Solution

Quiz # 1

(Set B)

1. (a) TRUE
   (b) TRUE
   (c) FALSE
   (d) FALSE
   (e) TRUE

(1 × 5 = 5)

2. (a) ⟶ (V)
   (b) ⟶ (i)
   (c) ⟶ (iv)
   (d) ⟶ (iii)
   (e) ⟶ (ii)

(1 × 5 = 5)

3. (a) At the final state the cylinder contains saturated liquid-vapour mixture, and thus the final temperature must be the saturation temperature at the final pressure.

$$T = T_{sat@1\,MPa} = \boxed{179.88\,^{\circ}C}$$

(1)

(b) Since at the final state half of the mass condenses, therefore, half of the mass remains as vapour.

Therefore, $x_2 = 0.5$.

The specific volumes at the initial and the final states are :

$$\left.\begin{aligned} P_1 &= 1.0 \text{ MPa} \\ T_1 &= 300^\circ C \end{aligned}\right\} \quad v_1 = 0.25799 \text{ m}^3/\text{kg}$$

At $P_2 = 1.0$ MPa, $x_2 = 0.5$,

$$\begin{aligned} v_2 &= v_f + x_2 v_{fg} \\ &= 0.001127 + 0.5\,(0.19436 - 0.001127) \\ &= 0.001127 + 0.5\,(0.193233) \\ &= 0.001127 + 0.0966165 \\ &= 0.0977435 \text{ m}^3/\text{kg} \end{aligned}$$

Thus,

$$\begin{aligned} \Delta V &= m\,(v_2 - v_1) \\ &= (0.8)\,(0.0977435 - 0.25799) \\ &= (0.8)\,(-0.1602465) \\ &= -0.1281972 \\ &\approx \boxed{-0.1282 \text{ m}^3} \end{aligned}$$

(4)