

Assignment #1

Chapter 1

8) $W = 3277 \text{ N}$

56) $p_{abs} = 68 \text{ kPa}$

68) $h = 1274 \text{ m}$

47) $\Delta T = 15 \text{ K}$

144) $m = 0.0408 \text{ kg}$

Assignment #2

Chapter 2

26)

$T, ^\circ\text{C}$	P, kPa	$v, \text{m}^3/\text{Kg}$	Phase description
50	<i>12.349</i>	0.	<i>Saturated mixture</i>
<i>120.23</i>	200	<i>.8857</i>	Saturated vapor
250	400	<i>.5951</i>	<i>Super heated vapor</i>
110	600	<i>.001052</i>	<i>Compressed liquid</i>

31)

$T, ^\circ\text{C}$	P, kPa	$v, \text{m}^3/\text{Kg}$	Phase description
-8	500	<i>0.0007569</i>	<i>Compressed liquid</i>
30	<i>770.06</i>	0.022	<i>Saturated mixture</i>
<i>2.48</i>	320	<i>.0632</i>	Saturated vapor
100	600	<i>.04790</i>	<i>Super heated vapor</i>

49) $T = 140.7^\circ\text{C}$

62) $\Delta V = -0.128 \text{ m}^3$

122) $\Delta V = -0.261 \text{ m}^3$
 $\Delta U = -1753.3 \text{ kJ}$

Assignment # 3

Chapter 2

70) $\Delta P = 26 \text{ kPa}$
 $\Delta m = 0.0070 \text{ kg}$

79) (a) $v = 0.03106 \text{ m}^3/\text{kg}$ (17.6% error)
(b) $v = 0.02609 \text{ m}^3/\text{kg}$ (1.2% error)
(c) $v = 0.02641 \text{ m}^3/\text{kg}$

84E) (a) $T = 527.2 \text{ R}$
(b) $T = 693.9 \text{ R}$
(c) $T = 2407^\circ\text{F}$ (700R)

85) (a) $P = 1861 \text{ kPa}$
(b) $P = 1586 \text{ kPa}$
(c) $P = 1600 \text{ kPa}$

91) (a) $T = 457.6 \text{ K}$
(b) $T = 465.9 \text{ K}$
(c) $T = 473 \text{ K}$ (200 °C)

125) $\Delta m = 42.9 \text{ kg}$

Assignment # 4

Chapter 3

14) $W_{b, \text{out}} = 430.5 \text{ kJ}$

23) $W_{b, \text{out}} = -82.8 \text{ kJ}$

22) $W_{b, \text{out}} = 6.51 \text{ kJ}$

29) (a) $P_3 = 350 \text{ kPa}$
(b) $T_3 = 138.88^\circ\text{C}$
(c) $W_{b, \text{out}} = 27.5 \text{ kJ}$

43) (a) $\hat{W}_{\text{total}} = 98.1 \text{ kW}$
(b) $\hat{W}_{\text{total}} = 188.1 \text{ kW}$
(c) $\hat{W}_{\text{total}} = -21.9 \text{ kW}$

Assignment # 5

Chapter 4

11) $Q_{\text{out}} = 33.4 \text{ kJ}$

5) $U_2 = 35.5 \text{ kJ}$

24) (a) $T_3 = 878.9^\circ\text{C}$
(b) $W_{b, \text{out}} = 150 \text{ kJ}$
(c) $Q_{\text{in}} = 875.0 \text{ kJ}$

188) $I = 15.72 \text{ A}$

Assignment # 6

Chapter 4

30) $T_2 = 58.2^\circ\text{C}$

46) $Q_{\text{total}} = 762 \text{ kJ/min}$

36) $W_{e,\text{in}} = .235\text{kWh}$

2-104) (a) $\Delta h = 447.8 \text{ kJ/kg}$

(b) $\Delta h = 448.4\text{kJ/kg}$

(c) $\Delta h = 415.6\text{kJ/kg}$

43) $W_{b,\text{out}} = 516 \text{ kJ}$

$Q_{\text{in}} = 2674 \text{ kJ}$ (using energy balance)

$Q_{\text{in}} = 2676 \text{ kJ}$ (alternative solution using table A-2b)

Assignment # 7

Chapter 4

63) (a) $\dot{m} = 5.833 \text{ kg/s}$

(b) $V_2 = 589.9 \text{ m/s}$

(c) $\dot{m} = 15.0 \times 10^{-4} \text{ m}^2$

72) (a) $v_2 = 93.0 \text{ m/s}$

(b) $A_1/A_2 = 0.625$

90) $\dot{W}_{\text{in}} = 965\text{kW}$

84) $T_2 = 267.3^\circ\text{C}$

86) (a) $\dot{W}_{\text{in}} = 86.04 \text{ kJ/s}$

(b) $\dot{V} = 0.176 \text{ m}^3/\text{s}$

Answers for The Homework Assignments # 7-16

Assignment # 7

Chapter 4

63-a) 5.833 kg/s

b) $V_2 = 589.9 \text{ m/s}$

c) $15.0 \times 10^{-4} \text{ m}^2$

90) $W_{in} = 965 \text{ kW}$

72-a) $V_2 = 93.0 \text{ m/s}$

b) 0.625

84) $T_2 = 267.3 \text{ }^\circ\text{C}$

86-a) $W_{in} = 86.04 \text{ kJ/s}$

b) $V_1 = 0.176 \text{ m}^3/\text{s}$

Assignment # 8

Chapter 4

145) $m = 0.0304 \text{ kg/s}$

96) $\Delta T = -50.13 \text{ }^\circ\text{C}$

$v_2 = 0.0454 \text{ m}^3/\text{kg}$

143) $Q_{out} = 482 \text{ kJ/min}$

110) $m_R = 139.0 \text{ kg/min}$

105) $m_2 = 0.107 \text{ kg/s}$

Assignment # 9

Chapter 4

154-a) $m_1 = 107.06 \text{ kg}$

b) $Q_{in} = 1825 \text{ kJ}$

153-a) $T_2 = 133.6 \text{ }^\circ\text{C}$

b) $m_1 = 9.78 \text{ kg}$

149-a) $m_1 = 9.584 \text{ kg}$

b) $Q_{in} = 339 \text{ kJ}$

160) $T_2 = 225 \text{ K}$

$P_2 = 637 \text{ kPa}$

Assignment # 10

Chapter 5

23) $Q_{out} = 1.35 \times 10^{13}$ kJ/year

125) $\Delta t = 19.2$ min/s

54) $\Delta t = 37.3$ min

55) $W_{net.in} = 3.07$ kW

Assignment # 11

Chapter 5

85) $\eta_{th.C} = 7.1\%$

87) $\eta_{th.max} = 25\%$

$\eta_{th} = 33\%$

104) $T_L = -13.3^\circ C$

136) $W_{net.out} = 8406$ kJ/h

$Q_{H.H.E} = 11,560$ kJ/h

Assignment # 12

Chapter 6

26-a) $\Delta S_{fluid} = 1.337$ kJ/K

34) $\Delta S = 16.19$ kJ/K

b) $\Delta S_{source} = -1.337$ kJ/K

c) $S_{gen} = 0$

39) $W_{p.out} = 27.16$ kJ

170-a) $m_{fw} = 0.247$

b) $S_{gen}/m_{fw} = 0.213$ kW/(K.kgfw)

Assignment # 13

Chapter 6

51) $\Delta S_{total} = 0.169$ kJ/K

76) $\Delta S_{total} = 0.1884$ kJ/kg.K

67) $q_{out} = 125.4$ kJ/kg

133) $Q_{in} = 3077$ kJ

Assignment # 14

Chapter 6

86) $m = 2.35 \text{ kg/s}$

108) $V_{2a} = 728.2 \text{ m/s}$

$T_{2a} = 786.3 \text{ K}$

100) $T_{2a} = 57.7^\circ \text{C}$

$W_{a,m} = 1.70 \text{ kW}$

154) $P_x = (P_1^2 P_2)^{1/3}$

$P_y = (P_1 P_2^2)^{1/3}$

156) $W_{s,out} = 95,240 \text{ kW}$

$m = 82.0 \text{ kg/s}$

Assignment # 15

Chapter 7

23) $I = 21.69 \text{ kW}$

35) $W_{rev,in} = 437.7 \text{ kJ}$

45) $X_{destroyed} = 196 \text{ kJ}$

39) $W_{pw,in} = 87.0 \text{ kJ}$

$W_{rev,in} = 7.74 \text{ kJ}$

101) Tank A

$u_{2,a} = 2127.2 \text{ kJ/kg}$

Tank B

$v_{2b} = 1.152 \text{ m}^3/\text{kg}$

Assignment # 16

Chapter 7

51) $X_{destroyed} = 27.3 \text{ kJ/kg}$

67) $W_{rev,in} = 126 \text{ kW}$

$X_{destroyed} = 4.12 \text{ W}$

74) $X_{destroyed} = 88.5 \text{ kW}$

79) $m_2 = 3.922$

$W_{rev,out} = 7.62 \text{ kJ}$

82) $m_i = 12.05 \text{ kg}$

$X_{destroyed} = 3,057 \text{ kJ}$