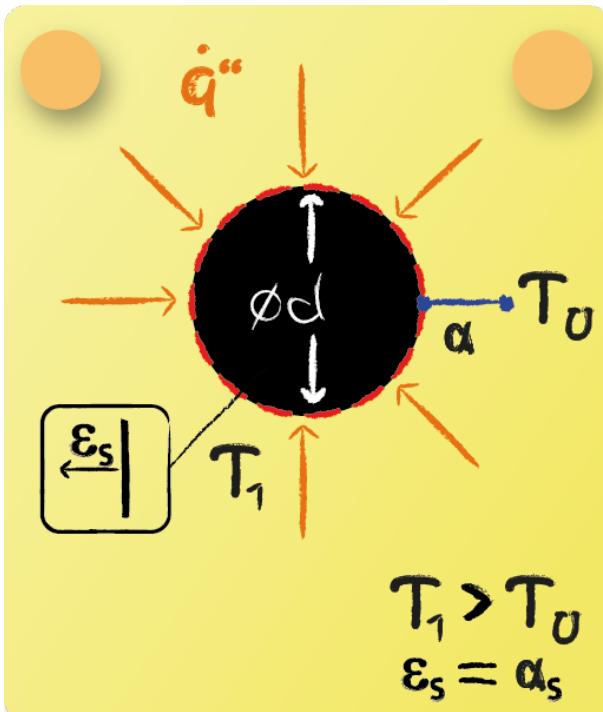


Energy Balance: Task 4



Set up the sphere's transient energy balance for $Bi \ll 1$.

1



The condition $Bi \ll 1$ states that thermal resistance at the body's surface is orders of magnitude greater than thermal resistance inside the body. This yields to the assumption of a homogeneous temperature distribution in the solid. There is an ingoing heat flux given as \dot{q}'' as well as ingoing and outgoing radiative heat fluxes indicated by α_s and ϵ_s . Another outgoing heat flux is due to convection indicated by α . The temporal change of internal energy is than formulated as:

$$\frac{\partial U}{\partial t} = \alpha_s \pi d^2 \sigma T_u^4 - \epsilon_s \pi d^2 \sigma T_1^4 + \pi d^2 \dot{q}'' - \alpha d^2 \pi (T_1 - T_u)$$