Hi,

I have some questions about reversibility and entropy.

Question 1. This is some of my intepretation and a question.

When the system went through a irreversible path, the entropy created through the irreversible path will be greater than dQ/T:

You are correct. This is a statement of the Second Law

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even though the change in the system entropy is still dQ/T (Because entropy is a state function, delta S is constant independent of the path). So where does that extra entropy go?

The change in entropy of the system for an irreversible process is never dQ/T.
However, you can calculate the entropy difference between initial and final states by finding a sequence of reversible paths that have the same initial and final states.

It goes into the surrounding and increase the entropy of the surrounding. But what if the system is completely isolated from the universe, (no heat exchange). Where does that extra entropy created through an irreversible path go?

If the system is isolated and undergoes an irreversible change, the entropy of the system increases. Since it cannot exchange heat with the environment, the entropy change in the environment is 0. **However, the change in entropy of the universe is Dsuniv=Ds_sys+Ds_environ= Ds_sys+0>0**

Note that the only way in which the system can exchange heat with the environment reversibly is when the environment and the system are at the same temperature. Otherwise, entropy will be generated, because the heat exchanged is the same: dS=dQ(1/T1-1/T2). In practice, this means that it is impossible for a system to change its temperature by exchanging heat reversibly with the environment.

Question 2. Quasistatic processes are always reversible?

The reversibility or irreversibility of a quasistatic process depends on how you define the system. For example,consider the expansion of the gas inside a piston: for the process, from the point of view of the gas, to be reversible, the pressure on both sides of the head of the piston must be the same. If the pressure in the environment is lower than that of the system, this can be done by compensating the difference in pressure by applying additional force and varying that force as the gas expands. While the gas may see a quasistatic, reversible process, it may be necessary to dissipate energy in the form

of friction or other dissipative losses in order to make the movement of
the piston slow enough. If you define your system as the gas inside the piston, plus the mechanism that compensates for the difference in pressure
between the environment and the gas inside the piston, then the overall process may be irreversible.

I understand that the heat flow between two bodies at equal temp is reversible.
But what if you start off with two bodies at equal temp,and you give Body B an infinitesmal amount of heat and let it equilibrate with A, then give B a little more. Basically you are slowly injecting heat into B and allow it come to equilibrium with A at every step. Is such a process quasistatic? Is it reversible?

The process is quasistatic. For a process to be reversible, the change in entropy of the universe has to be zero. In this case, the heat transfer to A and then to B must be such that there is no entropy generation in the universe. The environment, which is transferring heat to systems A and B alternatively, must always be at the same temperature as both systems A and B. **Otherwise, there will be entropy generation.**

I guess the moral to the story is this: although a system may see a quasistatic, reversible change, there still may be entropy generation if system can exchange energy with the environment and the environment is not at equilibrium with the system, i.e. It is at different temperatures, pressures, chemical potentials, etc...