Reminders 11-17-10:

-Read Chapter 10 & 11.

-Heat Transfer Lab Canceled. Last lab of semester is Next Week. Movie with Report on the week of the 29th.

-Momentum Lab; Some of you have not turned in the rewrite (present grade is zero). Some that have turn in edited version have not turned in old version too (I won't grade it until old version is turned in).

-Quiz Monday Chapter 10 and 11.

-Materials for Archimedes' Lab were Ti and Mo, not Ag.

-Watch for sig. fig questions on Final Exam.

Objectives:

-Calorimetry

-Phase Changes

-Examples

-Heat Transfer Processes

A 100g piece of copper at 95°C is dropped into 200 g of water that is in a 280g Al container. Both are initially at 15°C. What is the final temperature of the system?

$$\sum Q's = 0$$

$$m_{Cu} C_{Cu} (T_f - 95°) + m_{H_2O} C_{H_2O} (T_f - 15)$$

$$+ m_{Al} C_{Al} (T_f - 15) = 0$$

$$T_f \left[m_{Cu} C_{Cu} + m_{H_2O} C_{H_2O} + m_{Al} C_{Al} \right]$$

$$= 95 m_{Cu} C_{Cu} + 15 \left[m_{H_2O} C_{H_2O} + m_{Al} C_{Al} \right]$$

$$T_f = \frac{95 m_{Cu} C_{Cu} + 15 \left[m_{H_2O} C_{H_2O} + m_{Al} C_{Al} \right]}{m_{Cu} C_{Cu} + m_{H_2O} C_{H_2O} + m_{Al} C_{Al}}$$

$$C_{Al} = 0.215 \; cal/g \, C°$$

$$C_{Cu} = 0.0924 \; cal/g \, C°$$

$$C_{H_2O} = 1.00 \; cal/g°C$$

$$T_f = 17.7°C$$

- **A 40 g block is cooled to -78°C. It is added to 560g of water in an 80 g Cu calorimeter at a temperature of 25°C. Determine the final temperature of the system. Does all the ice melt? If not how much is left over?**

Does all the ice melt?

If yes, find the final temp. of system.

If no, find out how much ice melted and how much is left over if final is zero. If not, find the temp. that is below zero.

How much energy required to melt the ice.

$$Q = 40_g \, C_{ice} \, (0 - ^-78) + 40_g \, (79.7 \, cal/g)$$

$$C_{ice} = 0.5 \, cal/g \cdot °C$$

$$Q = 40_g (.5)(78) + 40(79.7) = \underline{4748 \, cal}$$

How much energy can calorimeter provide if it gets down to 0°C?

$$Q = 560_g \, (1 \, cal/g°)(25°C) + (80)(.0924)(25)$$

$$= \underline{14,185 \, cal}$$

Since $14,185 > 4748$ all ice melts.

$$\Sigma Q's = 0$$

$$M_{ice} C_{ice} (78) + m_{ice} L_f + m_{melt \atop ice} C_{H_2O} (T_f - 0)$$

$$+ m_{H_2O} C_{H_2O} (T_f - 25)$$

$$+ m_{cu} C_{cu} (T_f - 25) = 0$$

now do the algebra and
solve for T_f.

$$\underline{T_f = 16°C}$$