HEAT AND THERMODYNAMICS NOTES, continued…..

CHAPTER 10, 11

ΔQ = ΔU + ΔW (=Press*ΔVol)

HEAT ADDED = INTERNAL ENERGY CHANGE + WORK CHANGE

Fast Process, no time for heat transfer (ΔQ=0)

ADIABATIC:

Compress, temp goes up

Expand, temp goes down

(open soda bottle, inflate tire quickly)

ISOTHERMAL: happens slow ΔU = 0

Heat added makes object expand without raising temp.

(tire expands slowly by heat)

ISOVOLUMETRIC: (strong container ΔW and thus ΔV=0)

Add heat, temp goes up… pressure goes up too, but not volume. (Pressure cooker)

2nd Law….. No machine can transfer all energy from heat to do work. Heat flows from high to low temp, so some heat is lost to surroundings. (entropy, order to disorder)

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4) A steam boiler completely converts 155 kg of water to steam. The process involves the transfer of 350,000,000 Joules of heat. ($\Delta Q=mHv=155kg*2,260,000J/kg$). If the steam pressure is 1.76 million Pascals and the volume change is 100 cubic meters so the work done by the expanding steam is $\Delta W=P\Delta V= 1.76*10^6$ Pa* $100m^3 = 1.76*10^8$ Joules), what is the net change in the internal energy of the water-steam system?

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1) Why does an automobile engine require a cooling system?

2) Why are power plants located near rivers?

* A water balloon is dropped. When it hits the ground all of the energy is converted to heat. The water heats up, changes to steam, and the steam heats up and causes the balloon to expand, doing work.

Write the equation showing how heat is transformed into the three types of internal energy change and work.