

ROSE-HULMAN INSTITUTE OF TECHNOLOGY  
 Foundation Coalition Sophomore Engineering Curriculum

ES 202 - Fluid & Thermal Systems

**Water: PHASES & PROPERTIES**

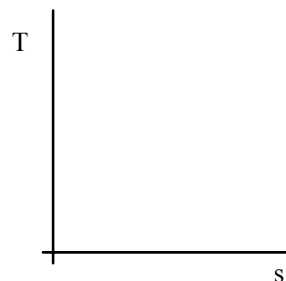
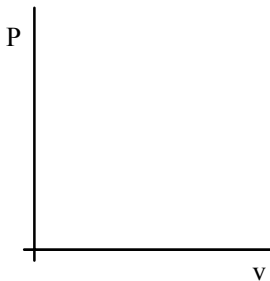
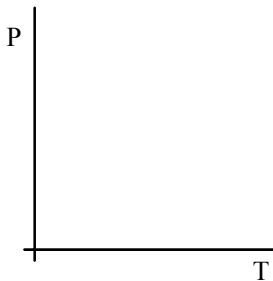
1. Provide the information requested in the table for WATER. When specifying the phases use the following abbreviations:

- CL = compressed (subcooled) liquid
- SL = saturated liquid
- SM = saturated mixture
- SV = saturated vapor
- SHV = superheated vapor

Use "NA" for items that are not applicable at a particular state.

State	Phase	Pressure, P [kPa]	Temperature T [°C]	Quality, x	Specific Volume, v [m <sup>3</sup> /kg]	Specific Internal Energy, u [kJ/kg]	Specific Enthalpy, h [kJ/kg]	Specific Entropy, s [kJ/(kg-K)]
1		500	350					
2		500	140					
3	SL	500						
4		500				1000		
5	SV	500						
6			100	0.30				
7			100		2.0			
8			100					6.0
9	SL		100					
10		5000	100					
11	SL	5000						

2. States 9 and 11 are approximations of state 10. Which approximation is more accurate?
3. Plot the states on the three diagrams below. Positions may be approximate but relative positions should be correct when compared with other states and saturation curves.



Phases & Properties

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ES 202 - Fluid & Thermal Systems

**R-134a: PHASES & PROPERTIES**

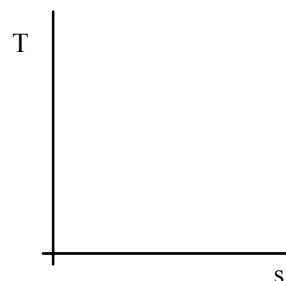
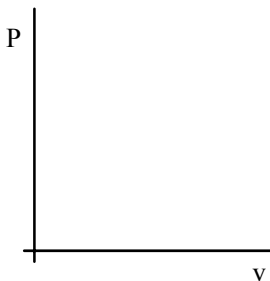
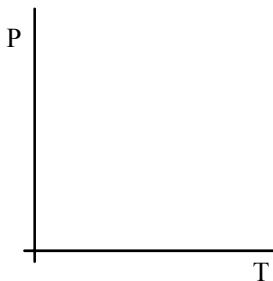
4. Provide the information requested in the table for R-134a. When specifying the phases use the following abbreviations:

- CL = compressed (subcooled) liquid
- SL = saturated liquid
- SM = saturated mixture
- SV = saturated vapor
- SHV = superheated vapor

Use "NA" for items that are not applicable at a particular state.

State	Phase	Pressure, P [kPa]	Temperature T [°C]	Specific Volume, v [m <sup>3</sup> /kg]	Specific Internal Energy, u [kJ/kg]	Specific Enthalpy, h [kJ/kg]	Specific Entropy, s [kJ/(kg-K)]	Quality, x
1		240	-12					
2		240				266.85		
3	SL	240						
4		240				150		
5	SV	240						
6			30					0.4
7			30	0.0188				
8			30		90.84			
9	SV		30					
10		1400	30					
11		1400	60					

5. Plot the states on the three diagrams below. Positions may be approximate but relative positions should be correct when compared with other states and saturation curves.



Phases & Properties