

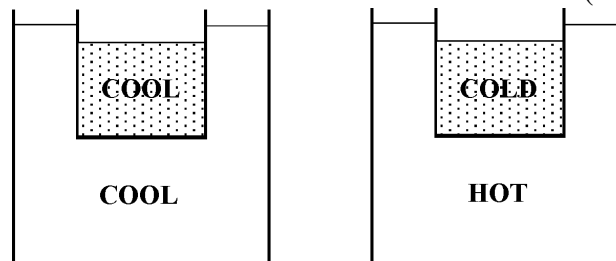
AOS 100/101  
Spring 2017

HOMWORK #2  
(Due Fri. February 17)

*Please provide concise, grammatically correct, neatly written answers to the following questions. All questions can be answered in, at most, a few sentences. Don't forget to write your name on the paper!!!*

**NAME:**

- 1) Liquid water has the peculiar property that its density is largest at 34°F. Imagine two adjacent lakes with identical surface areas. One lake is much deeper than the other. A mass of cold air rushes over the lakes in late November. Explain why the surface of the shallow lake freezes first. (HINT: Consider how conduction and convection change the temperature of the lake water).  
(10 pts.)
- 2) A sled-dog racer builds three identical igloos. One is used to store her supplies, another houses her team of 12 dogs, and the last one houses her. Which of the three igloos has the warmest internal temperature when she wakes up the next morning? Explain your answer. (HINT: Snow behaves like a *black-body* with respect to infra-red radiation.)  
(10 pts.)
- 3) In a lab experiment you note that an object experiences a steady decrease in temperature with the passage of time. If that object is absorbing 100 units of radiant energy every second, what must be true about the amount it emits? Explain your answer with reference to the concept of *radiative equilibrium*.  
(10 pts.)
- 4) An experiment is conducted in which a small beaker of fluid is placed into a larger beaker of fluid and changes in the temperatures of the fluids are observed (see Fig. 1). Which set of observations (Set 1 or Set 2) was the initial condition? Explain your answer in terms of the Second Law of Thermodynamics.  
(10 pts.)



SET 1

FIG. 1

SET 2