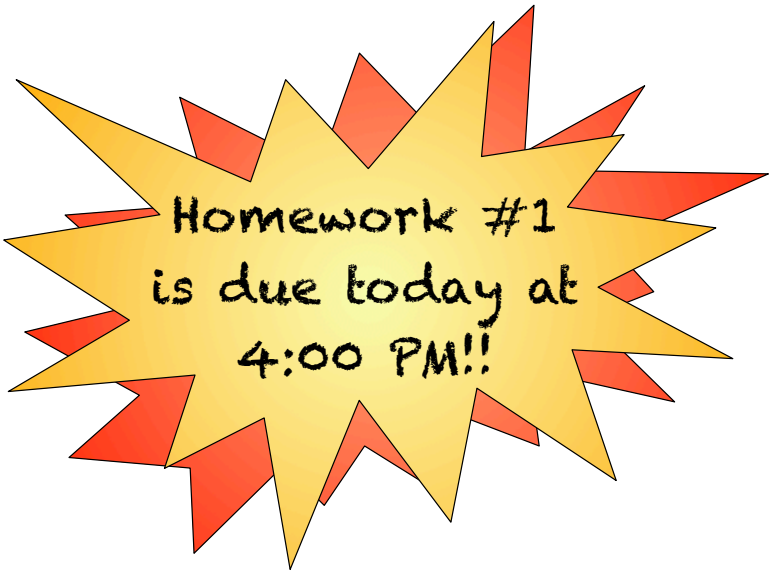


Please pick up
Homework assignment #2
from the front table.

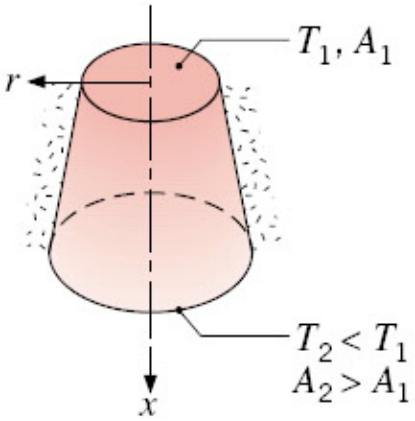
CH EN 3453 – Heat Transfer

Introduction to Conduction

Reminders

- No class Monday

Example – Book Problem 2.5



A solid, truncated cone serves as a support for a system that maintains the top (truncated) face of the cone at a temperature T_1, while the base of the cone is at a temperature $T_2 < T_1$. The thermal conductivity depends on the temperature according to $k = k_o - aT$, where a is a positive constant. Do the following quantities increase, decrease or stay the same with increasing x?

(1) heat transfer rate q_x
(2) the heat flux q_x''
(3) thermal conductivity k
(4) temperature gradient dT/dx

Range of Thermal Conductivities

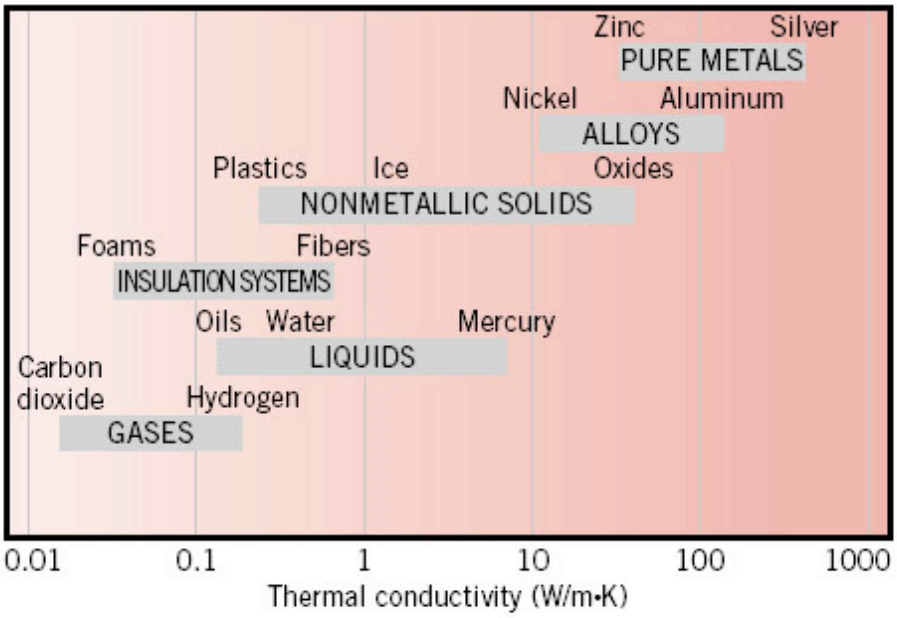


Figure 2.4 Range of thermal conductivity for various states of matter at normal temperatures and pressure.

Mean Free Path Effects

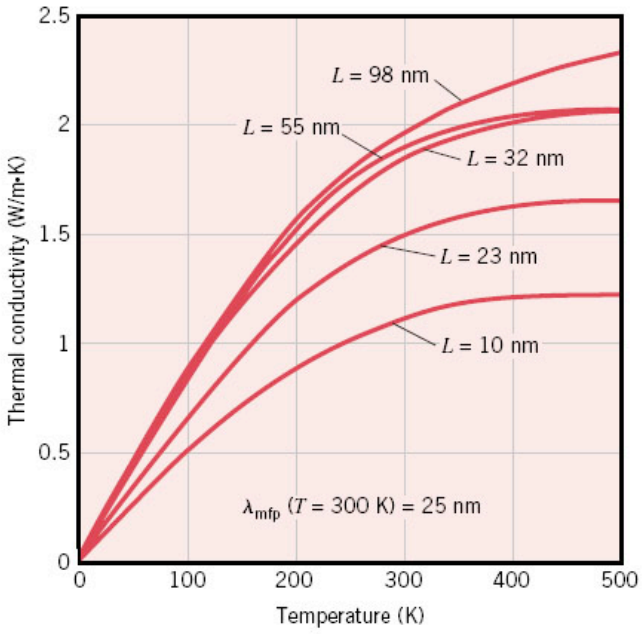


FIGURE 2.7 Measured thermal conductivity of yttria-stabilized zirconia as a function of temperature and mean grain size [3].

Thermal Conductivity of Gases

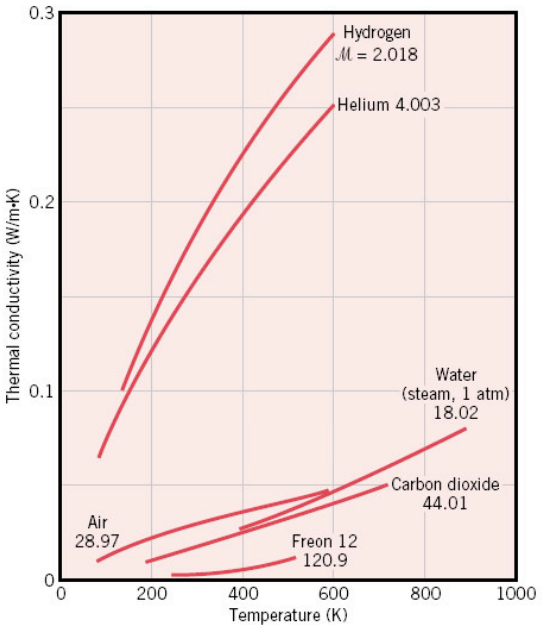
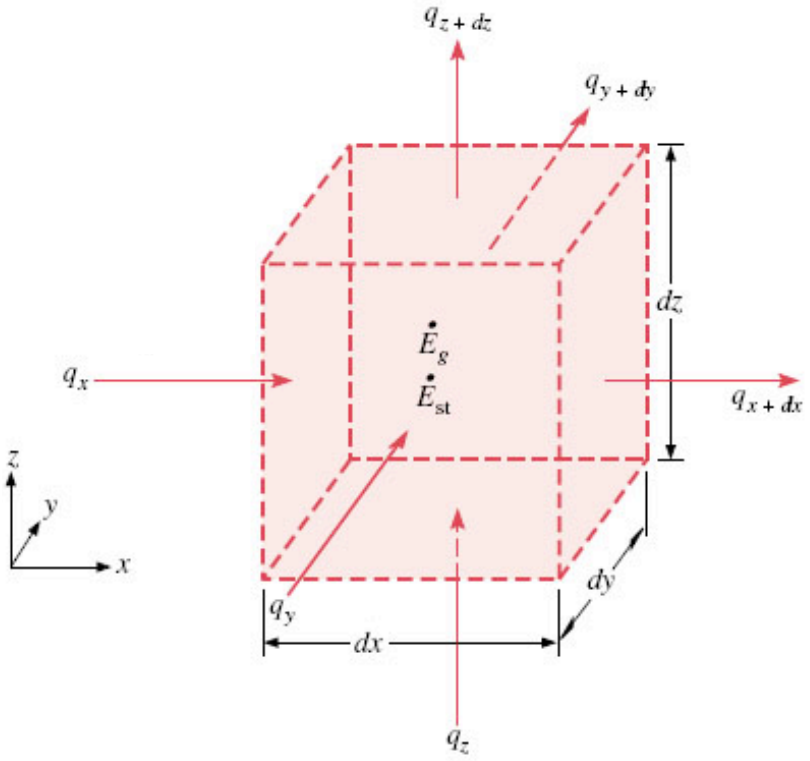


Figure 2.8 The temperature dependence of the thermal conductivity of selected gases at normal pressures. The molecular weight of the gases is also shown.

Control Volume within a Solid



Example – Book Problem 2.23

The steady-state temperature distribution in a one-dimensional wall of thermal conductivity 50 W/m·K and thickness 50 mm is observed to be T(°C) = $a + bx^2$, where a = 200°C, b = –2000°C/m^2 and x is in meters.

(a) What is the heat generation rate $\dot{q}$ in the wall?

(b) Determine the heat fluxes at the two wall faces