Work – Mechanical Energy Conservation
Class Work

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1. A 250g apple is 5 meters up in a tree. It falls and hits the ground. Answer the following questions.

   a. How much potential energy does the apple have in the tree?

   $mgh = Engy$ $0.250kg \cdot 10 \cdot 5 = 12.5J$

   b. How much work does the tree do on the apple while holding it prior to it falling?

   None

   c. How much kinetic energy does the apple have just prior to hitting the ground.

   $PE = KE = 12.5J$

   d. How fast is the ~~ball~~ Apple moving prior to hitting the ground?

   $KE = \frac{1}{2}mv^2$ $\frac{1}{2}(.250)(v)^2 = 12.5J$ $v = 10 m/s$

2. A 50kg box is being pulled across a frictionless floor for until it reaches 15m/s. Answer the following questions.

   a. How much mechanical energy does the box have at the end?

   $KE = \frac{1}{2}mv^2$ $\frac{1}{2} \cdot 15^2 \cdot 50 = 5625J$

   b. If the box was being pulled for 5 meters, how much force was being applied?

   $F \cdot d = Energy$ $\frac{Engy}{d} = F$ $\frac{5625}{5} = 1125 N$

   c. What was the acceleration of the box over the 5meters?

   $a = \frac{\Delta v}{\Delta t} = \frac{15}{?}$ $v_f^2 - v_i^2 = 2ad$ solve $\frac{(15)^2}{2 \cdot (5)} = 22.5 m/s^2$

   d. How much time did it take to travel the 5 meters?

   $v_f = v_i + at$ $\frac{v_f - v_i}{a} = t$ $\frac{15}{22.5} = 0.67 sec$

The string pulling the box is let go and the box slides onto a fractioned surface. The surface has a friction of 0.2. Answer the following questions.

   a. How much energy needs to be removed from the box before it will stop?

   $KE = TE$ see above $5625J$

   b. What is the net force and acceleration of the box while sliding on ~~this surface~~?

   $\Sigma F = F_f = \mu N = .2 \cdot 50 \cdot 10 = 100 N$ $\frac{\Sigma F}{m} = a$ $\frac{-100}{50} = -2 m/s^2$

   c. How far will the box slide?

   $KE = Mgud$ $\frac{5625}{50 \cdot 10 \cdot .2} = 56.25 m$

   d. How much time will it take to stop?

   $v_f = v_i + at$ $0 = 15 + -5(t)$ $\frac{-15}{-5} = 3 sec$