Problem 14-2

At an average film temperature of 350 K, what are the individual heat transfer coefficients when the fluid flowing in a 0.0254-m inside diameter tube is air, water, or oil? Each fluid in this comparison exhibits a Reynolds number of 5×10^4. How would the pressure drop vary for each fluid? The relevant properties of the three fluids at 350 K are listed in the table below.

	Air	**Water**	**Oil**
Density, kg/m^3	.955	973	854
Viscosity, Pa·s	2×10^{-5}	3.72×10^{-4}	3.56×10^{-2}
Thermal Conductivity, W/m·K	0.030	0.668	0.138
Heat Capacity, J/kg·K	1050	4190	2116

Problem 14-9

A heat exchanger is to be constructed by forming copper tubing into a coil and placing the coil inside an insulated steel shell. In this exchanger, water will flow inside the tubing, and a hydrocarbon vapor will be condensing on the outside surface of the tubing at a rate of 0.126 kg/s. The tubing has an inside diameter of 0.0127 m and an outside diameter of 0.0152 m. The inlet temperature is 10 °C and the exit temperature is 32 °C. The heat of condensation of the hydrocarbon at the condensation temperature of 88 °C is 335 kJ/kg. The heat transfer coefficient for the condensing vapor is 1420 W/m^2·K. Heat losses from the shell may be neglected. What length of copper tubing will be required to accomplish the desired heat transfer?