1. A meteor that falls to earth from a great distance has a speed of 11km/s. In class we found that the temperature of an iron meteor is 290,000K. We assumed all of the energy heats the meteor, and none of it is transferred to the surroundings.
    a. (3 pts.) If the meteor is made of calcium, what is the speed of the meteor? Explain.
    b. (3 pts.) If the meteor is made of calcium and the same assumptions hold, what is the temperature of the meteor? Explain.
    c. (3 pts.) Does the composition of the meteor make a big difference? Explain.
2. This question addresses the issue of whether differentiation heats a planet. (Differentiation is the process where heavy stuff, iron for example, sinks to the center of a planet.) A blob of iron sinks from the surface of earth to the center. Assume the blob does not transfer any energy to its surroundings. Assume the density of earth is uniform.
    a. (3 pts.) Find the temperature of the blob of iron after it has sunk to the center of earth.
    b. (3 pts.) Is differentiation effective for melting rock? Explain.

The potential energy of mass *m* at radius r in the interior of a planet with constant mass density ρ is

$$PE(r) = -\frac{4\pi}{3} G m \rho r^2$$