**ANNOUNCED QUIZ #9 – ME 3030 — Section 001 – Fall 2025**

NAME: SOLUTION

**This is an open book quiz. You may use a four-function calculator. An unsigned honors pledge will result in a zero.**

1. A sample of moist air is at a pressure of 20.000 bar, a temperature of 90.000°C, and a humidity ratio of 0.0050. To what temperature in °C must the sample be cooled at constant pressure to become saturated?

GIVEN: $P_i, T_i, \omega_i$. Constant pressure cooling

FIND: $T$ at saturation.

ASSUME:

ANALYSIS: Sample becomes saturated, so $\phi$ becomes 1.

$$\phi = 1 = \frac{P_v}{P_g(T)}$$

↑ want this

Get $P_v$

$$\omega = 0.622 \frac{P_v}{P - P_v} \rightarrow \frac{\omega}{0.622}(P - P_v) = P_v$$

$$P - P_v = \left(\frac{.622}{\omega}\right) P_v \qquad P = P_v\left(1 + \frac{.622}{\omega}\right)$$

$$P_v = \frac{P}{1 + \frac{.622}{\omega}} \qquad P_v = \frac{20\ \text{bar}}{1 + \frac{.622}{\omega}} = 0.1595\ \text{bar}$$

$$\phi = 1 = \frac{0.1595\ \text{bar}}{P_g(T)}$$

$$P_g(T) = 0.1595\ \text{bar}$$

Interpolate in Table A-2 →

| $T_{sat}$ (°C) | $P_{sat}$ (bar) |
|---|---|
| 55 | 0.1576 |
| (T) | 0.1595 |
| 60 | 0.1994 |

$$\frac{(0.1994 - .1576)\ \text{bar}}{(60 - 55)\ °C} = \frac{(.1595 - .1576)\ \text{bar}}{T - 55°C}$$

$T = 55.227\ °C$ ← ANS.

I HAVE NEITHER PROVIDED OR RECEIVED HELP DURING THIS QUIZ.

SIGNATURE