

ANSWERS TO END-OF-CHAPTER PROBLEMS
Fundamentals of Heat and Mass Transfer (7th Edition)

T.L. Bergman
A.S. Lavine
F.P. Incropera
D.P. DeWitt

CHAPTER 1

- 1.1 14.5 W/m², 58 W
- 1.3 2667 W
- 1.4 4312 W, \$8.28/d
- 1.5 -4.35 °C/m
- 1.6 0.10 W/m·K
- 1.7 8400 W
- 1.8 (a) 18.5×10^{-6}
- 1.9 19,600 W, 120 W
- 1.10 54 mm
- 1.12 16.6 W/m², 35.9 W
- 1.13 375 mm
- 1.15 110.40°C, 110.24°C
- 1.16 1.1°C
- 1.18 1400 W/m², 18,000 W/m²
- 1.19 (a) 22.0 W/m²·K; (b) 22.12, 0.6
- 1.20 20 W/m², 20 W/m², -20 W/m²
- 1.21 4570 W/m²·K, 65 W/m²·K
- 1.22 6.3 W/m²·K
- 1.23 102.5°C
- 1.24 51.8°C, 3203°C
- 1.25 6.3 m/s
- 1.26 0.35 W, 5.25 W
- 1.27 15 mW
- 1.28 (a) 18,405 W; (b) \$12,900
- 1.30 254.7 K
- 1.31 4.3 W
- 1.32 0.42, 264 W
- 1.33 (a) 0.32 W/m²·K, 0.32 W/m²·K, 2.1 W/m²·K
- 1.34 (a) 8.1 W; (b) 0.23 kg/h
- 1.35 (a) 0, 144 W, 144 W, 0; 0, 144 W, 144 W, 0; (b) 2.04×10^5 W/m³; (c) 39.0 W/m²·K
- 1.36 (a) 4.86 MW; (b) 9.22 kW; (c) 4.87 MW; (d) 4.87 MW
- 1.37 (a) 300°C; (b) 3.89 MW; (c) 3.19 kW; (d) 3.89 MW
- 1.39 2.41, 312 W, 1.25, 600 W
- 1.40 (a) 0.223 W; (b) 3.44 W
- 1.41 100°C

- 1.42 (a) 643 W; (b) 175 h
- 1.43 512°C, 518°C
- 1.45 (a) 0.052°C/s; (b) 48.4°C
- 1.46 375 W, 1.8×10^{-4} W, 0.065 W
- 1.47 300 J, 1800 J, 9000 J
- 1.48 6380 kWh, \$1150 or \$383
- 1.49 (a) 1.41×10^{-3} kg/s
- 1.51 (a) 4180 s; (b) 319 K, 359 K; (c) 830 K
- 1.52 (a) 0.0181 m³/s, 4.7 m/s; (b) 5.97 W
- 1.53 840 kW
- 1.54 2360 W/m², 6100 W/m²
- 1.55 (a) 32.5 kW/m², 126 kW/m², 17.6 K/s, 68.6 K/s
- 1.57 (a) 104 K/s; (b) 1251 K
- 1.58 (b) 383°C
- 1.59 63 kg/s
- 1.61 (a) 700 A
- 1.62 132 J/kg·K
- 1.63 \$0.0032/day
- 1.64 (a) -0.084 K/s; (b) 439 K
- 1.65 3.2 h
- 1.66 (a) 60.6×10^{-3} kg/s·m², 121 g/m²; (b) 32.3×10^{-3} kg/s·m²
- 1.67 (a) 1010 W; (b) 1310 W
- 1.69 49°C
- 1.70 (a) 7.13×10^{-3} m³/s; (b) 70°C
- 1.71 (a) 47.0°C or 39.9°C
- 1.72 (a) 86.7°C; (b) 47°C
- 1.73 (a) -0.044 K/s; (b) 230 W, 230 W
- 1.74 (a) 26°C; (b) 4.0×10^{-5} l/s
- 1.75 12.2 W/m²·K, 12.2 W/m²·°C
- 1.76 (a) 600 K
- 1.77 375 W/m²·K
- 1.78 (a) 5500 W/m²; (b) 87.8°C
- 1.79 (a) 5268 W; (b) 41°C
- 1.81 345°C
- 1.82 (a) 84°C
- 1.83 (a) 190.6 W
- 1.84 (a) 153°C; (b) 16 W/m²·K
- 1.85 (a) 386 W/m²; (b) 27.7°C; (c) 55%

CHAPTER 2

- 2.10 50 W/m·K, 5 W/m²·K
- 2.11 (a) -280 K/m, 14.0 kW/m²; (b) 80 K/m, -4.0 kW/m²; (c) 110°C, -8.0 kW/m²; (d) 60°C, 4.0 kW/m²; (e) -20°C, -10.0 kW/m²
- 2.12 (a) 2000 K/m, -200 kW/m²; (b) -2000 K/m, 200 kW/m²; (c) 2000 K/m, -200 kW/m²
- 2.14 0, 60 K/m

- 2.15 14.85 K/m
 2.17 (a) 15.0 W/m·K, 400 K; (b) 70.0 W/m·K, 380 K
 2.18 (b) 5.9×10^{-3} W/m·K, (c) 0.74×10^{-3} °C, (d) 25.02°C
 2.19 1010 W, \$1050; 151 W, \$157; 10.1 W, \$10
 2.22 0.025 W/m·K, 0.173 W/m·K, 0.0158 W/m·K
 2.23 765 J/kg·K, 36.0 W/m·K
 2.25 1490 W/m²
 2.28 (a) 0, 0.98×10^5 W/m; (b) 56.8 K/s
 2.30 (a) 2×10^5 W/m³; (b) 0, 10,000 W/m²
 2.31 (a) 200 W/m², 182 W/m², 18 W/m²; (b) 4.3 W/m²·K
 2.32 (b) 2×10^5 W/m³; (c) -2950 W/m², 5050 W/m²; (d) 51 W/m²·K, 101 W/m²·K; (f) -2×10^5 W/m³; (g) 20°C, 4.94×10^6 J/m²
 2.34 (a) 10^6 W/m³; (b) 120°C, 10^4 K/m, -10^5 K/m²; (c) 220°C, 10^4 K/m, -10^5 K/m²; (d) 220°C, 2×10^4 K/m, -2×10^5 K/m²
 2.49 (a) 0.20 m; (b) 0; (c) -4608 W/m², -144,765 W; (d) 24,000 W/m², -24,000 W/m², 72,380 W, -72,380 W
 2.50 (d) 133°C, 122°C, 133.1°C
 2.52 (d) 94.3°C, 52.5°C
 2.53 (a) 25°C, 35°C; (b) 50°C, 30°C; (c) 86.1°C
 2.56 (c) 18.0 kW/m², -360 K/m; (d) 8.73×10^6 J/m²; (e) 8.73×10^6 J/m²
 2.65 (a) 1.8×10^6 W/m³; (c) 1.8×10^5 W/m²; (d) 7.77×10^7 J/m²
 2.68 (b) 3.18×10^8 W/m³, 1.59×10^5 W/m²

CHAPTER 3

- 3.2 32 mm, \$1920/yr
 3.3 (a) 7.7°C, 4.9°C
 3.4 (a) 1270 W/m²
 3.5 85.7 W/m², 31 W/m²
 3.6 (b) 2830 W/m²
 3.7 14.1 W/m²
 3.8 1.31 mm from bottom
 3.9 (a) 996 W/m²·K, 0.40%; (b) 14.5 W/m²·K, 37.9%
 3.10 (a) 0.553; (b) 22.1°C, 10.8°C; (c) -56.3°C
 3.11 3113 W/m·K
 3.12 (a) 29.4 W
 3.13 (b) 4.21 kW; (c) 0.6%
 3.14 1.30×10^8 J
 3.15 0.185 K/W
 3.16 0.189 K/W
 3.17 85.6 W/m², 102 W/m²
 3.18 1.53 W/m·K
 3.19 (b) 86 mm
 3.20 333 W, 121 W
 3.21 2.13