LO: Students will be able to calculate energies associated with heat exchange.

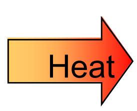
DOL: Students will successfully calculate calorimetry problems at least 4/5 times.

Feb 8-9:17 AM

Heat (q)

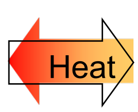
•**Heat**: the transfer of energy between objects due to a temperature difference

- Flows from higher-temperature object to lower-temperature object

System (T1) 

Surroundings (T2)

If T1 > T2
q system = -
exothermic

System (T1) 

Surroundings (T2)

If T1 < T2
q system = +
endothermic

Calorimetry: the measurement of heat flow

•device used is called a... calorimeter

specific heat capacity (C): amt. of heat needed to raise temp. of 1 g of a substance 1°C (1 K)

•Only useable within a state of matter (i.e. s, l, or g)

/arious Specific Heat Capacities

Substance	Specific heat capacity (J/K g)
Gold	0.129
Silver	0.235
Copper	0.385
Iron	0.449
Aluminum	0.897
H2O(l)	4.184
H2O(s)	2.03
H2O(g)	1.998

Metals do not generally require much energy to heat them up (i.e. they heat up easily)

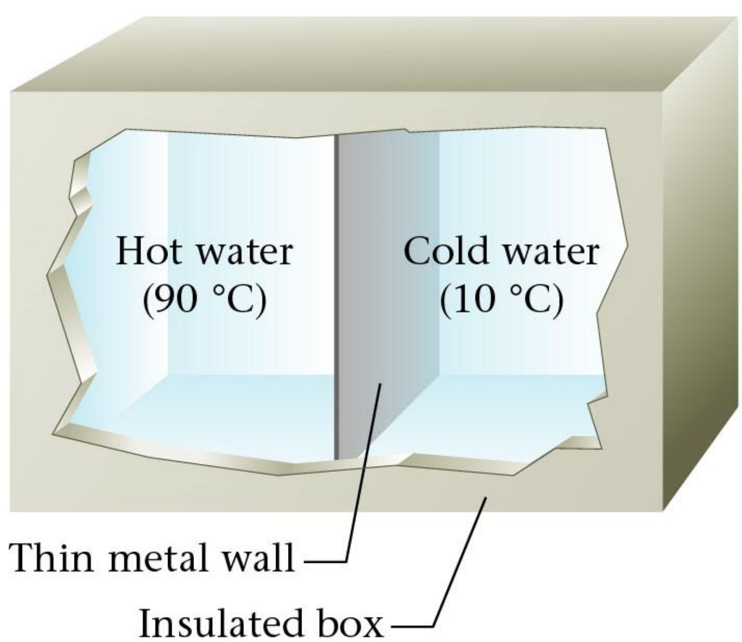
Water requires much more energy to heat up

Food and Energy

1 calorie = 4.184 joules

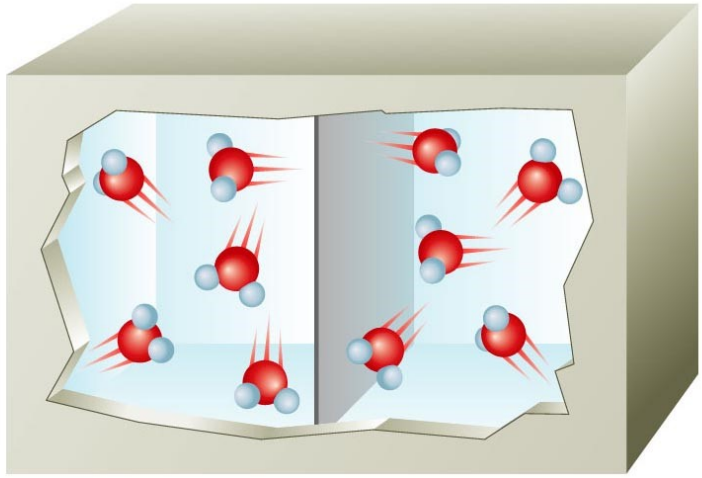
1000 calories = 1 “Calorie”   "science"
or… 1 Kcal = 1 “Calorie”   "food"

What will happen over time?



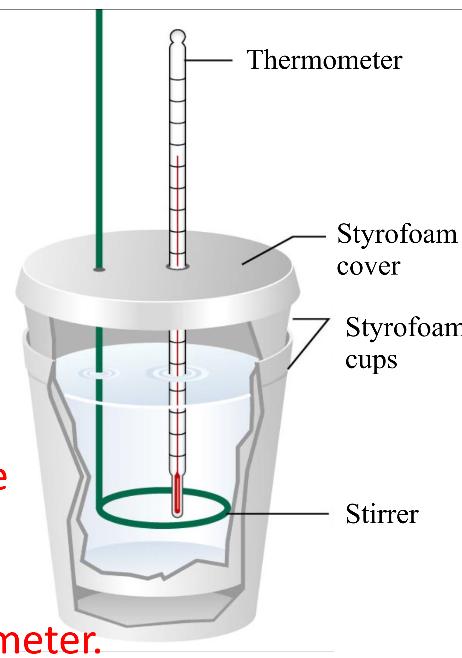
Zumdahl, Zumdahl, DeCoste, World of Chemistry 2002, page 291

Eventually, the temperatures will equalize



Zumdahl, Zumdahl, DeCoste, World of Chemistry 2002, page 291

Much calorimetry is carried out using a coffee-cup calorimeter, under constant pressure
(i.e. atmospheric pressure)



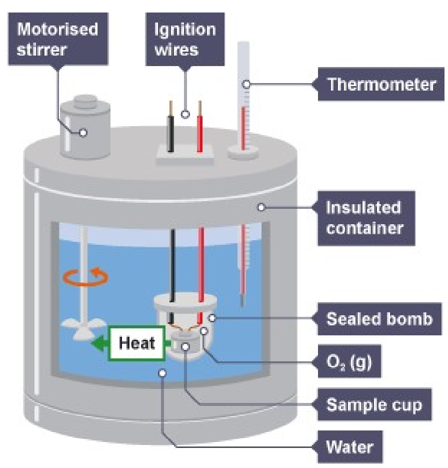
- If we assume that no heat is lost to the surroundings, then the energy absorbed inside the calorimeter must be equal to the energy released inside the calorimeter.

i.e., **q absorbed = – q released**

$q_x = - q_y$

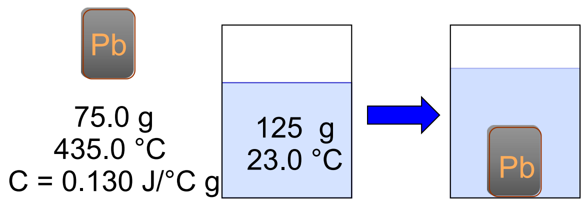
Bomb Calorimetry: this method is used to determine how many calories are in food.

Food Scientist (yes this is a real job) use a Bomb Calorimeter to blow up food and see how much energy was stored in the food.



Heat Transfer Experiments

75.0 g piece of lead (specific heat = 0.130 J/g°C), initially at 435°C, is set into 125.0 g of water, initially at 23.0°C. What is the final temperature of the mixture?



What is the final temperature, T_f, of the mixture?

qwater = –qPb

q = m x C x ΔT for both cases, although specific values differ

Plug in known information for each side

Solve for Tf ...