No	Question	Name	Matrix	substance		Temperature, T	Pressure, P	Mass, m	Volume, υ	Specific volume, v	Specific internal energy, u	Specific enthalpy, h	Specific entropy, s	quality, x	phase description	Note
				water, H_2O	refrigerant-134a	[°C]	[kPa]	[kg]	[m^3]	[m^3/kg]	[kJ/kg]	[kJ/kg]	[kJ/kg·K]	[-]	[-]	[-]
Example	3-127	Lecturer	-	x			200	-	240						Saturated liquid-vapor mixture	25% mass is liquid, 75% mass is vapor

Given :

Substance : water

two intensive properties : $P = 200$ kPa, 75% mass is vapor

Phase description : Saturated liquid-vapor mixture

Solution :

From Table A-5 :

TABLE A–5

Saturated water—Pressure table

		Specific volume, m^3/kg		*Internal energy*, kJ/kg			*Enthalpy*, kJ/kg			*Entropy*, kJ/kg·K		
Press., P kPa	Sat. temp., T_{sat} °C	Sat. liquid, v_f	Sat. vapor, v_g	Sat. liquid, u_f	Evap., u_{fg}	Sat. vapor, u_g	Sat. liquid, h_f	Evap., h_{fg}	Sat. vapor, h_g	Sat. liquid, s_f	Evap., s_{fg}	Sat. vapor, s_g
200	120.21	0.001061	0.88578	504.50	2024.6	2529.1	504.71	2201.6	2706.3	1.5302	5.5968	7.1270

Temperature :

$$T = T_{\text{sat}} = 120.21\ ^\circ\text{C}$$

Quality :

$$75\%\ \text{mass is vapor} \rightarrow x = 0.75$$

Specific volume :

$$v = v_{\text{f}} + x(v_{\text{g}} - v_{\text{f}}) = (0.001061\ \text{m}^3/\text{kg}) + (0.75)[(0.88578\ \text{m}^3/\text{kg}) - (0.001061\ \text{m}^3/\text{kg})]$$

$$v = 0.66460\ \text{m}^3/\text{kg}$$

Specific internal energy :

$$u = u_{\text{f}} + xu_{\text{fg}} = (504.50\ \text{kJ/kg}) + (0.75)(2024.6\ \text{kJ/kg})$$

$$u = 2023.0\ \text{kJ/kg}$$

Specific enthalpy :

$$h = h_{\text{f}} + xh_{\text{fg}} = (504.71\ \text{kJ/kg}) + (0.75)(2201.6\ \text{kJ/kg})$$

$$h = 2155.91\ \text{kJ/kg}$$

Specific entropy :

$$s = s_{\text{f}} + xs_{\text{fg}} = (1.5302\ \text{kJ/kg} \cdot \text{K}) + (0.75)(7.1270\ \text{kJ/kg} \cdot \text{K})$$

$$s = 6.8755\ \text{kJ/kg} \cdot \text{K}$$

No	Question	Name	Matrix	substance		Temperature, T	Pressure, P	Mass, m	Volume, υ	Specific volume, v	Specific internal energy, u	Specific enthalpy, h	Specific entropy, s	quality, x	phase description	Note
				water, H_2O	refrigerant-134a	[°C]	[kPa]	[kg]	[m^3]	[m^3/kg]	[kJ/kg]	[kJ/kg]	[kJ/kg·K]	[-]	[-]	[-]
Example	3-127	Lecturer	-	x		120.21	200	-	240	0.66460	2023.0	2155.91	6.8755	0.75	Saturated liquid-vapor mixture	25% mass is liquid, 75% mass is vapor

Note : If your calculation work require interpolation of the given data in the table, please show the details steps of the involved interpolation. If you required more than a table, please show all the involved table and also the reason for the selected table. Please include the units for the properties in your calculation.

If this is the question in a test or final examination, your solution can be given as follow:

"*The given substance is water.*"

"*The information of 25% mass is liquid and 75 % mass is vapour indicates this is a saturated liquid-vapor mixture.*" Or "*Given phase is saturated liquid-vapor mixture.*"

"*From Table A-5,*"

"$T = T_{\text{sat}} = 120.21\ ^\circ\text{C}$"

"*The information of 25% mass is liquid and 75 % mass is vapour indicates quality,* $x = 0.75$."

"$v = v_{\text{f}} + x\left(v_{\text{g}} - v_{\text{f}}\right)$"

"$v = (0.001061\ \text{m}^3/\text{kg}) + (0.75)[(0.88578\ \text{m}^3/\text{kg}) - (0.001061\ \text{m}^3/\text{kg})]$"

"$v = 0.66460\ \text{m}^3/\text{kg}$"

And so on for other …..