 4.92 \text{ N}$$

$$mgh - Fd = \frac{1}{2}mv^2 \quad \frac{m}{s} \quad \text{DON'T cancel}$$

$$1.5(10)(9) - F(9) = \frac{1}{2}(1.5)(11^2)$$

$$135 - 9F = 90.75$$

4. Always the consummate outdoorsman, Slim Jim is skiing 6m/s when he begins to ski up a ramp that is tilted at 30°.

- A. Using Conservation of Energy, calculate how high he goes.

$$E_k = E_p$$

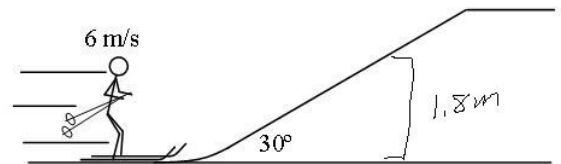
$$\frac{1}{2}mv^2 = mgh$$

$$\frac{1}{2}(6^2) = 10h$$

$$\frac{1}{2}36 = 10h$$

$$18 = 10h$$

$$h = 1.8 \text{ m}$$



- B. Now that you have his vertical distance, calculate how far up the ramp he goes.

$$\sin \theta = \frac{\text{Opp}}{\text{Hyp}}$$

$$\sin 30^\circ = \frac{1.8}{H}$$

$$H = \frac{1.8}{.5} = 3.6 \text{ m}$$