Quiz (use your own paper)

- (8 pts) Name _____
- (1 pt) Write the equation to calculate $\widehat{H}_{NH_3}$ at 350°C.
- (1 pt) Write the transient species mass balance equation.

Exam 3

- Take Home, Today thru Tuesday (Nov 20 – Nov 24)
  - Due Tuesday morning (11/24) at 9 am
  - Closed Book, Closed Notes/Homework
  - One 8.5 x 11 paper with notes on both sides
    - I am not supplying equations
    - I am supplying data (C_p, $\Delta H_f°$, etc.)
  - Calculator needed
  - Straight edge needed
- Time limit is 3 hours
  - Some easy problems, some more complicated problems
  - I would like to test what you know, not what you can learn during the test period
- Aligned with competencies!!

Competencies for Exam 3

- Students will be able to set up and solve steady state energy balances (1st law of thermodynamics) for closed and open systems
- Students will understand and be able to apply the concepts of:
  - heat capacity
  - latent heat (phase change)
  - heat of reaction & heat of combustion
  - heat of formation.
- Students will be able to calculate internal energy & enthalpy at system conditions assuming ideal behavior
- Students will be able to set up and solve transient mass balances

In-Class Assignment (with team)

1. Take turns explaining review sheet outline
   - Circle any areas where your team is weak
2. Go over practice exam
   - Identify competencies for each problem
     - Some are from previous exam period
   - Discuss solution strategy
   - Write down weak areas that should be reviewed with Dr. Fletcher or TAs

Do It!

Competencies on Practice Exam

1.	Heat exchanger	(83%)
2.	Humidity (psychrometric chart)	(75%)
	• Energy & mass balance	
	• Review of humidity	
3.	Stoichiometry of mixtures	(70%)
4.	Heat of Reaction	(98%)
5.	Energy balances on cycle	(93%)
	• Pump & Turbine	
	• Heat exchangers	
	• P-H diagram	
6.	Adiabatic flame temperature	(90%)
7.	Transient species balance	(85%)
	Average score	(83%)

Psychrometric Chart

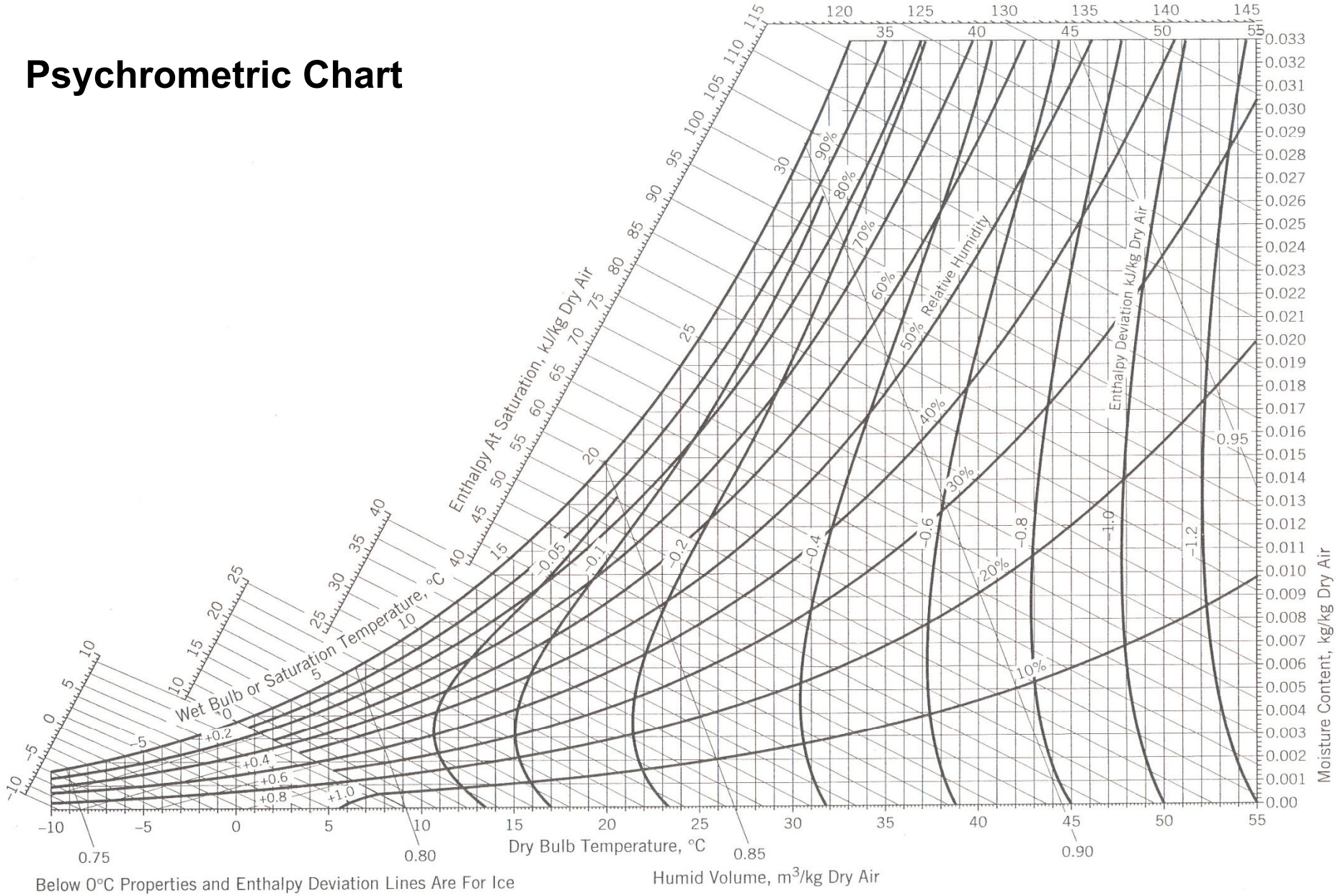

Figure 8.4-1 Psychrometric chart—SI units. Reference states: H_2O (L, 0°C, 1 atm), dry air (0°C, 1 atm). (Reprinted with permission of Carrier Corporation.)

Refrigerant 22
P-H diagram

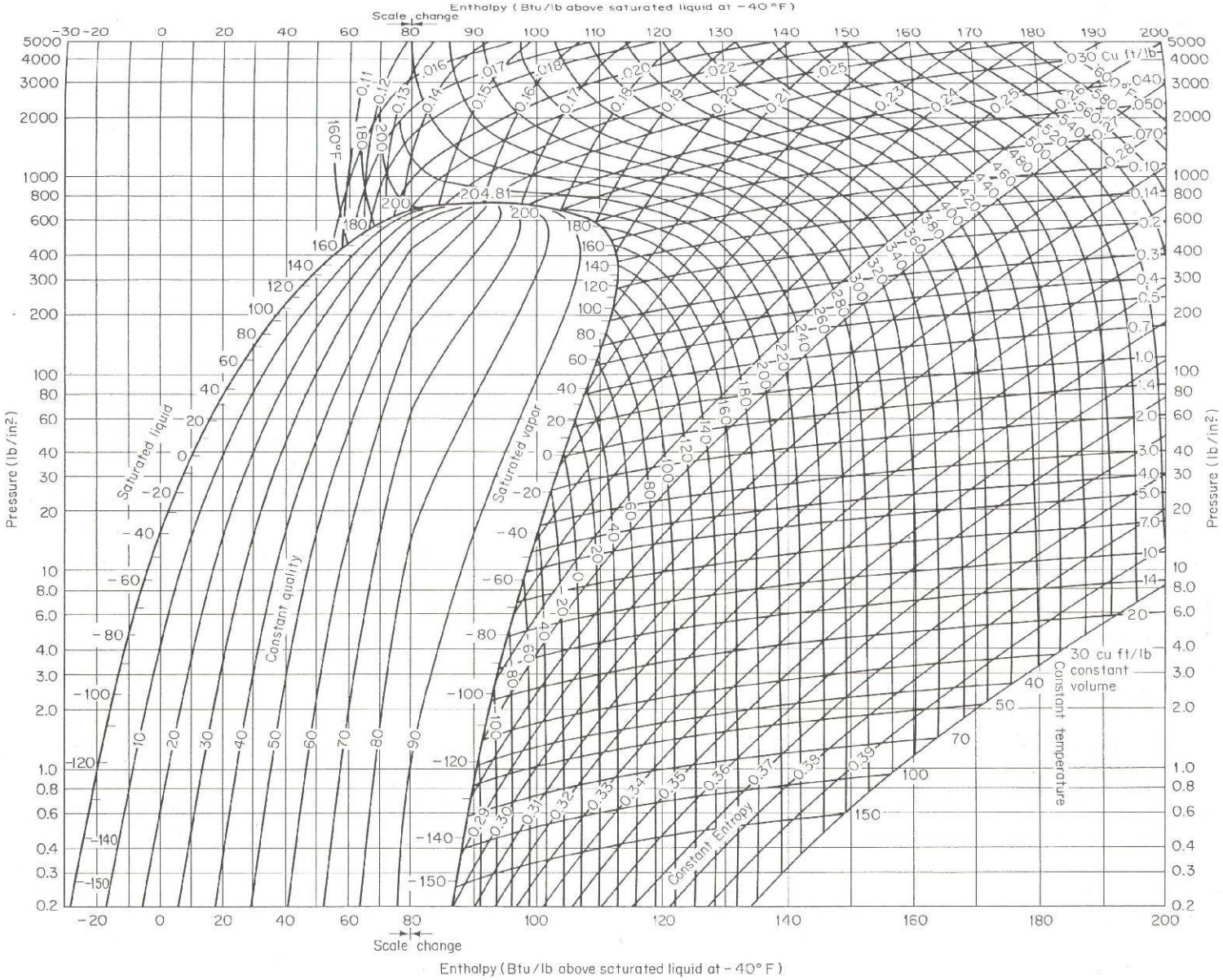

Fig. 3-38. Enthalpy–log pressure diagram for Refrigerant 22. Temperature in °F., volume in cu. ft./lb., entropy in B.t.u./(lb.)(°R.), quality in weight per cent. Copyright E.I. du Pont de Nemours & Company. Reprinted by permission of the copyright owner. The 1967 Karlsruhe *H*–log *P* chart in the metric system covers a range of −90° to 250°C., 0.035 to 121 bars. The Landolt-Börnstein 1967 tables, vol. IVa, give saturation properties from −100° to 96°C., while D'Ans-Lax, "Taschenbuch," 1967, tables at somewhat coarser increments extend from −100° to 70°C. In Vargaftik, "Thermophysical Properties of Substances," Moscow, 1963, tables mostly cover the range −100° to 50°C. The 1967 A.S.H.R.A.E. "Fundamentals" volume contains the above diagram and also an enlarged section for pressures to 300 lb./sq. in. abs. Detailed saturation tables for −155(1)204 and 204.81°F. and superheat tables from −150° to 480°F., 0.2 to 540 lb./sq. in. abs. are contained in *du Pont Bulletin* T-22, 1964. The 1967 A.S.H.R.A.E. "Fundamentals" volume also contains saturation tables for −150(5)-100(2)204 and 204.81°F.