Name:_____

Thermodynamics Unit - Practice Thermodynamics problems

True/False

T F For an isothermal process, $\otimes S_{SYS}$ can never decrease.

T F For all phase transitions, $\otimes H = 0$

T F A process that doubles the number of microstates of system will double the entropy of the system.

T F Dropping an eraser from a height of three feet to the floor leads to an increase in the entropy of the Universe.

T F The standard entropy of an element in its standard state at 298.15 K and 1 bar is zero.

T F Conservation of energy tells that $\Delta U = 0$ for all processes.

T F If adding 25 J of heat to a 5.6 g block of iron increases it temperature by 10° C, then adding 25 J of heat to a 2.8 g block of iron will increase its temperature by 20°C.

T F When the heat for a process is positive, there is always an increase in temperature of the system.

Name:_____

For each of the following note what you would expect for the entropy of the system, surroundings, and total.

A container of liquid honey (the system) sitting in your kitchen (the surroundings) crystallizes

ΔS_{SYS}	Increase	Decrease	Stay the Same	No Way to Know
ΔS_{SURR}	Increase	Decrease	Stay the Same	No Way to Know
ΔS_{TOTAL}	Increase	Decrease	Stay the Same	No Way to Know

1 mole of an ideal gas initially at a pressure of 10 bar, expanding isothermally against a constant
external pressure of 1 bar until mechanical equilibrium is reached.

ΔS_{SYS}	Increase	Decrease	Stay the Same	No Way to Know
ΔS_{SURR}	Increase	Decrease	Stay the Same	No Way to Know
ΔS_{TOTAL}	Increase	Decrease	Stay the Same	No Way to Know

A 25 g block of solid iron at a temperature 50 °C is dropped into a glass of ice water that contains 50 g of solid water and 50 g of liquid water at 0°C? Does all the ice melt?

$C_{P,solid\ water} = 36\ J\ K^{-1}\ mol^{-1}$
$C_{P,liquid\ water} = 75.3\ J\ K^{-1}\ mol^{-1}$
$C_{P,solid\ iron} = 25.1\ J\ K^{-1}\ mol^{-1}$
$\otimes_{FUS}H° = 6.02\ kJ\ mol^{-1}$

 Name:_____

Enthalpy in kJ mol^{-1}, entropy and heat capacities in J K^{-1} mol^{-1}

	$\otimes_f H°$	S°	C_P
$CH_4(g)$	-74.8	186.3	35.3
$CO_2(g)$	393.5	214	37.1
$H_2O(g)$	-242	189	33.6
$H_2(g)$	0	130.7	28.8

What are $\otimes S_{sys}$, $\otimes S_{surr}$, $\otimes S_{total}$ when 10 g of carbon dioxides reacts with excess hydrogen to form water vapor and methane gas at a temperature of 600K. You can assume the reaction goes to completion and that the enthalpy and entropy changes are independent of temperature.

For the above reaction of 10g of CO_2 what are q, w, and $\otimes U$?

