Additional Problem IX for Physics 6

Converting typical kinetic energies that we are used to into thermal energy typically produces *small* rises in temperature; this was in part responsible for the difficulty in discovering the law of conservation of energy. It also implies that hot objects contain a lot of energy. (This latter comment is largely responsible for the industrial revolution in the 19th century.) To get some feel for these numbers, carry out three estimates:

a) A steel ball is dropped from a height of three meters onto a concrete floor. It bounces a large number of times but eventually comes to rest. Estimate the ball's rise in temperature.

b) Suppose the steel ball you used in part (a) is at room temperature. If you converted all its internal energy to kinetic energy, how fast would it be moving? (Give your answer in units of **miles per hour**. Also, ignore the fact that you would have to create momentum.)

c) Suppose a nickel-iron meteor falls to the earth from deep space. Estimate how much its temperature would rise on impact.