

Hw 3.4

$$14-16 \quad m_a = \frac{c_p v}{c_{at}} = \frac{100.753 (8m)}{0.787 (203.15)} = 9.27 \text{ kg} \quad w = 0.622 \frac{p_v}{p - p_v} = 0.622 \left(\frac{1.924}{100.753} \right) = 0.0262$$

$$h = c_p T + w h_g = (1005 \cdot 30) + (0.0262 \cdot 2555.6) = 97.1 \text{ kJ/kg}$$

$$14-18 \quad p_1 = 100 \text{ kPa} \quad t_1 = 20^\circ\text{C} \quad \phi_1 = 0.9 \quad p_2 = 800 \text{ kPa}$$

$$p_{v1} = 0.9(2.3392) = 2.105 \text{ kPa} \quad w_1 = 0.622 \left(\frac{2.105}{100 - 2.105} \right) = 0.0134$$

$$t_2 = t_1 \left(\frac{p_2}{p_1} \right)^{\frac{k-1}{k}} \rightarrow 293.15(6)^{0.286} = 531 \text{ K}$$

$$p_{v2} = \frac{w_1 p_2}{0.622 + w_1} = \frac{0.0134(800)}{0.622 + 0.0134} = 16.87 \text{ kPa}$$

$$\phi_2 = \frac{p_{v2}}{p_{sat}} = \frac{16.87}{45.45} = 0.371$$

$$14-14 \quad T = 20^\circ\text{C} \quad p = 85 \text{ kPa} \quad \phi = 0.85$$

$$p_v = \phi p_{sat} = 0.85(2.3392) = 1.9883 \text{ kPa}$$

$$p_a = 85 - 1.9883 = 83.012$$

$$w = 0.622 \left(\frac{p_v}{p_a} \right) = 0.622 \left(\frac{1.9883}{83.012} \right) = 0.0149$$

$$h = c_p T + w h_g = 20.1 + (0.0149 \cdot 2537.4) = 57.91 \text{ kJ/kg}$$

$$14-28 \quad p = 95 \text{ kPa} \quad T_{db} = 25^\circ\text{C} \quad T_{wb} = 17^\circ\text{C}$$

$$p_{sat} @ 15^\circ\text{C} = 1.938 \text{ kPa} \quad p_{sat} @ 25^\circ\text{C} = 3.170 \text{ kPa} \quad h_{fg} @ 15^\circ\text{C} = 2460.6 \text{ kJ/kg}$$

$$w_{s2} = \frac{0.622 \cdot p_{sat}}{p - p_{sat}} = \frac{0.622 \cdot 1.938}{95 - 1.938} = 0.01245$$

$$w_1 = \frac{c_p(T_{wb} - T_{db}) + w_{s2} h_{fg2}}{h_{g1} - h_{f2}} = 0.00965 \text{ kg/kg}$$

$$p_v = \frac{w \cdot p}{0.622 + w} = 1.451 \text{ kPa} \quad \phi = \frac{p_v}{p_{sat}} = \frac{1.451}{3.170} = 45.8\% / 0.458$$

$$h = c_p \cdot T_{db} + w h_{g0} = 49.7 \text{ kJ/kg}$$

$$14-32 \quad p_{sat} @ 25 = 3.1698 \text{ kPa} \quad w_2 = \frac{p_{sat,2}}{p - p_{sat,2}} \cdot 0.622 = 0.622 \frac{3.1698}{98 - 3.1698} = 0.02024 \text{ kg}_{H_2O} / \text{kg}_{dry air}$$

$$w_1 = \frac{c_p(T_2 - T_1) + w_2 h_{fg,2}}{h_{g,1} - h_{f,2}} \quad h_f = 104.83 \quad h_{g,1} = 2564.6$$

$$h_{f,2} = 244.7$$

$$w_1 = 0.01655 \text{ kg/kg}$$

$$p_{v1} = \frac{w_1 p}{0.622 + w_1} = 2.541 \text{ kPa} \quad p_{sat} @ 35 = 5.6291$$

$$\phi_1 = \frac{p_{v1}}{p_{sat}} = \frac{2.541}{5.6291} = 45.1\%$$

14-39 A: 0.093 B: 48 kg/kg C: 45% D: 12°C F: 0.856

14-41 A: 63% B: 0.15 C: 55 kg D: 20°C E

$$E: P_v = \frac{0.015(101.3)}{0.622 + 0.015} = 2.39 \text{ kPa}$$

14-43 A: 73 B: 0.014 C: 38.9 kg/m³ D: 75% E: 43 Pa