A system consists of a copper tank with a mass of 13 kg, 4 kg of liquid water, and an electrical resistor of negligible mass. The system is insulated on its outer surface. Initially, the temperature of the copper is 27 °C and the temperature of the water is 50 °C. The electrical resistor transfers 100 kJ of energy to the system. Eventually the system comes to equilibrium. Determine the final equilibrium temperature in °C.



SOLUTION:

Apply the First Law to a system consisting of the copper, water, and resistor,

$$\Delta E_{\rm sys} = Q_{\rm into} + W_{\rm into} \Longrightarrow \Delta U_{\rm sys} = Q_{\rm into} + W_{\rm into} ,$$

where the change in total energy in the system consists only of the change in internal energy. There is no heat transfer into or out of the system since the copper tank is insulated, i.e., $Q_{into sys} = 0$. The work into the system is the electrical work into the resistor, $W_{into sys} = 100$ kJ. The change in internal energy is,

$$\Delta U_{\rm sys} = m_{\rm Cu} \Delta u_{\rm Cu} + m_{\rm H_2O} \Delta u_{\rm H_2O} .$$
 (The resistor mass is negligible.) (2)

Treating the copper and water as incompressible substances,

$$\Delta u_{\rm Cu} = c_{\rm Cu} \Delta T_{\rm Cu} = c_{\rm Cu} \left(T_{2,\rm Cu} - T_{1,\rm Cu} \right), \tag{3}$$

$$\Delta u_{\rm H_2O} = c_{\rm H_2O} \Delta T_{\rm H_2O} = c_{\rm H_2O} \left(T_{2,\rm H_2O} - T_{1,\rm H_2O} \right). \tag{4}$$

Note that the final temperatures of the water and copper will be the same, i.e., $T_{2,Cu} = T_{2,H2O} = T_2$.

Simplifying Eq. (1), making use of Eqs. (2) - (4),

$$m_{\rm Cu}c_{\rm Cu}(T_2 - T_{1,\rm Cu}) + m_{\rm H_2O}c_{\rm H_2O}(T_2 - T_{1,\rm H_2O}) = W_{\rm into},$$
⁽⁵⁾

$$\left(m_{\rm Cu}c_{\rm Cu} + m_{\rm H_2O}c_{\rm H_2O}\right)T_2 = W_{\rm into} + m_{\rm Cu}c_{\rm Cu}T_{\rm 1,Cu} + m_{\rm H_2O}c_{\rm H_2O}T_{\rm 1,H_2O} , \qquad (6)$$

$$T_{2} = \frac{W_{\rm into} + m_{\rm Cu}c_{\rm Cu}T_{1,\rm Cu} + m_{\rm H_{2}O}c_{\rm H_{2}O}T_{1,\rm H_{2}O}}{m_{\rm C}c_{\rm Cu} + m_{\rm H_{2}O}c_{\rm H_{2}O}T_{1,\rm H_{2}O}}.$$
(7)

$$m_{\rm Cu}c_{\rm Cu} + m_{\rm H_2O}c_{\rm H_2O}$$

Substitute the given values,

 $W_{\text{into sys}} = 100 \text{ kJ}$

 $c_{\text{Cu,300 K}} = 0.385 \text{ kJ/(kg.K)}$ (from thermodynamic table, e.g., Table A-19 of Moran et al., 7th ed.) $c_{\text{H2O,300 K}} = 4.179 \text{ kJ/(kg.K)}$ (from thermodynamic table, e.g., Table A-19 of Moran et al., 7th ed.) $m_{\text{Cu}} = 13 \text{ kg}$ $m_{\text{H2O}} = 4 \text{ kg}$ $T_{1,\text{Cu}} = 27 \text{ }^{\circ}\text{C} = 300 \text{ K}$ $T_{1,\text{H2O}} = 50 \text{ }^{\circ}\text{C} = 323 \text{ K}$ $\Rightarrow \overline{T_2} = 322 \text{ K} = 49.3 \text{ }^{\circ}\text{C}$



TABLE A-19

Properties of Selected Solids and Liquids: c_p , ρ , and κ

Substance (k//kg·k) (kg/m²) (W/m·k) Selected Solids, 300K Aluminum 0.903 2700 237 Coal, anthracite 1.260 1350 0.26 Copper 0.385 8930 401 Granite 0.775 2630 2.79 Iron 0.447 7870 80.2 Lead 0.129 11300 35.3 Sand 0.800 1520 0.27 Silver 0.235 10500 429 Soil 1.840 2050 0.52 Steel (AISI 302) 0.480 8060 15.1 Tin 0.227 7310 66.6 Building Materials, 300K Brick, common 0.835 1920 0.72 Concrete (stone mix) 0.880 2300 1.4 Hardboard, siding 1.170 640 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380		Specific Heat	Density,	Thermal Conductivity re
Selected Solids, 300K Aluminum 0.903 2700 237 Coal, anthracite 1.260 1350 0.26 Copper 0.385 8930 401 Granite 0.775 2630 2.79 Iron 0.447 7870 80.2 Lead 0.129 11300 35.3 Sand 0.800 1520 0.27 Silver 0.235 10500 429 Soil 1.840 2050 0.52 Steel (AISI 302) 0.480 8060 15.1 Tin 0.227 7310 66.6 Building Materials, 300K Brick, common 0.835 1920 0.72 Concrete (stone mix) 0.880 2300 1.4 Glass, plate 0.750 2500 1.4 Hardboard, siding 1.170 640 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Sof	Substance	$(kJ/kg \cdot K)$	ہم (kg/m³)	(W/m · K)
Aluminum 0.903 2700 237 Coal, anthracite 1.260 1350 0.26 Copper 0.385 8930 401 Granite 0.775 2630 2.79 Iron 0.447 7870 80.2 Lead 0.129 11300 35.3 Sand 0.800 1520 0.27 Silver 0.235 10500 429 Soil 1.840 2050 0.52 Steel (AISI 302) 0.480 8060 15.1 Tin 0.227 7310 66.6 Building Materials, 300K Brick, common 0.835 1920 0.72 Concrete (stone mix) 0.880 2300 1.4 Hardboard, siding 1.170 640 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Insulting Materials, 300K 0.835 <th>Selected Solids, 300K</th> <th></th> <th></th> <th></th>	Selected Solids, 300K			
Coal, anthracite 1.260 1350 0.26 Copper 0.385 8930 401 Granite 0.775 2630 2.79 Iron 0.447 7870 80.2 Lead 0.129 11300 35.3 Sand 0.800 1520 0.27 Silver 0.235 10500 429 Soil 1.840 2050 0.52 Steel (AISI 302) 0.480 8060 15.1 Tin 0.227 7310 66.6 Building Materials, 300K 2300 1.4 Glass, plate 0.750 2500 1.4 Glass, plate 0.750 2500 1.4 Hardboard, siding 1.170 640 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Insulting Materials, 300K 835 80 0.068 <t< td=""><td>Aluminum</td><td>0.903</td><td>2700</td><td>237</td></t<>	Aluminum	0.903	2700	237
Copper 0.385 8930 401 Granite 0.775 2630 2.79 Iron 0.447 7870 80.2 Lead 0.129 11300 35.3 Sand 0.800 1520 0.27 Silver 0.235 10500 429 Soil 1.840 2050 0.52 Steel (AISI 302) 0.480 8060 15.1 Tin 0.227 7310 66.6 Building Materials, 300K 353 1920 0.72 Concrete (stone mix) 0.880 2300 1.4 Hardboard, siding 1.170 640 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Insulating Materials, 300K 1.805 32 0.038 Dotytyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 <	Coal, anthracite	1.260	1350	0.26
Granite 0.775 2630 2.79 Iron 0.447 7870 80.2 Lead 0.129 11300 35.3 Sand 0.800 1520 0.27 Silver 0.235 10500 429 Soil 1.840 2050 0.52 Steel (AISI 302) 0.480 8060 15.1 Tin 0.227 7310 66.6 Building Materials, 300K Brick, common 0.835 1920 0.72 Concrete (stone mix) 0.880 2300 1.4 Glass, plate 0.750 2500 1.4 Hardboard, siding 1.170 640 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.39 Duct liner (glass fiber, coated) 0.835 32 0.038 Duct liner (glass fiber, coated) 0.835 32 0.038 Duct li	Copper	0.385	8930	401
Iron 0.447 7870 80.2 Lead 0.129 11300 35.3 Sand 0.800 1520 0.27 Silver 0.235 10500 429 Soil 1.840 2050 0.52 Steel (AISI 302) 0.480 8060 15.1 Tin 0.227 7310 66.6 Building Materials, 300K 2300 1.4 Glass, plate 0.750 2500 1.4 Glass, plate 0.750 2500 1.4 Hardboard, siding 1.170 640 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Insulating Materials, 300K 1.800 120 0.039 Duct liner (glass fiber, coated) 0.835 32 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835	Granite	0.775	2630	2.79
Lead 0.129 11300 35.3 Sand 0.800 1520 0.27 Silver 0.235 10500 429 Soil 1.840 2050 0.52 Steel (AISI 302) 0.480 8060 15.1 Tin 0.227 7310 66.6 Building Materials, 300K Brick, common 0.835 1920 0.72 Concrete (stone mix) 0.880 2300 1.4 Glass, plate 0.750 2500 1.4 Hardboard, siding 1.170 6440 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Insulating Materials, 300K 1.800 120 0.039 Duct liner (glass fiber) - 16 0.046 Cork 1.800 120 0.038 Polystyrene (extruded) 0.835 32 0.038	Iron	0.447	7870	80.2
Sand 0.800 1520 0.27 Silver 0.235 10500 429 Soil 1.840 2050 0.52 Steel (AISI 302) 0.480 8060 15.1 Tin 0.227 7310 66.6 Building Materials, 300K 8 2300 1.4 Brick, common 0.835 1920 0.72 Concrete (stone mix) 0.880 2300 1.4 Glass, plate 0.750 2500 1.4 Hardboard, siding 1.170 640 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Insulating Materials, 300K 1.800 120 0.039 Duct liner (glass fiber) - 16 0.046 Cork 1.800 120 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes)	Lead	0.129	11300	35-3
Silver 0.235 10500 429 Soil 1.840 2050 0.52 Steel (AISI 302) 0.480 8060 15.1 Tin 0.227 7310 66.6 Building Materials, 300K Brick, common 0.835 1920 0.72 Concrete (stone mix) 0.880 2300 1.4 Glass, plate 0.750 2500 1.4 Hardboard, siding 1.170 640 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Insulating Materials, 300K 1.800 120 0.039 Duct liner (glass fiber) - 16 0.046 Cork 1.800 120 0.039 Duct liner (glass fiber, coated) 0.835 32 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.668<	Sand	0.800	1520	0.27
Soil 1.840 2050 0.52 Steel (AISI 302) 0.480 8060 15.1 Tin 0.227 7310 66.6 Building Materials, 300K 8 2300 0.72 Concrete (stone mix) 0.835 1920 0.72 Concrete (stone mix) 0.880 2300 1.4 Glass, plate 0.750 2500 1.4 Hardboard, siding 1.170 6440 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Insulating Materials, 300K 1.800 120 0.039 Duct liner (glass fiber) - 16 0.046 Cork 1.800 120 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.668 Saturated Liquids 599.8 0.465 Mercury, 300K	Silver	0.235	10500	429
Steel (AISI 302) 0.480 8060 15.1 Tin 0.227 7310 66.6 Building Materials, 300K Brick, common 0.835 1920 0.72 Concrete (stone mix) 0.880 2300 1.4 Glass, plate 0.750 2500 1.4 Hardboard, siding 1.170 640 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Insulating Materials, 300K 120 0.039 0.046 Cork 1.800 120 0.039 Duct liner (glass fiber, coated) 0.835 32 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.668 Saturated Liquids 4.818 599.8 0.465 Mercury, 300K 0.139 13529 8.540 Refrigerant 122, 300K 1.267 1183.1 0.085 Refrigerant 123, 300K 1.434 1199.7<	Soil	1.840	2050	0.52
Tin 0.227 7310 66.6 Building Materials, 300K Brick, common 0.835 1920 0.72 Concrete (stone mix) 0.880 2300 1.4 Glass, plate 0.750 2500 1.4 Hardboard, siding 1.170 640 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Insulating Materials, 300K Blanket (glass fiber) - 16 0.046 Cork 1.800 120 0.039 0uct liner (glass fiber, coated) 0.835 32 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.068 Saturated Liquids Ammonia, 300K 4.818 599.8 0.465 Mercury, 300K 0.139 13529 8.540 Refrigerant 22, 300K 1.267 1183.1 0.085 Refrigerant 23, 300K	Steel (AISI 302)	0.480	8060	15.1
Building Materials, 300K Brick, common 0.835 1920 0.72 Concrete (stone mix) 0.880 2300 1.4 Glass, plate 0.750 2500 1.4 Hardboard, siding 1.170 640 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Issulating Materials, 300K 1.800 120 0.039 Duct liner (glass fiber) - 16 0.046 Cork 1.800 120 0.039 Duct liner (glass fiber, coated) 0.835 32 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.668 Saturated Liquids 0.139 13529 8.540 Refrigerant 23, 300K 4.818 599.8 0.465 Mercury, 300K 0.139 13529 8.540 Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K	Tin	0.227	7310	66.6
Brick, common 0.835 1920 0.72 Concrete (stone mix) 0.880 2300 1.4 Glass, plate 0.750 2500 1.4 Hardboard, siding 1.170 640 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Insulating Materials, 300K 120 0.039 0.012 Blanket (glass fiber) - 16 0.046 Cork 1.800 120 0.039 Duct liner (glass fiber, coated) 0.835 32 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.668 Saturated Liquids 0.139 13529 8.540 Refrigerant 22, 300K 4.818 599.8 0.465 Mercury, 300K 0.139 13529 8.540 Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K 1.434 0.90 0.455	Building Materials, 300K			
Concrete (stone mix) 0.880 2300 1.4 Glass, plate 0.750 2500 1.4 Hardboard, siding 1.170 640 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Insulating Materials, 300K Blanket (glass fiber) - 16 0.046 Cork 1.800 120 0.039 Duct liner (glass fiber, coated) 0.835 32 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.668 Saturated Liquids Ammonia, 300K 4.818 599.8 0.465 Mercury, 300K 0.139 13529 8.540 Refrigerant 22, 300K 1.267 1183.1 0.085 Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K 1.909 884.1 0.145 <td>Brick, common</td> <td>0.835</td> <td>1920</td> <td>0.72</td>	Brick, common	0.835	1920	0.72
Glass, plate 0.750 2500 1.4 Hardboard, siding 1.170 640 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Insulating Materials, 300K U U U Blanket (glass fiber) – 16 0.046 Cork 1.800 120 0.039 Duct liner (glass fiber, coated) 0.835 32 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.668 Saturated Liquids 1.267 1183.1 0.085 Refrigerant 22, 300K 1.267 1183.1 0.085 Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K 1.909 884.1 0.145	Concrete (stone mix)	0.880	2300	1.4
Hardboard, siding 1.170 640 0.094 Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Insulating Materials, 300K 510 0.12 Blanket (glass fiber) - 16 0.046 Cork 1.800 120 0.039 Duct liner (glass fiber, coated) 0.835 32 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.068 Saturated Liquids 4.818 599.8 0.465 Mercury, 300K 0.139 13529 8.540 Refrigerant 22, 300K 1.267 1183.1 0.085 Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K 1.909 884.1 0.145	Glass, plate	0.750	2500	1.4
Limestone 0.810 2320 2.15 Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Insulating Materials, 300K Blanket (glass fiber) – 16 0.046 Cork 1.800 120 0.039 Duct liner (glass fiber, coated) 0.835 32 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.668 Saturated Liquids Ammonia, 300K 4.818 599.8 0.465 Mercury, 300K 0.139 13529 8.540 Refrigerant 22, 300K 1.267 1183.1 0.085 Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K 1.909 884.1 0.145	Hardboard, siding	1.170	640	0.094
Plywood 1.220 545 0.12 Softwoods (fir, pine) 1.380 510 0.12 Insulating Materials, 300K Ison 120 0.046 Cork 1.800 120 0.039 Duct liner (glass fiber, coated) 0.835 32 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.068 Saturated Liquids Ammonia, 300K 4.818 599.8 0.465 Mercury, 300K 0.139 13529 8.540 Refrigerant 22, 300K 1.267 1183.1 0.085 Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K 1.909 884.1 0.145	Limestone	0.810	2320	2.15
Softwoods (fir, pine) 1.380 510 0.12 Insulating Materials, 300K Insulating Materials, 300K Insulating Materials, 300K Blanket (glass fiber) - 16 0.046 Cork 1.800 120 0.039 Duct liner (glass fiber, coated) 0.835 32 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.068 Saturated Liquids Ammonia, 300K 4.818 599.8 0.465 Mercury, 300K 0.139 13529 8.540 Refrigerant 22, 300K 1.267 1183.1 0.085 Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K 1.909 884.1 0.145	Plywood	1.220	545	0.12
Insulating Materials, 300K Blanket (glass fiber) – 16 0.046 Cork 1.800 120 0.039 Duct liner (glass fiber, coated) 0.835 32 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.068 Saturated Liquids Ammonia, 300K 4.818 599.8 0.465 Mercury, 300K 0.139 13529 8.540 Refrigerant 22, 300K 1.267 1183.1 0.085 Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K 1.909 884.1 0.145 Water 275K 4.211 000.0 0.574	Softwoods (fir, pine)	1.380	510	0.12
Blanket (glass fiber) – 16 0.046 Cork 1.800 120 0.039 Duct liner (glass fiber, coated) 0.835 32 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.068 Saturated Liquids 4.818 599.8 0.465 Mercury, 300K 0.139 13529 8.540 Refrigerant 22, 300K 1.267 1183.1 0.085 Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K 1.909 884.1 0.145	Insulating Materials, 300K			
Cork 1.800 120 0.039 Duct liner (glass fiber, coated) 0.835 32 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.068 Saturated Liquids Ammonia, 300K 4.818 599.8 0.465 Mercury, 300K 0.139 13529 8.540 Refrigerant 22, 300K 1.267 1183.1 0.085 Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K 1.909 884.1 0.145	Blanket (glass fiber)	-	16	0.046
Duct liner (glass fiber, coated) 0.835 32 0.038 Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.068 Saturated Liquids Ammonia, 300K 4.818 599.8 0.465 Mercury, 300K 0.139 13529 8.540 Refrigerant 22, 300K 1.267 1183.1 0.085 Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K 1.909 884.1 0.145	Cork	1.800	120	0.039
Polystyrene (extruded) 1.210 55 0.027 Vermiculite fill (flakes) 0.835 80 0.068 Saturated Liquids 4.818 599.8 0.465 Ammonia, 300K 0.139 13529 8.540 Refrigerant 22, 300K 1.267 1183.1 0.085 Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K 1.909 884.1 0.145	Duct liner (glass fiber, coated)	0.835	32	0.038
Vermiculite fill (flakes) 0.835 80 0.068 Saturated Liquids	Polystyrene (extruded)	1.210	55	0.027
Saturated Liquids Ammonia, 300K 4.818 599.8 0.465 Mercury, 300K 0.139 13529 8.540 Refrigerant 22, 300K 1.267 1183.1 0.085 Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K 1.909 884.1 0.145	Vermiculite fill (flakes)	0.835	80	0.068
Ammonia, 300K4.818599.80.465Mercury, 300K0.139135298.540Refrigerant 22, 300K1.2671183.10.085Refrigerant 134a, 300K1.4341199.70.081Unused Engine Oil, 300K1.909884.10.145Water 275K4.2110.00.00.574	Saturated Liquids			
Mercury, 300K 0.139 13529 8.540 Refrigerant 22, 300K 1.267 1183.1 0.085 Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K 1.909 884.1 0.145 Water 275K 4.211 000.0 0.574	Ammonia, 300K	4.818	599.8	0.465
Refrigerant 22, 300K 1.267 1183.1 0.085 Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K 1.909 884.1 0.145 Water 275K 4.211 000.0 0.574	Mercury, 300K	0.139	13529	8.540
Refrigerant 134a, 300K 1.434 1199.7 0.081 Unused Engine Oil, 300K 1.909 884.1 0.145 Water 275K 4.211 000.0 0.574	Refrigerant 22, 300K	1.267	1183.1	0.085
Unused Engine Oil, 300K 1.909 884.1 0.145 Water 275K 4.211 000.0 0.574	Refrigerant 134a, 300K	1.434	1199.7	0.081
Water 275K 6 211 000 0 0 574	Unused Engine Oil, 300K	1.909	884.1	0.145
4.211 999.9 0.5/4	Water, 275K	4.211	999.9	0.574
300K 4.179 996.5 0.613	зооК	4.179	996.5	0.613
325K 4.182 987.1 0.645	325K	4.182	987.1	0.645
350K 4.195 973.5 0.668	350K	4.195	973-5	0.668
375K 4.220 956.8 0.681	375K	4.220	956.8	0.681
400K 4.256 937.4 0.688	400K	4.256	937-4	0.688

Sources: Drawn from several sources, these data are only representative. Values can vary depending on temperature, purity, moisture content, and other factors.

Table from Moran et al., 7th ed.