

Answer on Question #66265, Physics / Mechanics | Relativity

For a specific volume of $0.2 \text{ m}^3/\text{kg}$, find the quality of steam if the absolute pressure is (a) 40 kPa and (b) 630 kPa. What is the temperature of each case.

Solution:

a) We use the table of Saturated water— Pressure. We use the next equation:

$$v = v_f + x(v_g - v_f)$$

$$0.2 \text{ m}^3/\text{kg} = 0.001 \text{ m}^3/\text{kg} + x(0.3993 - 0.001)\text{m}^3/\text{kg}$$

$$0.2 = 0.001 + 0.3983x$$

$$0.3983x = 0.2 - 0.001$$

$$0.392x = 0.199$$

$$x = 0.199 (\text{m}^3/\text{kg})/0.3983 (\text{m}^3/\text{kg})$$

$$x = 0.4996$$

In the quality region the temperature is given as $T = 155 \text{ }^\circ\text{C}$

b)

$$v = v_f + x(v_g - v_f)$$

$$0.2 \text{ m}^3/\text{kg} = 0.0011 \text{ m}^3/\text{kg} + x(0.3044 - 0.0011)\text{m}^3/\text{kg}$$

$$0.2 = 0.001 + 0.3044x$$

$$0.3044x = 0.2 - 0.0011$$

$$0.392x = 0.1989$$

$$x = 0.1989 (\text{m}^3/\text{kg})/0.3044 (\text{m}^3/\text{kg})$$

$$x = 0.6534$$

In the quality region the temperature is given as $T = 166 \text{ }^\circ\text{C}$

Answer: $155 \text{ }^\circ\text{C}$; $T = 166 \text{ }^\circ\text{C}$

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