

Name: _____ CM Box: _____

Circle your section:

Sanders – 05

Sanders – 06

Lui – 07

Lui – 08

ES 202
Fluid & Thermal Systems

Examination I
December 17, 2004

Problem	Score
1	/70
2	/30
Total	/100

Show all work for credit

Open table ONLY

Laptops allowed

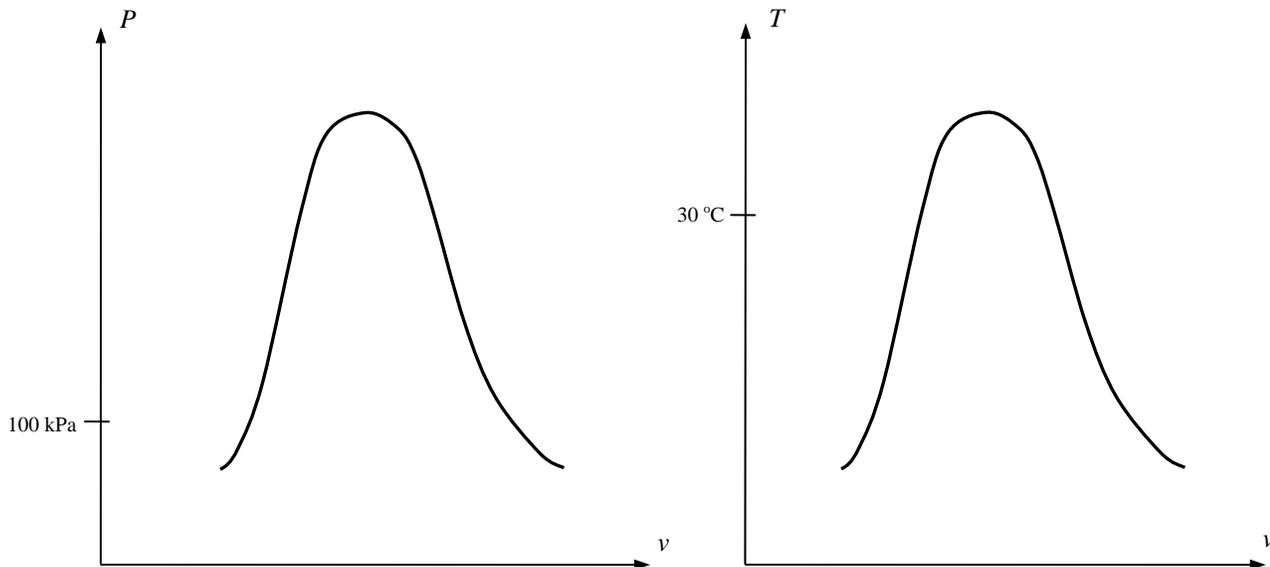
Problem 1 (70 points)

a) Determine the thermodynamic properties for Refrigerant 134a in the unshaded boxes of the table below, up to 4 significant figures. You may use the next page as work space. Use the following abbreviations when specifying any verbal description:

- CL = compressed (subcooled) liquid
- SL = saturated liquid
- SM = saturated mixture
- SV = saturated vapor
- SHV = superheated vapor
- NA = not applicable
- INSUF = insufficient information

State	Phase	Pressure, P (kPa)	Temperature, T ($^{\circ}\text{C}$)	Specific Volume, v (m^3/kg)	Specific Enthalpy, h (kJ/kg)	Quality, x
1		100	40			
2	SL	100				
3		100	-26.43			
4		100		0.10		
5		1000	30			
6			30		277.17	
7			30			0.8
8	SV		30			

b) Locate all identifiable states (1 – 8) on the P - v and T - v diagrams below.



Problem 2 (30 points)

Given air at two different states:

State 1: $T_1 = 500 \text{ K}$, $P_1 = 100 \text{ kPa}$ (ideal gas)

State 2: $T_2 = 1500 \text{ K}$, $P_2 = 1 \text{ MPa}$

a) Is the ideal gas model a reasonable approximation to State 2? Show your reasoning.

b) Determine the following changes in thermodynamic properties using the most accurate method available to you:

i. specific enthalpy: $h_2 - h_1 = \underline{\hspace{2cm}}$ kJ/kg

ii. specific entropy: $s_2 - s_1 = \underline{\hspace{2cm}}$ kJ/kg-K

iii. specific volume: $v_2 - v_1 = \underline{\hspace{2cm}}$ m³/kg