1. A cylinder of 120-mm diameter at 1000 K is quenched in saturated water at 1 atm. Describe the quenching process and estimate the maximum heat removal rate per unit length during the process.

2. A 65-cm-long, 2-cm-diameter brass heating element is to be used to boil water at 120°C. If the surface temperature of the heating element is not to exceed 125°C, determine the highest rate of steam production in the boiler, in kg/h.

3. Saturated steam at 1 atm condenses on a 3-m-high and 8-m-wide vertical plate that is maintained at 90°C by circulating cooling water through the other side. Determine (a) the rate of heat transfer by condensation to the plate, and (b) the rate at which the condensate drips off the plate at the bottom.

4. Saturated steam at 55°C is to be condensed at a rate of 10 kg/h on the outside of a 3-cm-outer-diameter vertical tube whose surface is maintained at 45°C by the cooling water. Determine the required tube length.

5. Repeat the problem 4 for a horizontal tube.