Solutions

2.1

- $v(0.3) = 0.001044 + 0.3 \times 1.671856 = \mathbf{0.503}$ m^3/kg; $h(0.3) = 419.04 + 0.3 \times 2257.0 = \mathbf{1096.1}$ kJ/kg.
- $v(0.8) = 0.001044 + 0.8 \times 1.671856 = \mathbf{1.339}$ m^3/kg; $h(0.8) = 419.04 + 0.8 \times 2257.0 = \mathbf{2224.6}$ kJ/kg.

2.2

- Vapour mass $= 2 \times 0.3 = \mathbf{0.6}$ kg.
- Liquid mass $= 2 - 0.6 = \mathbf{1.4}$ kg. ✓

2.3

- $v = RT/p = 0.287 \times 400/200 = \mathbf{0.574}$ m^3/kg.
- $p = RT/v = 0.287 \times 400/1.000 = \mathbf{114.8}$ kPa.

2.4

- Volume fractions weight the phases by v, which differs by three orders of magnitude across the dome; only the mass fraction makes $v = v_f + x(v_g - v_f)$ linear and additive.
- Inside the dome p and T are not independent (they lock on the saturation line) and molecules interact during phase change, so the two-variable ideal-gas equation of state does not apply.

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