Heat/Energy (Thermal Physics)

Book Chapter: 5, 10, 11, 12
Book Pages: 117-125, 127-132, 136-140; 307-314, 333-336, 338-340; 359-363, 371-374
Practice Problems: pp 146- 149; 4, 10, 48: pp 327; 10: pp353; 4: 383; 2
Work
Gravitational Potential energy
Hooke's Law
Work energy theorem
Power
Law of Conservation of Energy
Equivalence of mass and Energy
Kinetic Energy
Potential Energy
Binding Energy
Heat
Calorie/Joule
Thermal Expansion
Equations:

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

$$PE = mgh$$

$$PE + KE = E_t = Cons\tan t$$

$$PE = -\frac{GMm}{R}$$

$$E = mc^2$$

$$Q = m\Delta TC_p$$

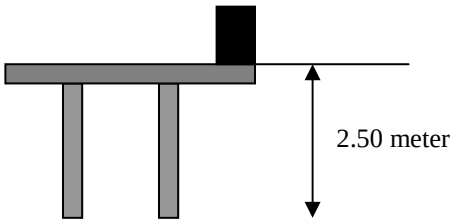
$$W_{net} = \frac{1}{2}mv^2 - \frac{1}{2}mv_0^2$$

$$F_s = -kx$$

$$P = \frac{W}{t}$$

$$\Delta L = \alpha L_o \Delta T$$

Free Response:
A 12.5 Kg iron cube is resting at the edge of a table as shown in the diagram below. The cube is 2.50 meters above the floor. The room is at a temperature of 20°C.



1) What is the gravitational potential energy of the cube?

The cube is pushed off the table at time t=0.

2) What is the kinetic energy of the cube at:
   a) time t=0?

   b) after the cube has fallen 1.25 meters?

   c) just before the cube strikes the ground?

3) If all the potential energy from a cube dropped from 500.00 m were used to heat the cube, what would the final temperature of the cube be? The specific heat of iron is .875 J/g ^{o}C.

4) If the cube, from 3, were dropped into 100.0 g of water at 5.00^{o} C what would the equilibrium temperature be?

5) Calculate the final speed of the original cube in two different ways.

6) If the total mass of the cube were converted to energy, how much energy would be produced?