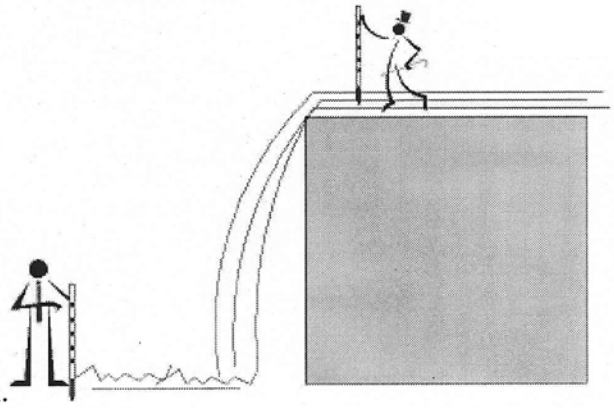
E115 Midterm#1 Sept. 29, 2006

#1 (10 points) An elemental solid has a heat capacity of 1 J/g-K.
What is the atomic weight of the element?

(a) 25
(b) 12
(c) can't tell

#2 (20 points) Consider the tin-crystallization process of question No. 3 in Problem set #2.
(a) Is the entropy change positive or negative? Explain your reasoning.
(b) Write the equations that you would use to calculate this change, but do not do any numerical work.

#3 (15 points) Joule is said to have determined the mechanical equivalent of heat by measuring the temperature difference between the water flowing over the top of a waterfall and the water in the pool at the bottom.



If the height of the waterfall is 100 m,

(a) what is the velocity at which the water enters the pool?

(b) What is the temperature rise between the two locations? The specific heat of water is 1 cal/g/°C.

#4 (15 points) In the diagram below, water in the upper vessel (1) is at 20°C. The temperature of the
two-phase mixture in the large rigid vessel (2) is100°C. The valve between the two vessels is opened briefly and then closed. The contents of the lower vessel are maintained at 100°C during this process.

(a) Does water leave or enter the large vessel?

(b) Does the pressure in the lower vessel increase, decrease or remain the same?
Explain your choice for each part.