Answer on Question #58127, Physics / Molecular Physics | Thermodynamics

13 **Task.** A 0.5kg piece of metal (c = 600/kgK) at 300 degree celcius is dumped into a large pool of water at 20 degrees celcius. Assuming the change in temperature of water to be negligible, calculate the overall change in entropy for the system.

Solution. According to famous formula $dS = \frac{dQ}{T}$, where ΔS - change in entropy, ΔQ - heat, given to or taken out of the system, T – temperature of system (in K) after finishing the process. According to heat balance equation and fact, that we can neglect change in temperature of water $dQ = cmdT$, where c – is specific heat, m – mass of metal, ΔT - change in temperature of metal.

$$dS = \frac{cmdT}{T} \rightarrow \Delta S = cm\int_{t1}^{t2}\frac{dT}{T} = cmln\frac{t2}{t1}$$

t2=20 C=293 K; t1=300 C=573 K

$$\Delta S = cm\int_{t1}^{t2}\frac{dT}{T} = 600 \cdot 0.5 \cdot ln\frac{293}{573} = -201.2\ \frac{J}{K}$$

Answer.

$$|\Delta S| = 201.2\ \frac{J}{K}$$

14 **Task.** Calculate how much heat is needed to be supplied to a gas at a pressure of 1.25×105Pa, such that the pressure increases by 25 per cent at constant volume, and the internal energy by 120J.

Solution. Using famous formula $dQ = dU + PdV$ and condition of not changing volume, we can get, that $dQ = dU + P \cdot 0 = dU$
So, $dQ = dU$ means, that all heat, given to system, goes to changes in internal energy

Answer. $dQ = 120J$