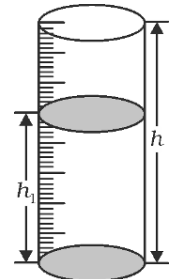
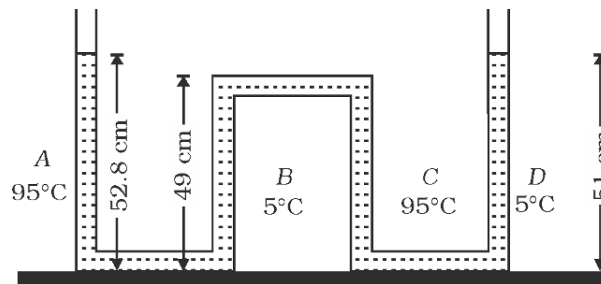


Date Planned : __ / __ / __	Daily Tutorial Sheet - 13	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	Level - 3	Exact Duration : _____

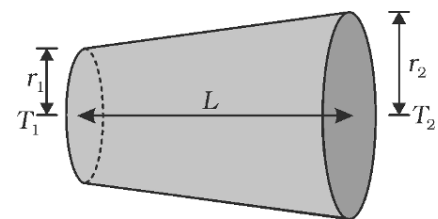
147. Consider a cylindrical container of cross-section area A , height h and having coefficient of linear expansion α_c . The container is filled by liquid of real expansion coefficient γ_L up to height h_1 . When temperature of the system is increased by $\Delta\theta$ then :



- Find the new height, area and volume of cylindrical container.
 - Find the new volume of liquid.
 - Find the new height of liquid level when expansion of container is neglected.
 - Find the new height of liquid level when expansion of liquid is neglected.
 - Find the relation between γ_L and α_c for which volume of container above the liquid level remains unchanged (consider expansion of both container and liquid).
148. The apparatus shown in figure consists of four glass columns connected by horizontal sections. The height of the two central columns B and C are 49 cm each. The two outer columns A and D are open to the atmosphere. A and C are maintained at a temperature of 95°C while the columns B and D are maintained at 5°C . The height of liquid in A and D measured from the base line are 52.8 cm and 51 cm respectively. Determine the coefficient of cubical expansion of the liquid.



149. Find the heat current through the frustum of a cone shown in figure. Temperature of its two ends are maintained at T_1 and T_2 ($T_2 > T_1$) respectively and the thermal conductivity of the material is k . There is no heat loss through the curved surface.



150. A conducting cylindrical shell has inner radius R_1 maintained at a temperature T_1 and outer radius R_2 maintained at a temperature T_2 respectively ($T_1 > T_2$). Thermal conductivity of the shell varies with distance from the axis as $k = \frac{\alpha}{r^2}$. Find temperature as a function of distance r from the axis of the cylinder.

- 151.** A hollow sphere of inner radius $R_1 = 0.25$ m and outer radius $R_2 = 0.50$ m is placed inside a heat reservoir of temperature $T_0 = 1000^\circ\text{C}$. The hollow sphere contains water at initial temperature 0°C . The thermal conductivity of the material is $K = \frac{10^2}{4\pi} \text{ W / m.K}$.

(i) Find the time required to raise the temperature of water to 100°C .

(ii) Find further time required to convert all the water into steam at 100°C .

Assume that heat absorbed by sphere is negligible. Take specific heat of water $c = 4.2 \text{ kJ/kg K}$, latent heat of vaporization $L_v = 2268 \text{ kJ/kg}$.

- 152.** A cylinder with adiabatic wall contains water. The cylinder is closed on top with a metal cover with area A , thickness b , thermal conductivity K . Heat capacity of water is c , temperature of surrounding is T_0 , assumed to be constant. Initially water is in thermal equilibrium with surrounding. An electric heater is now switched on which produces heat at a constant rate H . Find the temperature of water as function of time after the heater is switched on.

