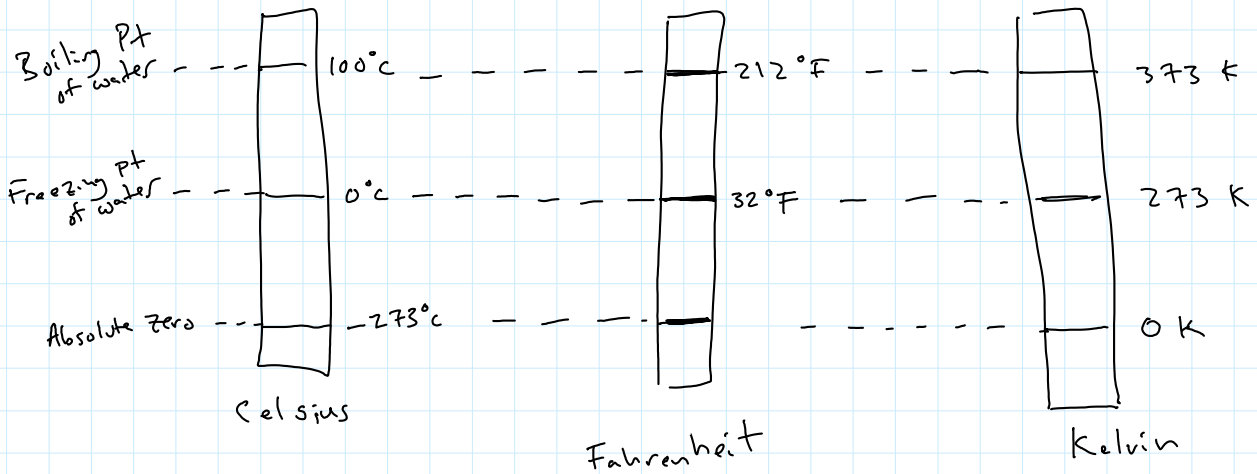
Phy 4C 1/9

Monday, January 9, 2017 11:44 AM

Goals for the Lecture:

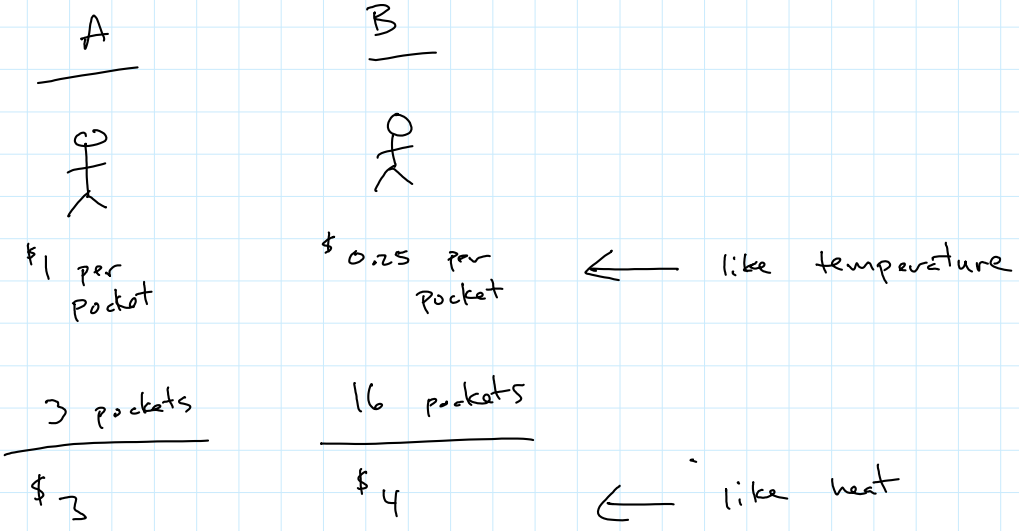
1) Introduce myself and the course
2) Discuss good study habits
3) Understand temperature
4) Understand Celsius, Fahrenheit, and Kelvin temperature scales and the pros and cons of each
5) Be able to convert temperatures between Celsius, Fahrenheit, and Kelvin temperatures

Temperature → tells us the average KE of the molecules



$$T_F = \frac{9}{5} T_c + 32$$

Heat vs temp



Zeroth Law: if A and B are in thermal equilibrium

with C, then A and B are in thermal equilibrium with each other

⇒ means we can take somethings temperature

Worksheet p. 253

Top: B is correct, only ΔT

middle: correct

bottom: correct

Heat required to change temp of some substance:

Q = heat

$Q \propto$ mass

$Q \propto \Delta T$

$Q \propto$ specific heat capacity (material)

$$Q = c\, m\, \Delta T$$

Example Problem

Mix { Liquid water at 20°C (100 g) and metal with $c = 750 \frac{J}{kg\,K}$ (200 g) at 90°C

$c_{water} = 4186 \frac{J}{kg\,K}$

mix in an insulated container.

Find T_{final}

$$Q_{water} + Q_{metal} = 0$$

or

$$|Q_{water}| = |Q_{metal}|$$

$$Q_{water} + Q_{metal} = 0$$

$$c_{water}\, m_{water}\, \Delta T_{water} + c_{metal}\, m_{metal}\, \Delta T_{metal} = 0$$

$$\left(4186 \frac{J}{kg\,K}\right)(0.1\ kg)(T_f - 20^\circ C) + (750)(0.2)(T_f - 90^\circ C) = 0$$

$$T_f = 38.5\ ^\circ C$$

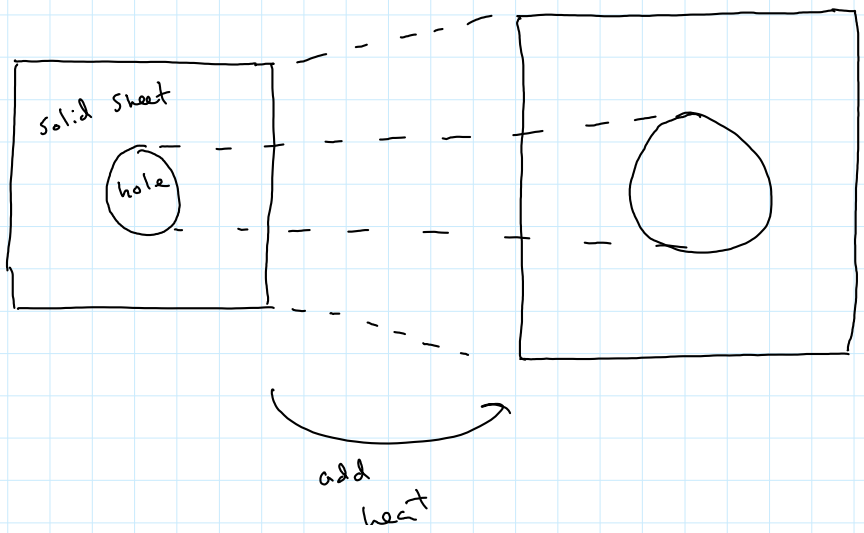
Thermal expansion

$$\Delta L = \alpha L_i \Delta T$$ Linear expansion

α: coef. of linear expansion (material)

$$\Delta V = \beta V_i \Delta T$$ volume expansion

$$\beta \simeq 3\alpha$$



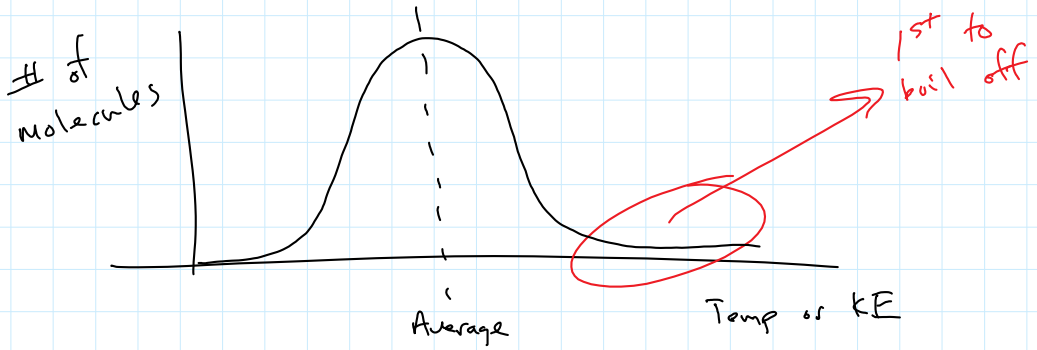
everything expands

hole gets bigger

---

worksheet p. 254

Top: same temp for both



bottom: student A is correct