Announcements – Lecture XX – Friday, June 19h

1. **Final Lab:** Tuesday, June 23rd, ISB 155 (A-C)
   (Pre-Lab Quiz – TA Evaluation in Class Owls)

2. **Exam III:** Friday, June 26th, In Class
   3 or 4 questions will be taken from Lab Owls:-
   3.4 , 4.2 , 4.5 , 5.5 , 5.6

Quiz 16 Class #: ____ Last Name: _____

Write the net ionic equation for the reaction that takes placed when aqueous solutions of lithium hydroxide and hydrofluoric acid (HF) are combined?

$LiOH(aq) + HF(aq)$

$[Li^+, OH^-]$ $[H^+, F^-]$

$LiF(aq)$ $HOH = H_2O(l)$

$LiOH(aq) + HF(aq) = LiF(aq) + H_2O(l)$

$LiOH(aq) + HF(aq) = LiF(aq) + H_2O(l)$

SB WA Salt

$Li^+ + OH^- + HF(aq) = Li^+ + F^- + H_2O(l)$

$OH^- + HF(aq) = F^- + H_2O(l)$

NIE

5.1 Energy

A: Kinetic, Potential, Units and 1st Law of Thermodynamics

KINETIC ENERGY:

Energy of motion ... Thermal, Mechanical, Electromagnetic ... etc

$E = \frac{1}{2}mv^2$

POTENTIAL ENERGY:

Positional energy ... Chemical, Electrostatic .... etc

$E = mgh$

UNITS of ENERGY:

$E = mgh$

$kg(m.s^{-2})\,m = kg.m^2.s^{-2} = J$

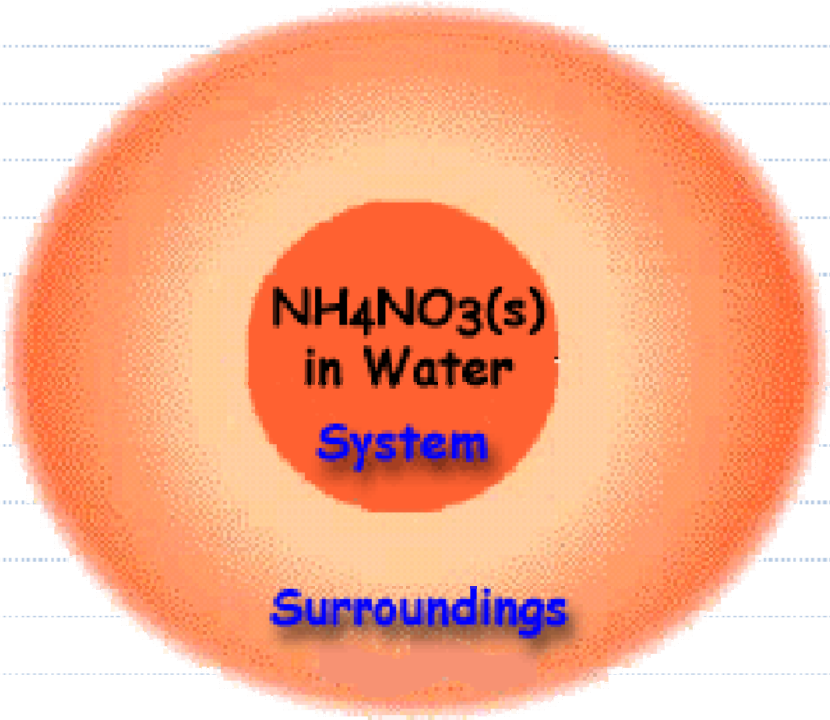
$m = 0.6\,kg$ (~ can of soda)
$h = 1.7\,m$ (~ average shoulder height)

$E = 0.6(9.18)(1.7) \approx 10J$

1ST LAW of THERMODYNAMICS :- Conservation of Energy.

5.1 Energy

C: Principles of Thermodynamics



SYSTEM: What we are concerned with ... the chemical reaction.

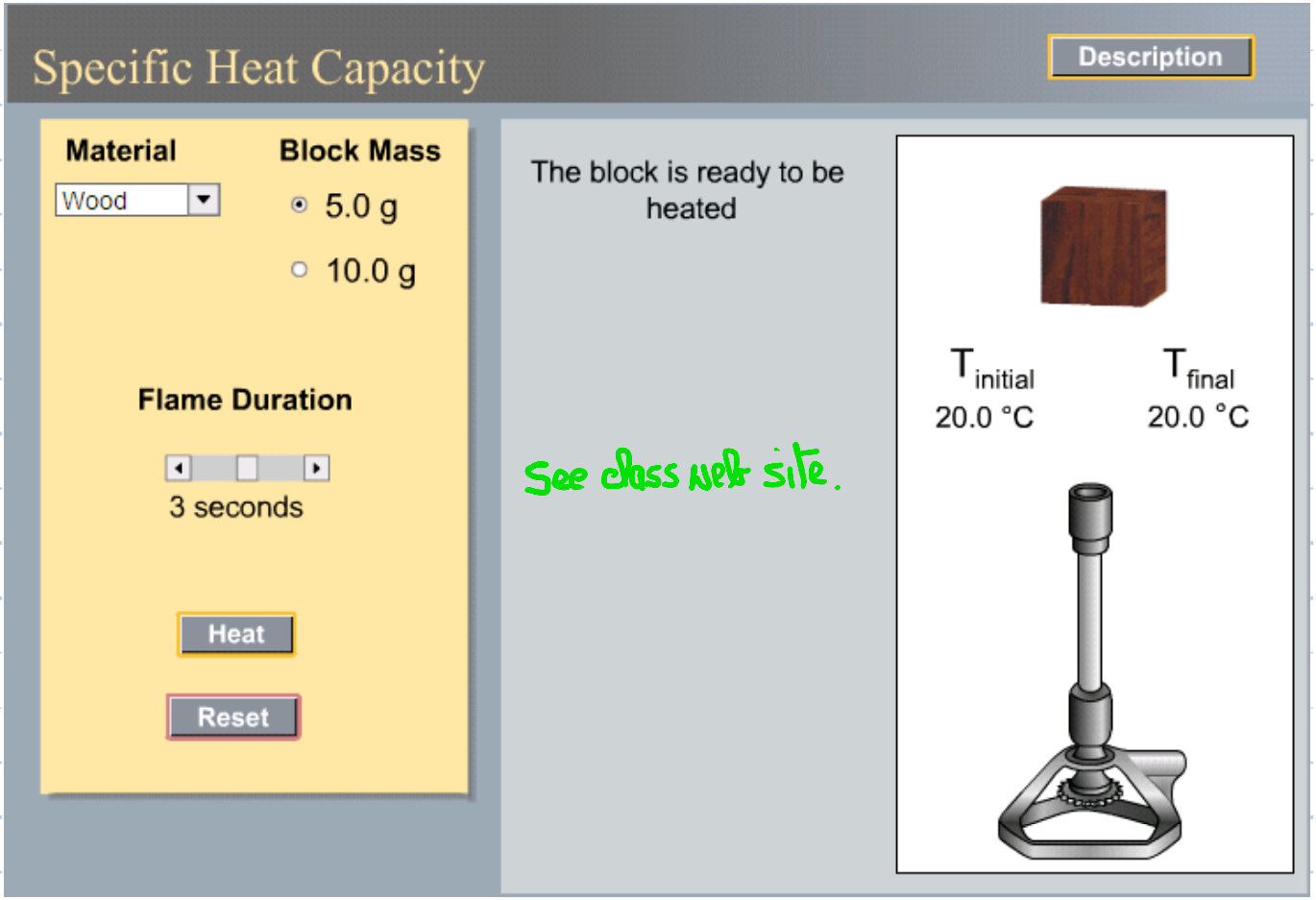
SURROUNDINGS: Everything else

SYSTEM + SURROUNDINGS = UNIVERSE

Exothermic : Heat given off ... $\Delta H < 0$
Endothermic : Heat required ... $\Delta H > 0$

5.3 Energy, Temperature Changes, and Changes in State

A: Heat Transfer and Temperature Changes – Heat Capacity



$q = m \times C \times \Delta T$ → Change in Temperature

$\Delta T = T_{FINAL} - T_{INITIAL}$

m → mass (g)

C → Heat Capacity

5.3 Energy, Temperature Changes, and Changes in State

A: Heat Transfer and Temperature Changes – Heat Capacity

How much energy is required to raise the temperature of 14.5g of gaseous hydrogen from 23.4°C to 35.3°C.
{Heat Capacity H_2 = 14.3J/g°C}

$$q = m \times C \times \Delta T$$

$m = 14.5\,g$
$C = 14.3\,J/g.°C$
$\Delta T = T_f - T_i = 35.3 - 23.4 = 11.9°C$

$$q = 14.5\,g\,(14.3\,J/g.°C)\,11.9°C = 2.47 \times 10^3\,J$$

or

$2.47\,kJ \quad (1\,kJ = 1 \times 10^3\,J)$

5.3 Energy, Temperature Changes, and Changes in State

B: Heat Transfer Between Substances

$q_{Cu} = m \times C \times \Delta T$

$q_{H_2O} = m \times C \times \Delta T$

1^{ST} LAW : $\Sigma q's = 0$

A 35.6g sample of copper at 99.8°C is dropped into a beaker containing 183g of water at 18.5°C. What is the final temperature when thermal equilibrium is reached?

Cu: 0.385 J/g.°C **H_2O = 4.184 J/g.°C**

$q_{Cu} = 35.6(0.385)\Delta T$

$= 13.706\,\Delta T$

$= 13.706\,(T_f - 99.8)$

$= 13.706\,T_f - 1367.9$

$q_{H_2O} = 183(4.184)\Delta T$

$= 765.7\,\Delta T$

$= 765.7\,(T_f - 18.5)$

$= 765.7\,T_f - 14,165$

$\Sigma q's = 0$

$13.706\,T_f - 1367.9 + 765.7\,T_f - 14,165 = 0$

$779.406\,T_f - 15,532.9 = 0$

$779.406\,T_f = 15,532.9$

$T_f = \frac{15,532.9}{779.406} = 19.9°C$

5.4 Enthalpy Changes and Chemical Reactions

C: Determining Enthalpy Change -- Calorimetry