Ch. 8 Homework

for Exam #2

Questions 2, 6, 9
Problems 1, 2, 5

Extra Problem: Sister walks steadily by at 0.5m/s with 2 cookies. Little brother (m = 20 kg) can get a cookie if he runs & catches her. How much work does he do?

Questions

2) \( F = 20,000 \text{ N} \quad d = 100 \text{ m} \quad W = Fd = 2000,000 \text{ J} \)

\[
\text{Power} = \frac{\text{Work}}{\text{Time}}
\]

Crane #1  \( \text{Power} = \frac{2 \times 10^6 \text{ J}}{t} \)

Crane #2  \( \text{Power} = \frac{2 \times 10^6 \text{ J}}{\frac{1}{3}t} = 3 \left(2 \times 10^6 \text{ J}\right) \)

Crane #2 has 3x more power than Crane #1

6) Kinds of energy

a) Water behind dam - potential
b) Swinging pendulum - potential + kinetic
c) Apple on a tree - potential
d) Space shuttle in orbit - kinetic + potential
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Q. 9.

\[
\begin{align*}
K_E_A &= \frac{1}{2} m v^2 \\
K_E_B &= \frac{1}{2} \left( \frac{1}{2} m \right) (2v)^2 \\
&= \frac{1}{4} m 4v^2 \\
&= m v^2 \\
\end{align*}
\]

\[
\boxed{K_E_B = 2 \times K_E_A}
\]

Problems

1.

\[
W = F \cdot d_{vert} = mg \cdot h = (65 \text{kg})(9.8 \text{m/s}^2)(3 \text{m})
\]

\[
W = 1911 \text{J}
\]

6.

60 Watt bulb

\[
\text{Power} = 60 \text{W} = \frac{\text{Work}}{\text{time}}
\]

\[
\text{Work} = 60 \text{W} (1 \text{hr})(3600 \text{sec/\text{hr}}) = 216,000 \text{J}
\]

\[
\text{c) \# Flights} = \frac{216,000 \text{J}}{1911 \text{J}} = 113 \text{flights}
\]
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P's (cont)

2) \( m = 1 \text{ kg} \)
\( v = 10 \text{ m/s} \)
\( m = 2 \text{ kg} \)
\( v = 5 \text{ m/s} \)

\[ W = \Delta KE = \frac{1}{2} m (v_f^2 - v_i^2) \]
\[ = \frac{1}{2} m [(0 - (-10 \text{ m/s}))^2] \]
\[ = \frac{1}{2} m (100 \text{ m}^2/\text{s}^2) \]
\[ = 50 \text{ kg m}^2/\text{s}^2 = 50 \text{ J} \]

\[ W_{\text{second ball would bounce}} \]

8) 150 \text{ lb} = W
\( d = 3.5 \text{ ft} \)

\[ W = F \cdot d = 150 \text{ lb} \cdot 3.5 \text{ ft} = 525 \text{ ft-lb} = W \]

Extra Problem

\( m = 20 \text{ kg} \), \( v_i = 0 \), \( v_f = 0.5 \text{ m/s} \)

\[ W = \Delta KE = \frac{1}{2} (20 \text{ kg}) [(0.5 \text{ m/s})^2 - 0] \]
\[ W = 2.5 \text{ J} \]