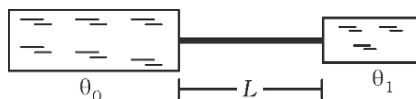
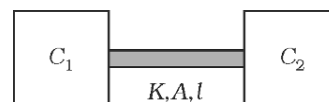


Date Planned : __ / __ / __	Daily Tutorial Sheet - 14	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	Level - 3	Exact Duration : _____

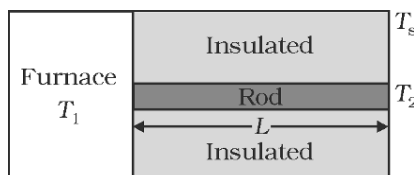
- 153.** Figure shows a large tank of water at a constant temperature θ_0 and a small vessel containing a mass m of water at an initial temperature $\theta_1 (< \theta_0)$. A metal rod of length L , area of cross section A and thermal conductivity K connects the two vessels. Find the time taken for the temperature of the water in the smaller vessel to become $\theta_2 (\theta_1 < \theta_2 < \theta_0)$. Specific heat capacity of water is s and all other heat capacities are negligible. Neglect radiation effects.



- 154.** Two blocks with heat capacities C_1 and C_2 are connected by a rod of length l , cross-sectional area A and heat conductivity K . Initial temperature difference between the two blocks is T_0 . Assuming the entire system to be isolated from surroundings, heat capacity of the rod to be negligible, determine the temperature difference between the blocks as a function of time. Neglect radiation effects.



- 155.** One end of a rod of length L and cross-sectional area A is kept in a furnace of temperature T_1 . The other end of the rod is kept at a temperature T_2 . The thermal conductivity of the material of the rod is K and emissivity of the rod is e .



It is given that $T_2 = T_s + \Delta T$, where $\Delta T \ll T_s, T_s$ being the temperature of the surroundings. If $\Delta T \propto (T_1 - T_s)$, find the proportionality constant. Consider that heat is lost only by radiation at the end where the temperature of the rod is T_2 .

- 156.** A solid copper sphere of density ρ , specific heat c and radius r is at temperature T_1 . It is suspended inside an evacuated chamber whose walls are at temperature 0 K . What is the time required for the temperature of sphere to drop to T_2 ? Take the emissivity of the sphere to be equal to e .
- 157.** A hot body placed in air is cooled down according to Newton's law of cooling, the rate of decrease of temperature being k times the temperature difference from the surrounding. Starting from $t = 0$, find the time in which the body will lose half the maximum heat it can lose.

- 158.** A solid body X of heat capacity C is kept in an atmosphere whose temperature is $T_A = 300K$. At time $t = 0$, the temperature of X is $T_0 = 400K$. It cools according to Newton's law of cooling. At time t_1 its temperature is found to be $350 K$.
At this time (t_1) the body X is connected to a large body Y at atmospheric temperature T_A through a conducting rod of length L , cross-sectional area A and thermal conductivity K . The heat capacity of Y is so large that any variation in its temperature may be neglected. The cross-sectional area A of the connecting rod is small compared to the surface area of X . Find the temperature of X at time $t = 3t_1$ (in Kelvin).