1. Consider a thin strip heater and its hemispherical cylindrical reflector, as shown in the sketch. The diameter of the reflector is 15 cm and the height of the strip heater is 2 cm. Both may be treated as infinitely long. The temperature of the strip heater is 1100°C and that of the environment is 20°C. All surfaces may be assumed to be black.

(a) What is the view factor $F_{22}$? $F_{24}$? (where “4” denotes the general environment).

(b) If the convective interactions may be ignored (i.e., $h = 0$), what is the steady-state temperature of the reflector?

(c) If both sides of the reflector convectively interact with the environment, and if the heat transfer coefficient for each side is 15 W/m$^2$-K, what temperature will the reflector attain? Assume that the heater remains at 1100°C. An answer to within ± 25°C will suffice.